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MASTER OF MILITARY STUDIES

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**TITLE:**

Decreasing the Vulnerability Gap: Improving Decision Making Training in the Marine Corps

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## **Executive Summary**

**Title:** Decreasing the Vulnerability Gap: Improving Decision Making Training in the Marine Corps

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**Thesis:** To maintain an intellectual edge on the future battlefield and to improve the practice of mission tactics, the Marine Corps must reinvigorate decision-making practices, leverage technologies, and formalize an organization-wide approach to capture the decision-making effectiveness of its leaders.

**Discussion:** As technology and weapon systems continue to grow in range and lethality, their threat to massed forces and entire units increases exponentially. The armed forces of the United States have grown accustomed from past wars to aggregated forces and entire units fighting together on the battlefields. To mitigate the risk posed by current and future weapons, the Marine Corps must change the way it fights and become more dispersed and disaggregated. This dispersal will make the decisions of small unit leaders more paramount as the decisions once made by more senior members will be made and executed by more junior leaders. Maturation of the judgment and decision-making capacity of small unit leaders will need to be achieved to maintain an intellectual edge. Decision-making training, therefore, should focus on developing the level of expertise required to enhance cue recognition, the ability to recognize biases and invalid cues, and the speed to minimize the vulnerability gap or the time an individual is vulnerable from observing a situation to making a decision. The Marine Corps has attempted to vitalize decision-making training numerous times but none other than traditional methods have taken hold in an organization-wide way. Invigorating some of those legacy methods while also leveraging existing and emerging technologies has the potential to significantly enhance the decision-making of the Marine Corps' small unit leaders. Along the same lines, the Marine Corps currently does not require nor has the means to capture decisions made by its individuals.

**Conclusion:** By reinvigorating traditional decision-making methods, leveraging technologies, mandating decision-making training, and capturing the effectiveness of the decisions made by its leaders, the Marine Corps can produce better decision-makers and better understand the cognitive readiness of its units.

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## *Preface and Acknowledgments*

Having spent nearly half of my time in the Marine Corps as an instructor at various Marine Corps schools, I have always been fascinated by the science and art of decision-making. I have found myself continually asking questions like: Why is that person a better decision-maker than this person? What have they done differently than the other that contributes to their decision-making? How does their conscious/subconscious process information to better inform their decisions? How can I get better at decision-making? This journey to finally seek the answers to these questions has been one of the most fruitful and emotional experiences of my life and one that I could not have done without the help of a group of people I now consider family.

One of the universal truths in life is that there will be plenty of life-changing events for as long as we inherit this earth. Halfway through this year at Command and Staff, my four-year-old daughter was diagnosed with a brain condition that required surgery to prevent further issues which immediately re-prioritized the many things going on in my life, including this paper. From the diagnosis to the weeks and months after her surgery and as things started to trend in the right direction and equalize, I reflected on the time-sensitive and high-stakes decisions my wife and I had to make and was amazed at the correlation between some of the concepts laid out in this paper relating to decision-making in combat and decision-making in other areas of life. In more ways than one, this recognition has changed the way I look at my decision-making in every aspect of my life.

There are no words to describe the gratitude and thanks I have for the many people who helped and supported me through this journey. Dr. Paolo Tripodi, a mentor in the truest sense of the word, helped guide my efforts while also allowing me the flexibility to take care of the most important thing in my life. His knowledge, support, and guidance are without a doubt the main contributing factor to getting me where I am at this point.

The support, advice, and friendship from Dr. Lauren Mackenzie are things I will carry for the rest of my life. As my civilian faculty advisor and second reader, her inputs and feedback were and will continue to be most welcome and have further developed me as a father, husband, and Marine Corps officer. Her approach to education and teambuilding are worthy of emulation and her genuine concern for the welfare of my family will never be forgotten. I am incredibly fortunate to call her a friend and mentor.

Lastly, the love, strength, and fortitude of my wife and two daughters amaze me each and every day and are a constant reminder of how blessed I am at this point in my life and career. Without them none of this matters. I will forever be thankful for their love, support, and patience.

## Introduction

Technological innovations and improvements to long-range weapon systems have elevated decision authorities to higher levels of command due to operational and strategic implications. Conversely, the increased range and lethality of these weapon systems pose a significant threat to massed forces, support bases, and rear area operations. As nearly all of the United States' wars have shown, the United States military has grown accustomed to aggregated forces and the luxury of operating as whole units which create a significant amount of risk on the future battlefield. The future force, more specifically the Marine Corps as it undergoes its transformation to a stand-in littoral force, will need to alter this way of operating to combat the risk associated with aggregation.<sup>1</sup> This will require Marine forces to be dispersed throughout the battlespace to “enable force protection, complicate the adversary’s targeting cycle, and impose cost upon the enemy in time and material.”<sup>2</sup> The required dispersal of forces has made the decision-making capabilities of small unit leaders increasingly more paramount as the decisions once made by field grade officers and senior enlisted will be made and executed by more junior leaders. Dispersal will require smaller units led by lower ranks to be more independent, more self-sufficient, and more decisive to achieve the same operational effects as the larger units of past wars. Success, therefore, will require a significant maturation of the intuitive judgment and decision-making of small unit leaders which can be achieved through both training and education.

While training and education are inseparable and both facilitate learning, there are distinct differences inherent to both that leaders at all levels must understand to better prepare their Marines for combat. Simply put, “training prepares Marines to deal with the known factors of war...while education prepares Marines to deal with the unknown factors.”<sup>3</sup> Training,

therefore, aids in producing or enhancing tangible skills in known or anticipated conditions such as how to conduct a defense. Education, however, may include the study of past historical defenses and the knowledge gained from that study can provide insights into the technique of timing a counterattack as the exact conditions when that decision would need to be made are unknown or cannot entirely be anticipated. Both training and education are essential to the decision-making capacity of Marines at all levels but neither will happen without deliberate attention from commanders.

