



# Thriving in Uncertainty

## From Predictive- to Probability-Based Assessments

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*War is the realm of uncertainty ... the realm of chance.*

—Carl von Clausewitz

**C**ommanders and their staffs need the most effective tools to thrive in conditions of uncertainty. The U.S. Army's capstone doctrine,

the National Defense Strategy, and current military theorists all reiterate this aspiration. The products our intelligence sections prepare, however, tend to present a binary choice of two predictive enemy courses of action. This article asserts that the common practice of specifying "most dangerous" and "most likely" enemy courses of action stifles analytic

agility and limits commanders from understanding the full range of potential mission events. It then reviews current doctrine to highlight the clear mandate for analysis that incorporates chance and uncertainty. The authors, one an intelligence officer and the other a cavalry officer, go on to assert that this mandate is not observed in the operational force and introduce formats that embrace probability rather than predictability. Although written from an Army perspective, the findings resonate with the joint and interagency communities as well. The goal of this article is to encourage commanders to reconsider their expectations of assessments they receive from their intelligence sections. Intelligence staff officers (designated as S2s at battalion and brigade levels and as G2s at division level and higher) owe commanders a roadmap of options available to a free-thinking enemy. And they need to articulate this over time as conditions change in the operational environment. By integrating probability tools into the military decision-making process, commanders and staffs can mitigate the risks and harness the opportunities inherent in the uncertainty of warfare.

## Chance and Uncertainty in Our Current Doctrine

Current intelligence doctrine mandates S2s and G2s describe enemy capabilities and options. The newly released Army Doctrine Publication 2-0, *Intelligence*, describes the purpose of intelligence as assisting commanders “in visualizing the operational environment, organizing their forces, and controlling operations to achieve their objectives by answering specific requirements focused in time and space.”<sup>1</sup> In addition, the current draft of Army Techniques Publication 2-01.3, *Intelligence Preparation of the Battlefield*, directs staffs to determine all valid threat/adversary courses of action and articulate them in order of likelihood.<sup>2</sup> This pins a

responsibility on S2s or G2s to continually present enemy capabilities and options.

Notably, appreciation of uncertainty is clear in the current versions; however, it was not always this way. Through the years, intelligence doctrine varied in its tolerance of predictive models. In 1984, Field Manual (FM) 101-5, *Staff Organization and Operations*, advised the G2 to list two or three enemy courses of action (COAs) in order of probability of adoption.<sup>3</sup> In 1993, the language was changed from requiring S2s and G2s to predict enemy intentions back toward predicting enemy variables and options. The 1994 and 2009 versions of the *Army Field Manual for Intelligence Preparation of the Battlefield* (FM 34-130 and FM 2-01.3) both mention the necessity to present enemy capabilities and options but also discuss categorizing such as most likely and most dangerous when planning time is limited. These fluctuations in guidance have contributed to the confusion among S2s and G2s on how to articulate step four of intelligence preparation of the battlefield (IPB), “determine threat/adversary courses of action.”<sup>4</sup> While S2s and G2s grapple with how to articulate the range of possible actions, operations doctrine remains relatively constant in its appreciation of uncertainty.

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**Previous page:** U.S. Army paratroopers assigned to the 173rd Airborne Brigade plan 10 October 2017 during exercise Swift Response 17 in Hohenfels, Germany. Swift Response is an annual U.S. Army Europe-led exercise focused on allied airborne forces' ability to quickly and effectively respond to crisis situations as an interoperable multinational team. (Photo by Staff Sgt. Alexander C. Henninger, U.S. Army)

The first chapter of FM 3-0, *Operations*, states, “The complex and dynamic nature of an operational environment (OE) makes determining the relationship between cause and effect difficult and contributes to the uncertain nature of military operations.”<sup>5</sup> Army Doctrinal Reference Publication (ADRP) 5-0, *The Operations Process*, adds, “Uncertainty pervades operations in the

screen line in the southeast and southwest avenues of approach to provide early warning to the defending infantry battalions. When the brigade commander saw this array on his Blue Force Tracking System, he immediately saw that the southeastern approach was not predicted by his S2’s most likely or most dangerous courses of action and repositioned the eastern troop west. During the night,



The problem is that our tactics, techniques, and procedures have not caught up with our foundational doctrine.



forms of unknowns about the enemy, the people, and the surroundings.”<sup>6</sup> A review of our intelligence and operational doctrine shows an appreciation of uncertainty in operations and reflects the need for commanders to appreciate a wide range of possibilities.