The need to hone the edge of decision-making is not a new concept for the Marine Corps. It has long understood that effective decision-making amongst its leaders is a critical component of effectiveness on the battlefield, especially because the Marine Corps practices mission tactics. As a key pillar of maneuver warfare, “mission tactics is the assignment of a mission to a subordinate without specifying how the mission must be accomplished.”<sup>4</sup> This requires subordinates to understand the intent of their commander so that their decisions and actions support the overall mission. In his 1999 article, *Cultivating Intuitive Decision Making*, General Krulak believed that the only way to cultivate this form of decision-making in Marine Corps leaders was through repetition of decisions. In his view, change was needed throughout the Corps from the School of Infantry to the Marine Air-Ground Task Force to implement that cultural change.<sup>5</sup> Since then, the Marine Corps has adopted various techniques to teach decision-making and conducted several studies dedicated to improving the decision-making of its Marines. The Marine Corps’ overall goal is to develop Marines to accurately recognize and quickly make sense of cues provided by their environment, arrive at a decision, and respond effectively.<sup>6</sup> However, competing garrison and operational interests drastically reduce the amount of decision-making training Marines perform which also reduces their capacity to

intuitively recognize patterns in their environment. To maintain an intellectual edge on the future battlefield and to improve the practice of mission tactics, the Marine Corps must reinvigorate decision-making practices, leverage technologies, and formalize an organization-wide approach to capture the decision-making effectiveness of its leaders.

This paper will begin by providing a foundation of the leading schools of decision-making theory by examining some of the most influential decision-making theorists. This will not only identify the differences between the schools of thought but will, more importantly, highlight the similarities and the complementary nature each provides to effective decision-making on the battlefield. With the foundation set, key components of the future operating environment will be examined followed by the Marine Corps' response to the need to hone the decision-making edge of its small unit leaders. This paper will conclude by providing recommendations for practical mediums that leaders at all levels can employ to enhance the decision-making of their Marines to achieve an intellectual advantage before ever stepping foot on the battlefield.

### **How We Think and Decide**

Determining the effectiveness of current decision-making practices first requires an examination of the overarching theories on how individuals process information and arrive at a decision. Decisions based on intuition, expertise, and skill have been at the center of much debate primarily between two groups of theorists: Naturalistic Decision-makers (NDM) or those who make decisions intuitively, and those who view decision-making through the lens of Heuristics and Biases (HB) where past experiences can inform decisions but are also wrought with cognitive flaws.<sup>7</sup> With the overall perspective of this paper focused on improving the decisions of small unit leaders in the time-compressed, fluid, and uncertain environment of

combat, it will not focus on the less time-compressed, more analytical forms of decision-making typically associated with deliberate planning models such as the Marine Corps Planning Process or the Military Decision-Making Process.

### **Naturalistic Decision-making**

The theory and study of NDM began in the 1940s largely through the study of master chess players and is centered around the idea of the successes of expert intuition.<sup>8</sup> The study by Adriaan de Groot and furthered by William Chase and Herbert Simon demonstrated that chess masters were more adept at identifying "the most promising moves rapidly" and identifying more complex patterns than less skilled chess players.<sup>9</sup> This notion gave rise to the idea of expertise and the ability to apply past studies and experiences to decision-making in the present. One of the leading scholars in the NDM camp is Gary Klein, a firm advocate for the primacy of intuition and expertise in decision-making. He has centered his position around people deemed to be subject matter experts in their profession that make decisions in dynamic or complex environments and, more importantly, around the intuitive nature of those decisions. He argues that the judgments that ultimately lead to decisions arise "without explicit awareness of the evoking cues".<sup>10</sup> This has also been termed an "automatic information-processing approach."<sup>11</sup>

Two studies involving firefighters and nurses are frequently cited to support the NDM idea of intuition. Similar to small unit leaders in the military, firefighters are required to make decisions in uncertain, time-compressed conditions. The results of the study showed that firefighters faced with an emergency fire would focus on the cues provided by the environment and would develop a single course of action that was then tested cognitively and either executed or modified before physical execution.<sup>12</sup> The cues provided by the environment were recognized by the firefighters from their "repertoire of patterns acquired over a decade of firefighting."<sup>13</sup>

Thus, the “recognition primed decision-making” (RPDM) model was born and is seen in multiple NDM works as well as *Marine Corps Doctrinal Publication 7: Learning*.<sup>14</sup> The RPDM fuzes the way decision-makers intuitively recognize patterns from past experiences with how they cognitively imagine their decision playing out.<sup>15</sup> Similar to the firefighter study, the 1993 study of neonatal intensive care unit nurses demonstrated an ability to detect and take appropriate action on life-threatening infections before they received the report on blood tests.<sup>16</sup> At first, they struggled to identify how they arrived at their decision, but researchers were able to get them to articulate the cues they were observing that influenced their decisions.<sup>17</sup> The researchers concluded that the nurses’ past experiences were key to their ability to recognize relevant and important cues and patterns.

An additional study was performed in 2007 to test the impact or power of intuition in the decision-making of athletes, specifically handball athletes. In the study, handball athletes were shown various clips of handball games. The videos were paused before action was made and the participants were asked to identify what options were available before the video was resumed.<sup>18</sup> From this study, several interesting thoughts on intuitive decision-making were gleaned. For example, the results showed that athletes executing intuitive decisions were both faster and more effective in their decision-making than those who made more deliberate choices.<sup>19</sup> Another interesting finding pertained to the level of expertise of the athlete. It found that the athletes considered to be experts were significantly more intuitive than non-expert athletes and that the experts used less information which led to even fewer “fixations.”<sup>20</sup> In many ways, these findings support both NDM and HB schools of thought. One area of deviation pertains to the number of options generated when faced with a dynamic environment. The study argues that these experts not only generate multiple options but also learn to order those options based on

their intuitive assessment.<sup>21</sup> This point was supported in *Take the First: Option Generation and Resulting Choices* by Marcus Raab and Joseph Johnson. They identified that true experts generate a lower number of options but that those options are of higher quality when compared to options generated by novices.<sup>22</sup> As the studies and research showed, a large portion of NDM or RPDM is centered around “unconscious associations between a perceived situation and a course of action” that lead to rapid, less-analytical decision-making.<sup>23</sup> As such, HB researchers and theorists take the stance that those intuitive decisions can be flawed as those unconscious associations possess inherent flaws.

### **Impact of Heuristics and Biases**

The theory of the impact of heuristics and biases on decision-making originated in the 1950s with Peter Meehl who analyzed 20 studies surrounding predictions of forecasts by a human judge and by statistical models.<sup>24</sup> He found that the statistical models were more accurate and more consistent than the human judges.<sup>25</sup> This study brought to light one of HB theorists' main arguments: that intuitive judgments can be both flawed and inconsistent. This is evidenced through multiple studies where different human judges were presented with the same information but came to different conclusions.<sup>26</sup> Daniel Kahneman, an Israeli psychologist whose career has been largely focused on decision-making, is a well-known HB theorist that furthered the results of this study. He acknowledges the existence of expertise and skill but highlights that the cues NDM practitioners tout can be flawed or skewed by the natural flaws of human cognition.<sup>27</sup> According to Kahneman, these “cues” go through no mechanism to validate their truth which can result in a bias that, in turn, leads to incorrect or ineffective decisions.<sup>28</sup> Additionally, he argues that people, even those considered experts in their field, can be misinformed by these subjective, albeit unconscious, intuitions.<sup>29</sup> Examples of this are baseball scouts, stock traders, and those

who make political predictions.<sup>30</sup> For these cases and to overcome the flaws of human cognition, Kahneman offers that statistical models can validate the cues provided by the environment and produce better decisions than those that rely on intuition and skill.<sup>31</sup> They counter the NDM theorists' position of expertise by stating that the criterion for expertise is based on a "history of successful outcomes" whereas the HB method of validating cues is based on "quantitative performance measures."<sup>32</sup>

While both theories of decision-making certainly have their merits and opposing viewpoints, the military does not solely advocate for one over the other nor should it. There are key aspects of each theory that support the Marine Corps' overall goal of developing effective decision-makers. However, in the time-sensitive, high-stakes arena of combat, the studies show that intuitive or the RPDM proves to be the more effective and lethal form. The development of this form of decision-making is expected to be of much more importance based on the current assessments of military leaders on the characteristics of the future operating environment.

### **The Future Operating Environment**

While the nature of war remains constant, how it is waged is an endless state of change.<sup>33</sup> The evolution of technologies and global interconnectedness has forced a shift in perspective in how the United States views future adversaries and what future conflict may look like. The Joint Chiefs believe the future environment will be one characterized by periods of acceleration under the "conditions of great power competition" and that disruptive technologies, innovations, and the need for adaptation will be pervasive.<sup>34</sup> The 38<sup>th</sup> Commandant of the Marine Corps, General Berger, offered the same position in 2019 and has echoed it in multiple venues since. He believes that the next decade, as every decade before it, will be characterized by "conflict, crises, and rapid change."<sup>35</sup> In his Commandant's Planning Guidance (CPG), he states that "we will need to

be even better tomorrow to maintain our warfighting overmatch.”<sup>36</sup> He believes that the Marine Corps will provide stand-in forces to key maritime terrain to deter and counter adversary initiatives. These forces will be within adversary threat rings and will therefore need to be highly mobile, expeditionary, and dispersed.<sup>37</sup> The *Tentative Manual for Expeditionary Advanced Base Operations* (EABO) was developed from this notion of the future operating environment. It states that due to increased threat rings of weapon systems, littoral forces must be dispersed as “widely as possible to enable force protection, complicate the adversary’s targeting cycle, and impose cost upon the enemy in time and material.”<sup>38</sup> The Marine Corps has grown accustomed to aggregating and operating as entire units but it is starting to recognize that smaller, low-signature, dispersed units are on the horizon.

### **The Requirement for Change**

The Joint Chiefs of Staff recognize this necessity for change and offer that because of the “profound and rapidly changing character of war,” the United States military must focus its efforts on “leader development” to maintain its advantage on the future battlefield.<sup>39</sup> They believe that the armed forces must do more to gain and maintain an advantage than pure technological advancements; they believe that leaders at all levels must “gain and sustain an intellectual overmatch.”<sup>40</sup> To achieve this, the armed forces must drastically improve the cognitive capacities of their warfighters by prioritizing both critical and creative thinking.<sup>41</sup> The Joint Chiefs have directed the evolution of the “leader development enterprise” that cannot solely reside in Professional Military Education (PME) courses.<sup>42</sup> Part of this evolution demands the enhancement of experience and the critical thinking skills to understand when a stimulus is being affected by bias or emotion. This requires a “purposeful combination of education, training,

rigorous exercises, and application in the real world.”<sup>43</sup> While reinvigorated by the Joint Chiefs, these concepts are not new to the Marine Corps.

In 1999, the 31<sup>st</sup> Commandant of the Marine Corps, General Charles Krulak, penned an article titled *Cultivating Intuitive Decisionmaking*. In it, he recognizes that the future operating environment will require Marines to make rapid, independent decisions while distinguishing between “information that is useful and that which is not pertinent.”<sup>44</sup> Drawing from the HB camp, he understood that certain biases and/or emotions had the potential to skew decisions. From the NDM or RPDM camp, he argued that our decision-makers must be able to “feel” the battlefield by “identifying patterns among the chaos and make decisions in seconds.”<sup>45</sup> This coup d’oeil, or “stroke of the eye”, is the ability to quickly recognize the different cues of a situation or “the quick recognition of a truth that the mind would ordinarily miss or would perceive only after long study and reflection.”<sup>46</sup> The changes needed to effectively develop this capacity for decision-making within the Marine Corps would require a wide-reaching impact on units, schools, and the supporting establishment.

Twenty years later, the current commandant echoes nearly all of the same points which should be an indicator that the Marine Corps has done little, or not enough, to rectify a shortfall highlighted two decades ago. General Berger in his CPG argues that one area the Marine Corps must refocus its efforts on is decision-making that creates speed and tempo. He believes to win the intellectual overmatch against our enemies that Marines must be comfortable with mission tactics, distribution of forces, and the chaos inherent to war.<sup>47</sup> Amongst a plethora of additional guidance, he pushed for a doctrinal publication that would formulate how Marines would learn, process information, and execute the decision cycle faster than our adversaries so that intuitive decision and action would become “second nature to all Marines.”<sup>48</sup>

## The Marine Corps' Response

While mentioned throughout multiple other articles and doctrinal publications as an expectation of its leaders, the release of Marine Corps Doctrinal Publication 7: *Learning* in 2020 codified and elaborated on the Marine Corps perspective of both learning and decision-making. In many ways, the doctrine weaves the necessity for PME together with decision-making practices and synthesizes these into how Marines learn. As former Command and Staff student Stephen Shull, addresses, “it is past time that the development and evaluation of a decision-making philosophy stand alone in a Marine Corps doctrinal publication.”<sup>49</sup>

The beginning of *Learning* centers around the nature of learning. Clearly in homage to how MCDP 1 Warfighting notes the universal and unchanging nature of war, *Learning* highlights the universal nature or environment in which learning occurs and is required. To be able to produce adaptive leaders capable of making intuitive decisions in the conduct of maneuver warfare, there must first exist a culture of continuous learning from both formal and informal settings.<sup>50</sup> Only if this culture exists can the Marine Corps truly create the intellectual overmatch envisioned by the Joint Chiefs of Staff and the Commandant and execute the essence of mission tactics based on commander's intent.<sup>51</sup>

Just as the rest of Marine Corps doctrine lacks an exact or prescriptive way to execute the theoretical concepts, *Learning* avoids a prescriptive method for execution but does provide time tested and proven mediums, e.g. tactical decision games, war games, case studies, etc., by which both learning and the cultivation of decision-making can occur.<sup>52</sup> In addition, it offers the incorporation of decision-making mediums into physical training and the use of goal setting as successful mediums to enhance learning.<sup>53</sup> The doctrine uses these examples to shift to the task of creating a passion for learning. It argues that one of the greatest enemies of learning is the

discouragement of individual initiative, feedback, and problem-solving.<sup>54</sup> The Marine Corps did not solely focus on the doctrinal and theoretical realms. Over the last decade, it embarked on numerous initiatives focused on improving small unit leaders' capacity for decision-making.