### **Defects in Formulation, Packaging, and Articulation**

What current doctrine directs is not what is happening in our maneuver formations. Despite doctrine’s call for adaptive intelligence to support a fluid operational environment, intelligence leaders at the operational and tactical echelons continue to publish stagnant assessments. Rarely, after the intelligence section completes its IPB and briefs the most likely COA to the commander, does the assessment change.<sup>7</sup> Partly due to operational tempo and partly to hubris, the exquisite most likely COA usually remains throughout subsequent mission planning—often in spite of contravening information, contrary results of reconnaissance, and events antithetical to the original forecast. This tendency is reinforced because staffs find it inconvenient to the planning process when the S2s or G2s alter an assessment because it has a cascading effect on everyone else’s products. In a time-constrained environment, with a commander bent on executing the mission, humans on the staff naturally resist change and settle into a predictive analysis.

Presenting only two possible futures fails to appreciate the range of options available to a cunning enemy. For example, during a combat training center decisive-action rotation, a brigade combat team mounted a defense. The cavalry squadron arrayed its two mounted troops along a

the opposing force achieved surprise as they infiltrated from the southeast past each of the cavalry troop’s vacated observation points on their way to the brigade’s vulnerable support area. Had the intelligence section understood the range of enemy capabilities and the commander demanded more than a binary most likely and most dangerous assessment, they might have recognized that an airborne assault into a southeastern drop zone was a viable probability.<sup>8</sup>

It is not that our intelligence leaders do not know our doctrine; they do. And it is not that our commanders are not tactically proficient; they are. The problem is that our tactics, techniques, and procedures have not caught up with our foundational doctrine. By embracing the complex nature of military operations, commanders and their staffs can better prevent surprise by the enemy and be prepared to exploit positions of relative advantage.

### **Complexity Theory**

Commanders can best understand a complex operational environment when they become comfortable speaking in terms of probabilities within complexity instead of predictive enemy courses of action. Complexity theorist Yaneer Bar-Yam noted that complexity sciences study how relationships between parts give rise to the collective behaviors of a system. He noted that the conventional question of whether to see the forest or the tree is insufficient. By understanding the details of the trees within the context of the forest system, one can see which aspects of the trees are relevant to the description of the forest. Bar-Yam used the term *emergence* to describe how to navigate complexity. For our purposes, this implies a knowledge of the range of options available to the enemy



(the trees) as well as a coherent vision for how those events could be executed in various times and spaces during an operation (the forest).<sup>9</sup>

The following five-step process seeks to incite emergence within the planning staff. The process offers a method for intelligence and operations officers to identify a range of events that could occur, assign probabilities to each event along a two-dimensional chart, and cue branch plans that can be visualized along multiple horizons. The outputs are a probability curve, which aids in understanding the likely range of possible events, and a Multi-Horizon Event Template (MHET), which enables a commander to visualize the probable events in time and space.