### **Small Unit Decision-Making Workshop**

Despite *Learning* not being published until 2020, the Marine Corps has taken some appropriate steps to improve the decision-making of its unit leaders. In 2011, the Marine Corps partnered with both private and civilian educational experts to explore small unit decision-making for both assessment and improvements purposes. The Small Unit Decision Making (SUDM) Workshop was created from the Marine Corps Vision and Strategy 2025 effort to improve small unit leaders' ability to intuitively “assess, decide, and act in a more decentralized manner.”<sup>55</sup> Throughout the three-day workshop, Marine leaders and educational experts identified five core competencies related to decision making in high stakes, time-compressed environments: Adaptability, Sensemaking, Problem-solving, Metacognition, and Attention Control.<sup>56</sup>

Competencies	Learning Outcome
Adaptability	Adjust attitudes, emotions, neurophysiology, and actions to detected change
Sensemaking	Estimate situations in given operational environments
Problem Solving	Evaluate the adequacy of generated options and/or choices
Metacognition	Using strategies to monitor/self-regulate learning and cognition
Attention Control	Deploy sustain, targeted attention on a chosen target

Table 1: SUDM core competencies and associated learning outcomes.<sup>57</sup>

Each of these competencies plays a vital role in the small unit leader's ability to make decisions rapidly and effectively in time-compressed and chaotic environments. Many of the results of the SUDM Workshop indicated that the Marine Corps was doing some things well as it

related to decision-making training, e.g. instrumented and immersive training, but that it was also missing the mark on a variety of other areas. One such example was that the Marine Corps lacks an “instructional framework that deliberately focuses [small unit leader] experiences and develops the psychomotor, cognitive, relationship, and social skills they need.”<sup>58</sup> In other words, the Marine Corps did not possess the tools, curriculum, or mandates to integrate or synergize the five core competencies the workshop identified. One of the key outputs of the workshop was that the Marine Corps recognized that cognitive readiness is an area that needs significant improvement.<sup>59</sup> One of the shortfalls of the workshop was that with only three days to collaborate, many of the overall recommendations were theoretical and lacked tangible metrics or materials to achieve them. One example of this was the workshop's overall recommendation that the Marine Corps should “institutionalize deliberate practice and performance mastery learning culture.”<sup>60</sup> While this looked good on paper, translating that into tangible and actionable proved difficult until 2015.

### **Tactical Decision Kit and the Decision Room**

In 2015, a federal grant authorized the Office of Naval Research (ONR) to pursue a new program to enhance small unit decision-making. Some of the Accelerating the Development of Small Unit Decision Making (ADSUDM) program was adapted from the previous SUDM program. By 2016 and throughout 2017, ONR had paired itself with Cognitive Performance Group (CPG) and leaders from 2d Battalion, 6th Marine Regiment (V26) to collaboratively develop a suite of user-friendly tools and systems to test and improve the decision-making in small units through repetitions and assessment. Over a year, the tools and systems underwent multiple revisions and upgrades based on trial and error and feedback from small unit through battalion leadership. Ultimately, the suite consisted of multiple form factors including tablets,

computers, small unmanned aerial systems (SUAS), Microsoft Hololens, and an augmented reality system. These systems hosted a variety of interactive software, e.g. Interactive Tactical Decision Game (ITDG), Virtual Battlespace 3, Combined Arms Network, and Spartan After Action Report (SPAAR). The ITDG on Wi-Fi connected tablets provided a digital platform for leaders to execute decision games with their Marines via importable overlays which allowed them a wide variety of environments as well as the ability to rapidly transition from one briefier to the next. Additionally, the system was able to catalog each Marine's plan for future reference and evaluation over time. The Deployable Virtual Training Environment (DVTE) computers hosted both Virtual Battlespace 3 (VBS3) and the Combined Arms Network. V26 used VBS3 to conduct virtual force-on-force during quarterly competitions. Each competition was bracket-style and the bouts consisted of squad versus squad, platoon versus platoon, and company versus company with matchups paired by random selection. During each of the competitions, ONR and CPG conducted data capture and analysis and system support. Outside of the competitions, one of the lounges in each barracks was converted into a "Decision Room" to house the kits and allow small unit leaders the freedom to use the systems as they saw fit. The Assistant Commandant of the Marine Corps recognized the importance and effectiveness of the suite and directed the Rapid Capabilities Office to provide a suite to infantry battalions across the Fleet Marine Force.<sup>61</sup> In all, 21 battalions received training on the TDK.<sup>62</sup>

The results of the study made "individualized acceleration of decision skill development a reality for the Marine Corps."<sup>63</sup> The final suite included the Decision-Making Learning Management System (DM-LMS), Spartan After Action Report Tool (SPAAR), and the Decision Making Assessment Tool (DMAT). The DM-LMS stored and assessed data on each Marine's performance in live, simulated, and classroom environments.<sup>64</sup> This allowed the individual as

well as their leaders to assess each Marine's growth and effectiveness of their decision-making. The SPAAR is an after-action tool that synthesized data from multiple inputs into a single, usable after-action tool that could be paused, rewind, and sped up as the leader saw fit.<sup>65</sup> The DMAT provided the unit leaders with the ability to track events and behaviors that occurred during a live or virtual exercise.<sup>66</sup> One way in which this was used was to provide Marines with feedback on how long it took them to orient to the environment, make decisions, and act on those decisions.

Following the delivery of the TDKs to the battalions and upon receipt of no-cost-to-unit, hands-on training, the majority of Marines surveyed stated that they were excited to use the kits in their battalions.<sup>67</sup> However, the quantitative data results, Figures 1 and 2, show a significantly different picture. The data showed a large disparity in use between different units (Figure 1) and that within nine months of receiving their kits and training, most units' use of the kits was minimal if at all (Figure 2).

Unit	Number of Sessions	Average Session Length	Minimum Session Length	Maximum Session Length	Standard Deviation
SOI-East	19	3496s (~58.1 minutes)	159s (~2.65 minutes)	9159s (~2.54 hours)	2517s (~41.95 minutes)
SOI-West	91	4246s (~70.8 minutes)	62s (~1.03 minutes)	14448s (~4.01 hours)	4001s (~66.7 minutes)
V11	82	10385s (~173.1 minutes)	111s (~1.85 minutes)	29977s (~8.33 hours)	11366s (~189.4 minutes)
V12	189	4001s (~66.7 minutes)	65s (~1.08 minutes)	15933s (~4.43 hours)	4868s (~81.1 minutes)
V16	428	3909s (~65.2 minutes)	60s (~1.0 minutes)	42834s (~11.9 hours)	5537s (~92.3 minutes)
V17	127	2815s (~46.9 minutes)	65s (~1.08 minutes)	12222s (~3.4 hours)	2511s (~41.85 minutes)
V21	146	4390s (~73.2 minutes)	78s (~1.3 minutes)	14491s (~4.03 hours)	3881s (~64.7 minutes)
V22	1	64s (~1.07 minutes)	64s (~1.07 minutes)	64s (~1.07 minutes)	NA
V24	112	7669s (~127.8 minutes)	60s (~1.0 minutes)	21214s (~5.89 hours)	5077s (~84.6 minutes)
V26	117	9316s (~155.3 minutes)	65s (~1.08 minutes)	37375s (~10.38 hours)	12036s (~200.6 minutes)
V28	90	3176s (~52.9 minutes)	79s (~1.32 minutes)	7500s (~2.08 hours)	2392s (~39.7 minutes)
V31	137	4469s (~74.3 minutes)	68s (~1.13 minutes)	19006s (~5.28 hours)	4505s (~75.1 minutes)
V32	296	2863s (~47.7 minutes)	64s (~1.07 minutes)	16717s (~4.64 hours)	2866s (~47.8 minutes)
V33	161	3568s (~59.4 minutes)	62s (~1.03 minutes)	16207s (~4.5 hours)	3754s (~62.6 minutes)
V35	104	3281s (~54.7 minutes)	60s (~1.0 minutes)	8709s (~2.42 hours)	2133s (~35.6 minutes)
V36	2	70s (~1.17 minutes)	67s (~1.12 minutes)	74s (~1.23 minutes)	4s
V37	117	4144s (~69.1 minutes)	75s (~1.25 minutes)	21747s (~6.04 hours)	4944s (~82.4 minutes)
V38	117	3526s (~58.8 minutes)	73s (~1.22 minutes)	15378s (~4.27 hours)	3602s (~60.0 minutes)
<b>Overall</b>	<b>2336</b>	<b>4383s (~73.1 minutes)</b>	<b>60s (~1.0 minutes)</b>	<b>42834s (~11.9 hours)</b>	<b>5623s (~93.7 minutes)</b>

NOTE: All session data under 60 seconds and over 12 hours was removed from the set

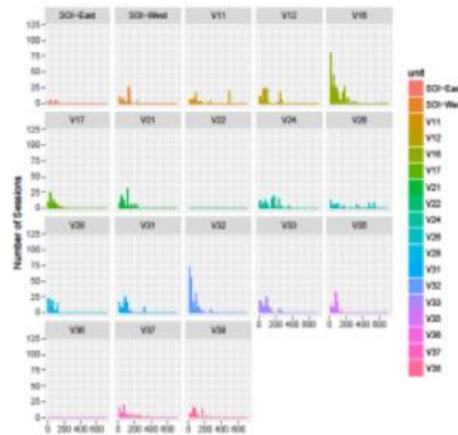


Figure 1: ITDG cumulative usage time by units<sup>68</sup>

Figure 2: Usage time by unit over nine months<sup>69</sup>

For the first time, the Marine Corps had the technological capability to test, enhance, evaluate, and capture decision-making at every level of leadership, and the overwhelming majority of units chose to turn the TDK into a paperweight to collect dust. While there might be multiple reasons, there are three possible and likely causes for why the system did not last. First, the suites may have become increasingly difficult to update, refresh, and refine with feedback coming across the entire Fleet which caused a backlog. If a backlog was a reason, it would have resulted in failures to update each unit's TDKs and the units made a deliberate decision to shift their focus elsewhere. Second, the TDKs were provided by the Rapid Capabilities Office but the Marine Corps never levied any usage requirements on the units. Units were neither rewarded nor penalized for their integration of the suite to improve their leaders' decision-making. Many units may have looked at the suite and consciously, or unconsciously, thought, "video games and decision training are not evaluated in my Defense Readiness Reporting System (DRRS) report," and chose to focus their efforts on DRRS reportable training. Finally, units and users may have attempted the digital decision-making methods the suite provided but ultimately preferred traditional analog methods, e.g. whiteboard, sand tables, etc.

### **Decreasing the Vulnerability Gap.**

One simple way to approach decision-making training is to look for opportunities to decrease the vulnerability gap, or the time it takes from stimulus within an environment to the arrival at a decision and the execution of that decision. Simply put, the vulnerability gap is the time an individual is vulnerable from observing a situation to making a decision or from making a decision to the execution of that decision. To further describe the vulnerability gap concept, a parallel to Colonel John Boyd's theories on identifying cues and responding to an environment is

appropriate. Figure 3 shows the full Observe, Orient, Decide, Act (OODA) cycle put forth by Col. Boyd but the simpler forms of the cycle, Figures 4-6 better illustrate the dangers of vulnerability gaps.

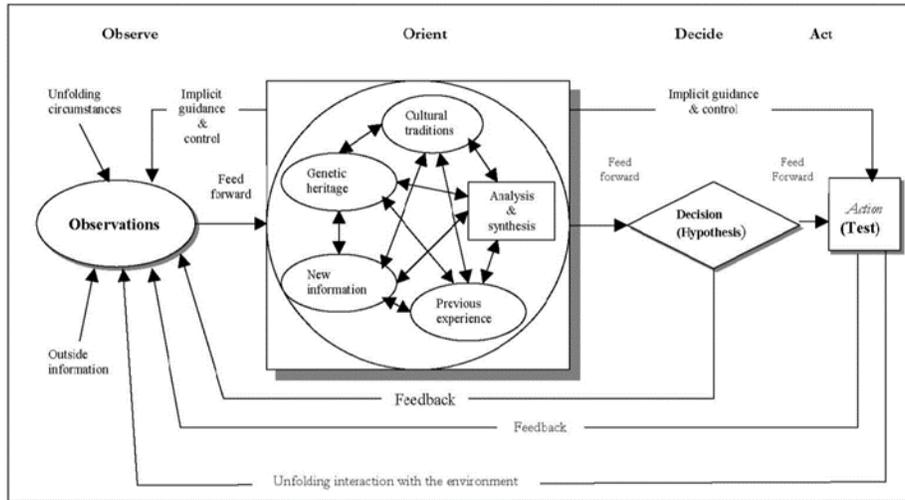


Figure 3: Complete OODA loop as put forth by Col. John Boyd<sup>70</sup>

In its admittedly over-simplistic form, the OODA loop (Figure 4) shows how one observes a cue or enemy action, orients to the situation, arrives at a decision, and executes that decision.<sup>71</sup>