### Step 1. Understand the Relevant Range of Possible Events

*There are not more than five musical notes, yet the combinations of these five give rise to more melodies than can ever be heard. There are not more than five primary colors, yet in combination they produce more hues than can ever been seen. There are not more than five cardinal tastes, yet combinations of them yield more flavors than can ever be tasted.*

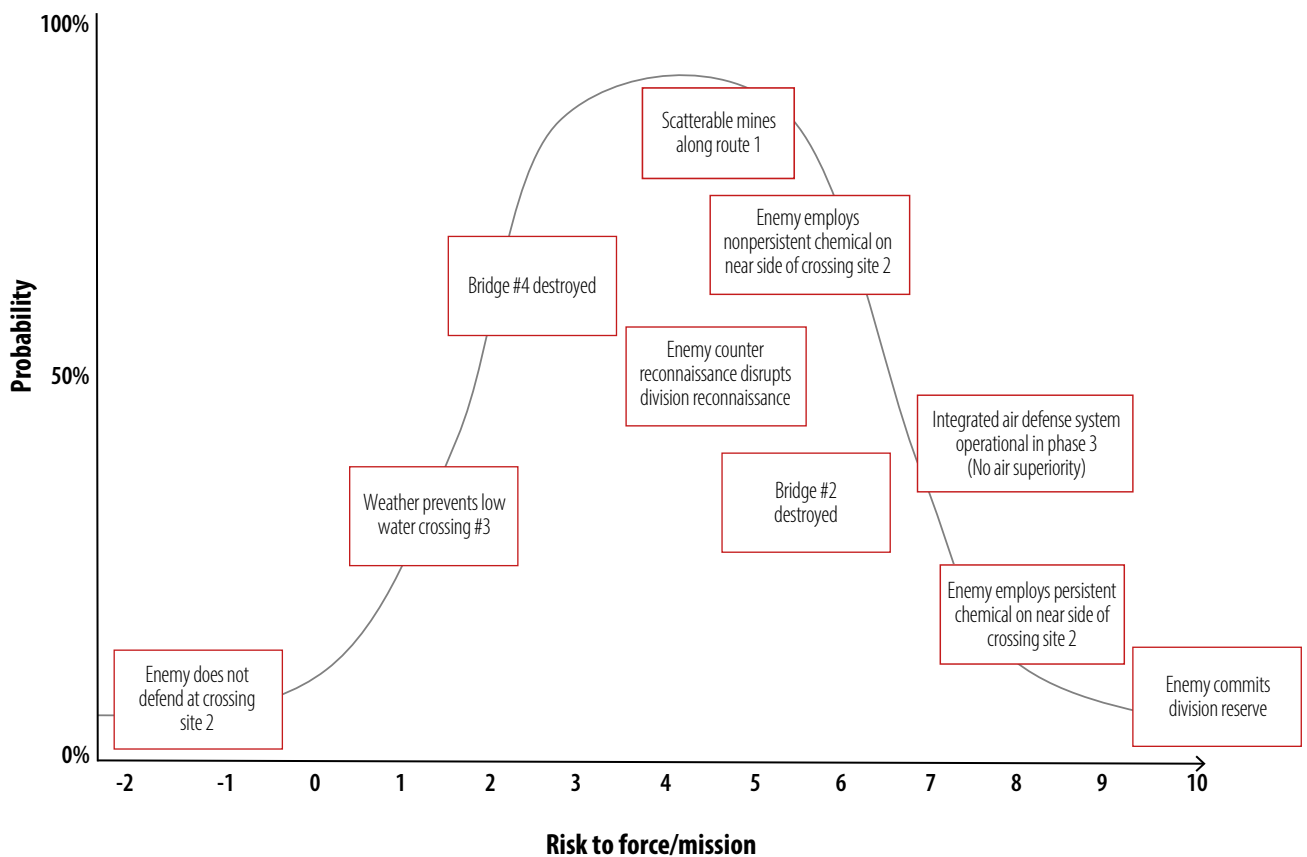
—Sun Tzu, *The Art of War*<sup>10</sup>

The first step is to generate the range of mission events that can occur. Mission events are concise statements of possible actions the enemy might choose to take, environmental and weather effects, actions of adjacent units or host-nation forces, and actions of subordinate units that could impact the course of the battle. Step one resembles a brainstorming phase. No mission event is better or worse than another if it is a possible event within the operational environment. The military decision-making process already incorporates running estimates from each staff section, in which the section analyzes the mission and relevant information from the perspective of their specific warfighting function. Within that running estimate, staff sections conduct reverse IPB in which they describe the threat capabilities within their warfighting function. The chief of staff or executive officer, after dictating the requirements and format, can delegate the creation of mission events by warfighting function. For example, the fires section can generate mission events related to the capabilities of the enemy indirect fire capabilities while the movement and maneuver section can generate mission events associated with the avenues of approach available to the enemy.