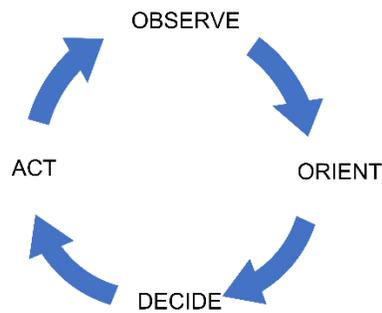


Figure 4: A simple form of the OODA loop

A natural analysis of the simple model reveals the importance of the process which is that arriving at a decision before observing or orienting to the problem is generally ill-advised but

also unveils that time is a critical aspect of the speed and effectiveness of the loop. While many authors, such as Robert Corum and Frans Osinga, argue that the military has oversimplified the model to solely encompass speedy decision-making, they also recognize the importance of time to the cycle.<sup>72</sup> The concept of the vulnerability gap is simple. As an individual or unit executes the cycle, they are vulnerable to external factors, e.g. enemy action, situation changing, injects from higher headquarters. Figure 5 shows this vulnerability gap as the time between each part of the process. The logical conclusion to this concept is that the longer it takes an individual, for example, to orient themselves to a situation, the greater the vulnerability gap where they are increasingly more susceptible to both enemy action and the likelihood of the situation changing before they can act appropriately as shown in Figure 6.

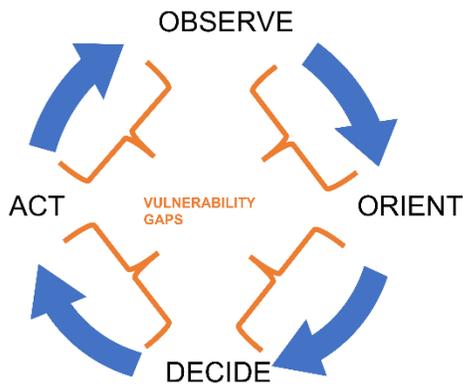


Figure 5: Author's rendition of OODA loop showing vulnerability gaps

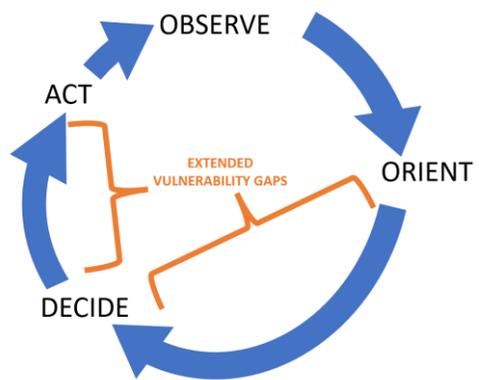


Figure 6: Author's rendition of OODA loop with extended vulnerability gaps

Through this lens, the ultimate goal for the Marine Corps unit leaders should be to decrease the vulnerability gaps within their decision-making cycles. The simple, but incorrect, answer to decreasing these vulnerability gaps is to just speed up the process and for individuals to observe, orient, decide, and act faster. Simply moving through the cycle faster is often misconstrued with the recognition primed decision-making model purely due to its speed over

the more analytical model. Purely aiming for speed also invites errors in the orientation and decision phases as the judgments may be flawed due to unevaluated biases. While it is possible that Boyd, Klein, and Kahneman could agree that speed has its vulnerabilities, the simple fact that the longer it takes individuals to make decisions in chaotic combat environments the more vulnerable they are means the importance of speed cannot be discounted and affords it a certain level of merit. Decision-making training, therefore, should focus on developing the level of expertise required to enhance recognition, the ability to recognize biases and invalid cues, and the speed to decrease the vulnerability gaps.

### **Recommendations**

Improving the decision-making of the Marine Corps' small unit leaders is achievable and needs to be vigorously addressed. The longer it takes the Marine Corps to make an institutional rudder steer to place more emphasis on decision-making and decision-making training, the less likely will its small unit leaders be able to achieve the intellectual overmatch required at the onset of the next conflict. Overall, there are four areas that the Marine Corps can and should affect to ensure its small unit leaders are as prepared as they can be for contact. First, there needs to be a significant increase in decision-making repetitions. Secondly, traditional methods for improving decision-making need to be reinvigorated. Third, existing and emerging technologies should be leveraged to better synthesize the five core competencies identified in the SUDM workshop. Lastly, the Marine Corps must mandate decision-making training at the unit level and require that training to be reportable.

## **Repetitions**

Cultivating and improving the decision-making of the Marine Corps' small unit leaders means that decision-making training must be more focused and will require an increased dedication of time and energy. The question of how many repetitions small unit leaders should be required to make to improve their decision-making capacity has been studied by researchers for decades. Contrary to the argument made in *Outliers* by Malcolm Gladwell, expertise does not require 10,000 hours of practice and, in some cases, may require significantly more or significantly less to reach an above-average level of expertise in a given area.<sup>73</sup> The bottom line and overall recommendation is that the Marine Corps needs to do more than it is currently doing for decision-making training. To highlight this need, the Marine Corps should look outside of its organization, specifically at graduate education for comparison. Students enrolled in the two-year Masters in Business Administration program at Harvard conduct over 500 case studies throughout their tenure.<sup>74</sup> Studying, evaluating, and participating in over 500 scenarios in two years is likely significantly more than the majority of Marines may study in a 4, 10, or 20-year career. Critics may dismiss this comparison and might consider business school and training for combat as unrelated. Related or not, the effects of combat decisions are more lethal and final than those in the business world and military small unit leaders should meet or exceed the number of decisions made by those in the business world. While repetitions are one aspect of reinvigorating decision-making training, another aspect is the medium for decision-making training. Fortunately, there exists a multitude of tools and techniques designed to provide decision-making repetitions.

## **Reinvigorating Traditional Methods**

Most Marines, if not all, are familiar with the more traditional forms of decision-making training, e.g. TDGs, sand table exercises (STEX), Physical TDGs (PTDGs), wargames, case studies, decision-forcing cases (DFCs), and field time. Each one of these has its inherent strengths and weaknesses and can serve as an effective medium to provide repetitions to develop decision-making. TDGs are cheap and can be executed anywhere from a battalion classroom to a barracks room. PTDGs add stress, chaos, and a free-thinking opponent bent on imposing their will. Case studies and DFCs allow individuals to relive past situations and share in the experience of those who lived the situation. Training in the field allows the individual to synthesize human factors (wet, tired, hungry, cold) with their past experiences and doctrinal training. Every method assists in providing the experience base required for skilled intuition while also allowing unit leaders to evaluate certain cues and/or biases that affect their decision-making process.<sup>75</sup> This does not mean, however, that individuals necessarily recall these experiences when faced with similar situations. This is because the majority of Marines typically do TDGs/STEXs that are based in distant or past battlefields such as Iraq or Afghanistan while they are physically sitting in their barracks room at their respective duty stations.

A way to reinvigorate a legacy method is to conduct a TDG, STEX, or wargame using an area that small unit leaders will see in the near future, e.g. their home duty station vice overseas. For example, Company A executes a TDG where its First Platoon is tasked to seize an intersection in Training Area 5. The group critiques and debriefs that plan. Next, Second Platoon is tasked with defending that same intersection in Training Area 5 which is subsequently critiqued and debriefed. Unbeknownst to the platoon leadership during the next field op, the first platoon will be tasked with seizing the same intersection that they seized in their TDG while the

second platoon defends that same intersection. The first time this method is employed, the unit leaders from each platoon may NOT think back to the TDG that they executed weeks prior. Part of the debrief should be a comparison of the results of the TDG and the results of the field evolution to determine what factors were considered in one event but not the other, what factors affected the outcomes in one but not the other, etc. Over time, the unit leaders should start consciously or unconsciously searching for past experiences when faced with a new one. This method has the potential to make cue identification a much higher fidelity experience by forcing leaders to search their past experiences for what cues affected their decision-making.

Two cognitive techniques that the Marine Corps should reinvigorate are the practices of premortems and imaging. Both are of immense value to the different theories on decision-making but are rarely taught to small unit leaders. Premortems are one of the few areas that experts like Gary Klein and Daniel Kahneman agree provide value to effective decision making. The concept of premortem is simple: once a plan is developed but before execution, unit leaders envision that their plan has failed. They then identify each of the areas that caused it to fail. Through inspection, controls can be put in place to mitigate negative effects or the plan can be refined. Both Klein and Kahneman offer that premortems reduce overconfidence and better support open dialogue for dissenting opinions.<sup>76</sup>

The concept of imaging should not be confused with the “progressive deepening” theory that postulates that individuals arrive at a decision, mentally execute the decision, and accept the decision or test another decision based on their mental results before any action takes place.<sup>77</sup> Instead, the concept of imaging refers to how a unit leader envisions their actions, e.g. a patrol, seizing a trench line, a movement to contact, etc. In its essence, imaging is a cognitive “mission rehearsal.”<sup>78</sup> Unit leaders imagine their unit moving sequentially through their operation,

identifying key aspects and events, and practice the decisions they are going to make at each instance. For example, a small unit leader is tasked with leading a patrol. That leader's plan calls for the unit to move around the south side of a piece of terrain. As the leader images their way through their patrol, they recognize that they need to keep that key terrain on their right side. In execution, should the unit find themselves with that terrain on the left side, they immediately recognize the improper cue and correct their course. Employed together, the techniques of premortems and imaging can be an invaluable tool that can decrease the time it takes to recognize cues and respond accordingly. Put another way, because the small unit leader has Observed and Oriented in the past, their ability to Observe and Orient in the present should be much faster because they have already identified many of the cues needed to make an effective decision. While these traditional techniques have rightfully earned their place in the decision-making training arsenal, emerging technologies offer significant promise to increase the fidelity and ease of decision-making training.

### **Leveraging Technologies**

The aforementioned legacy methods are undoubtedly effective as they have been in practice for hundreds, if not thousands of years, in various forms. There are, however, many ways that technological advancements can help enhance decision-making training. One such area is in the field of simulation. In September 2009, the Naval Research Advisory Committee published a report following a series of research events on simulation training to enhance decision-making experiences for Marines. It assessed that virtual or augmented simulation could improve the effectiveness of decision-making in Marines by building experience to improve intuitive decision-making.<sup>79</sup> The report highlighted various learning curves between virtual (synthetic environment) and augmented (real world with simulated injects) realities but argued

that these mediums offer more tangible experiences than others.<sup>80</sup> In other words, they offered that individuals gain experience through their own eyes and senses rather than through a paper TDG or a case study where the empirical experience belonged to someone else. The main downside to these simulated or augmented methods is that they are usually resource, power, or form factor intensive which reduces their applicability to all environments. One way of overcoming this shortfall is to provide these capabilities at a fixed location that allows Marines to come to the capability vice bringing the capability to the Marines.

One example of this is the Marine Corps' Wargaming Facility in Quantico, VA. This "next-generation, state-of-the-art facility" will allow the Marine Corps to wargame a spectrum of low to high-resourced courses of action, employ a multitude of wargaming tools and principles, and explore the impact of emerging capabilities.<sup>81</sup> This facility is already in use by the Marine Corps Command and Staff College, School of Advanced Warfighting, and Warfighting Lab which are a great start for approaching tactical, operational, and strategic problem sets. There are two main limitations to this concept of building facilities to support improved decision-making and both revolved around the concept of access. First, by only building a few wargaming facilities, a natural high demand and low supply problem will be created. There will be too many units that want access but not enough time for meaningful use as units will have to rotate usage. Secondly, one of the greatest values provided by the wargaming facility is that users can evaluate capabilities using classified data. As security clearances are granted on a need-to-know basis, not all decision-makers would have access to the true capabilities of these facilities. These criticisms are not meant to dissuade the Marine Corps or users from pursuing these facilities as they are valuable assets but rather to help inform future development to prevent these problems from coming to fruition.

Another emerging technology worthy of inclusion in the Marine Corps mainstream arsenal is the Streamlined Marine After-action Review Tool- Visualization (SMART-Viz). SMART-Viz is a collaborative effort between ONR, CPG, Lockheed Martin, Design Interactive, and Covan Group that provides leaders and decision-makers with a suite of tools designed to create rapid, automation-assisted after-action tools by capturing and evaluating decision making at all echelons of command.<sup>82</sup> Designed for use in any environment, SMART-Viz provides feedback to unit leaders through behavioral, cognitive, and outcome-based metrics captured via both data and manual inputs across all seven warfighting functions and specific desired outcomes as shown in Table 2.