Each section submits mission events, and the S2 or G2 compiles them into a master listing. Each warfighting function section, using its knowledge, experience, and insight, assigns a value to each mission event in terms of the event's risk to the friendly unit's forces and to its mission (x-axis) and assesses the probability of the mission event occurring (y-axis).<sup>11</sup> In the example provided by figure 1 (on page 58), the risk to mission and force is rated from -2 to 10, with 10 representing catastrophic failure, 0 having no effect on the mission, and negative numbers highlight mission events that contribute positively to mission accomplishment.

The process of generating the range of mission events is scalable to the analysis required and the resources available. The cavalry squadron that tested this concept used sticky notes and a whiteboard to plot the events, and used that same whiteboard during the mission analysis briefing.<sup>12</sup> A tactical headquarters will find METT-TC (mission, enemy, terrain, time available, temperature and weather, and civilian considerations) sufficient as a template for analysis, while an operational headquarters will find PMESII-PT (political, military, economic, social, infrastructure, information, physical environment, and time) more useful for its analysis. When relevant, planners should add the effects of host-nation force missions and those of adjacent units to provide a holistic context to the data. Resources available will also affect how the staff compiles the range of possible events. During hasty planning, intelligence officers generate events using only their knowledge and experience as guides. During deliberate planning, a more methodical technique generates the mission events. For operation plans and concept plans, operational planning teams should prepare a comprehensive listing of possible mission events.

Even if the staff completes none of the other steps, the act of generating the relevant range of possibilities enhances the commander's understanding of the operational environment. This is reflected in ADRP 3-0, *Operations*, which states, "The side that best understands an operational environment learns and adapts more rapidly and decides to act more quickly in conditions of uncertainty and is more likely to win."<sup>13</sup> Winning in warfare means exploiting positions of advantage, and the next steps show how to operationalize this enhanced understanding.



(Figure by Scott Pence)