Warfighting Function	Behavioral Measures	Cognitive Measures	Total
<b>Outcome Measures</b>	10	0	<b>10</b>
<b>Fires</b>	24	3	<b>27</b>
<b>Movement and Maneuver</b>	17	8	<b>25</b>
<b>Sustainment</b>	11	20	<b>31</b>
<b>Force Protection</b>	8	1	<b>9</b>
<b>Command and Control</b>	13	14	<b>27</b>
<b>Intelligence</b>	4	0	<b>4</b>
<b>Information</b>	3	10	<b>13</b>
<b>Total</b>	<b>90</b>	<b>56</b>	<b>146</b>

Table 2: SMART-Viz Performance Measures example.<sup>83</sup>

The four main desired outcome metrics used in SMART-Viz are lethality, survivability, mission accomplishment, and time.<sup>84</sup> These desired outcomes coupled with evaluation across the warfighting functions significantly enhance the quantity and, more importantly, the quality of the information provided back to decision-makers for their improvement. Figure 7 provides an overall view of the feedback decision-makers can expect from the SMART-Viz suite.



Figure 7: Commander Outcome Profile Example.<sup>85</sup>

Fortunately, SMART-Viz has its proverbial toe in the door in the Marine Corps. It has already been tested at four of the final evolutions at The Basic School and four MAGTF Warfighting Exercises and has two more years of development and refinement before the Marine Corps makes a final decision about its place amongst its forces.<sup>86</sup> As SMART-Viz is the only suite that holistically captures a decision-maker's effectiveness throughout an operation, the Marine Corps should actively push this system to units outside of large scale exercises to rapidly provide feedback for future development so that it makes its way across the “valley of death” unlike the TDK.

While these technologies certainly can enhance the fidelity of decision-making training, they are not the end-all-be-all. At its root, decision-making training is not a form factor issue or an area that requires technological innovation, it is a cultural issue that can be addressed, solved with tools and mediums already at our disposal, and enhanced with technological innovations that make the practice of decision making more efficient both in time and resources.

## **Capturing Decision-Making Training**

*MCDP 7: Learning* states that learning and decision-making are essential to maneuver warfare and are an “institutional priority and a professional expectation of all Marines.”<sup>87</sup> Despite this essential requirement for effectiveness on the battlefield, there exists no requirement levied on units to capture the cognitive readiness of their units. The bulk of an infantry battalion’s training is focused on meeting its Mission Essential Tasks and its Core and Core Plus Tasks as those are the primary reportable items in the Defense Readiness Reporting System (DRRS).<sup>88</sup> These reportable statistics are the main items used to determine and report a unit’s combat readiness to higher headquarters and Congress. To truly cultivate intuitive decision-making and to enhance the caliber of decisions made by small unit leaders, the Marine Corps should consider making decision-making training a reportable item in DRRS. Adjusting the DRRS process and software would be much easier to implement than changing the culture of units that do not emphasize decision-making training but this requirement would catalyze change.

Truly implementing these recommendations will require the Marine Corps to do several other things as well. It will have to work with the civilians and Marine educators at Training and Education Command to determine what the standard metrics should be for weekly or monthly decision-making requirements. Based on those requirements, resource and access requirements will need to be identified and developed. From there a test unit should be identified to determine the impact on other current mission requirements which can look similar to how the Marine Corps selected one infantry battalion on each coast to test a new manning and equipment construct. The results from this experimental unit will lead to adjustments to the model phase followed by an education phase across the force for the new requirements and resources. Lastly,

there will need to be an evaluation period or phase to determine rudder steers based on Fleet wide feedback.

Some of these recommendations will be easier to implement than others. The universal truth behind all of them, as it is with many things, is that they will be fruitless without the will of the commander to enact them. Commanders must be as involved in improving the decision-making of their small unit leaders as much as they are in material and training readiness. Their small unit leaders will be the ones executing their intent away from the flagpole which is justification enough to warrant increased attention.

### **Conclusion**

By reinvigorating traditional decision-making models while leveraging assistive technologies and levying a requirement for decision-making training on the force, the Marine Corps has the potential to enact both cultural and cultural change to be better prepared for the next fight. Drawing from multiple decision-making theory camps, the Marine Corps realizes that it needs to accelerate expertise within the ranks of its small unit leaders. This realization must be the spark for action. The provided recommendations can certainly be approached individually to enact change. Reinvigorating legacy methods such as TDGs, STExs, and the practice of imaging can be implemented immediately with little resources required. Integrating existing and emerging technologies and levying mandatory decision-making training requirements on units will require more resources, manpower, and time to implement but the Marine Corps does not need to solve this alone and can look to the organizations providing the technology to meet the Marine Corps requirements. These recommendations, however, are complementary to one another and can be implemented concurrently to truly enact the required change.

However, further research and study are required to truly enact change at the organizational level. One example of further study is the impact on other areas of readiness that may become the cost associated with increased decision-making training. With time being a finite commodity, units that increase time spent on decision-making will have to sacrifice time spent on other areas. Another area that warrants attention to enact these recommendations pertains to organizational practices and entities that shepherd technologies through the acquisitions process. Another reason the TDK may have failed was that there was no formal organization within the Marine Corps to maintain advocacy for the program. Finding the appropriate organization within the Marine Corps to sponsor, support, and maintain new or emerging technologies will aid in those technologies reaching their full potential.

While much of this paper has been focused on individual decision-making at the small unit leader level, it is important to keep in mind that the context of those decisions has greater importance. As the Marine Corps is a mission tactics-driven organization, the context of those small unit leader decisions rests on how they support the intent of the commander. Small unit leader decisions that do not support the commander's vision and intent detract from effectiveness on the battlefield at the macro level and can jeopardize mission accomplishment.

The art of decision-making has been a hallmark of the military profession throughout the history of warfare. The changing character of war certainly has its effects on the environment and the time in which decisions are made but it does not remove the fundamental requirement of effective decision making. Just as past battlefields have required effective decision-makers, so too will the battlefields of the future. As the strategic environment of the 21<sup>st</sup> century continues to evolve, military professionals must continue to hone the critical skill of decision-making. By

strengthening the individual decision-making of its small unit leaders, the Marine Corps can continue to increase its lethality in any clime or place.

## ENDNOTES

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  - <sup>27</sup> Kahneman and Klein, 518.
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  - <sup>29</sup> Kahneman and Klein, 521.
  - <sup>30</sup> Kahneman and Klein, 521, 520, 524.
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- <sup>83</sup> Squire, 6.
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