**Figure 1. Events Plotted along a Probability Curve**

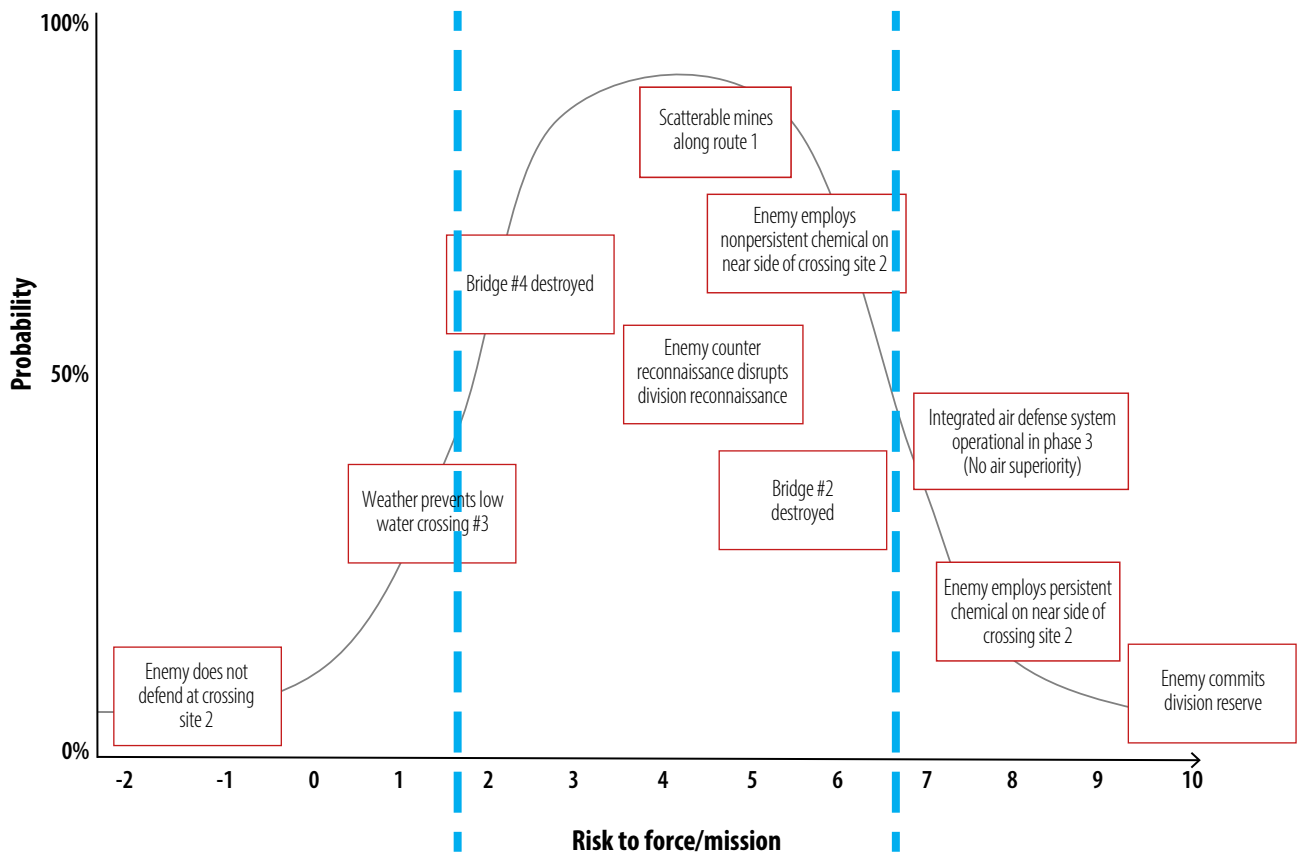
## Step 2. Plot the Range of Events

In figure 1, the mission event of “Scatterable mines along route 1” bears some risk on the mission (6) and is highly likely (80 percent). This plots on the chart at the (6,8) position. As the team populates the graph, a certain curve should take shape identifying the most probable mission events in the center with marginal to serious risk to the unit from left to right. In this particular example, the curve is symmetrical and is a bell curve. However, not every probability curve will be a symmetrical bell curve like our simple example. If the S2 or G2 is able to objectively quantify the data, the shape of the curve could quickly portray the relative danger of the operational environment. Curves that skew to the right represent a more dangerous operational environment, while curves that skew to the left represent a relatively less dangerous operational environment.

Commanders require techniques and procedures to integrate probability into the operations process

because of the roles chance and uncertainty play in warfare. Military affairs author B. A. Friedman recently introduced a metaphor that says strategy is to tactics just as Einstein’s theory of relativity is to quantum mechanics. The general theory of relativity exists and has influence over tiny particles, he noted, but the way in which we described them is very different. Tactics, like quantum mechanics, “does not predict a single definite result for an observation [or tactical event]. Instead, it predicts a number of different outcomes and tells you how likely each one of these is.”<sup>14</sup> Friedman’s metaphor finds support from both military theory and modern commercial enterprises.

In his seminal work, *On War*, Carl von Clausewitz stated, “War is the province of chance,” and actors will commonly find outcomes that differ from expectations. War’s inherent uncertainty must be considered during planning. Clausewitz added, “War is the province of uncertainty: three-fourths of those things upon which action in war must be calculated, are hidden



(Figure by Scott Pence)

**Figure 2. Focus on Most Likely Events (Middle of the Curve) to Prioritize Mission Planning**

more or less in the clouds of great uncertainty. Here, then, above all a fine and penetrating mind is called for, to grope out the truth by the tact of its judgment.” This requires the blending of a commander’s experience and intellect, what Clausewitz labeled a commander’s *genius for war*, with planning practices which consider the range of potential events.<sup>15</sup>

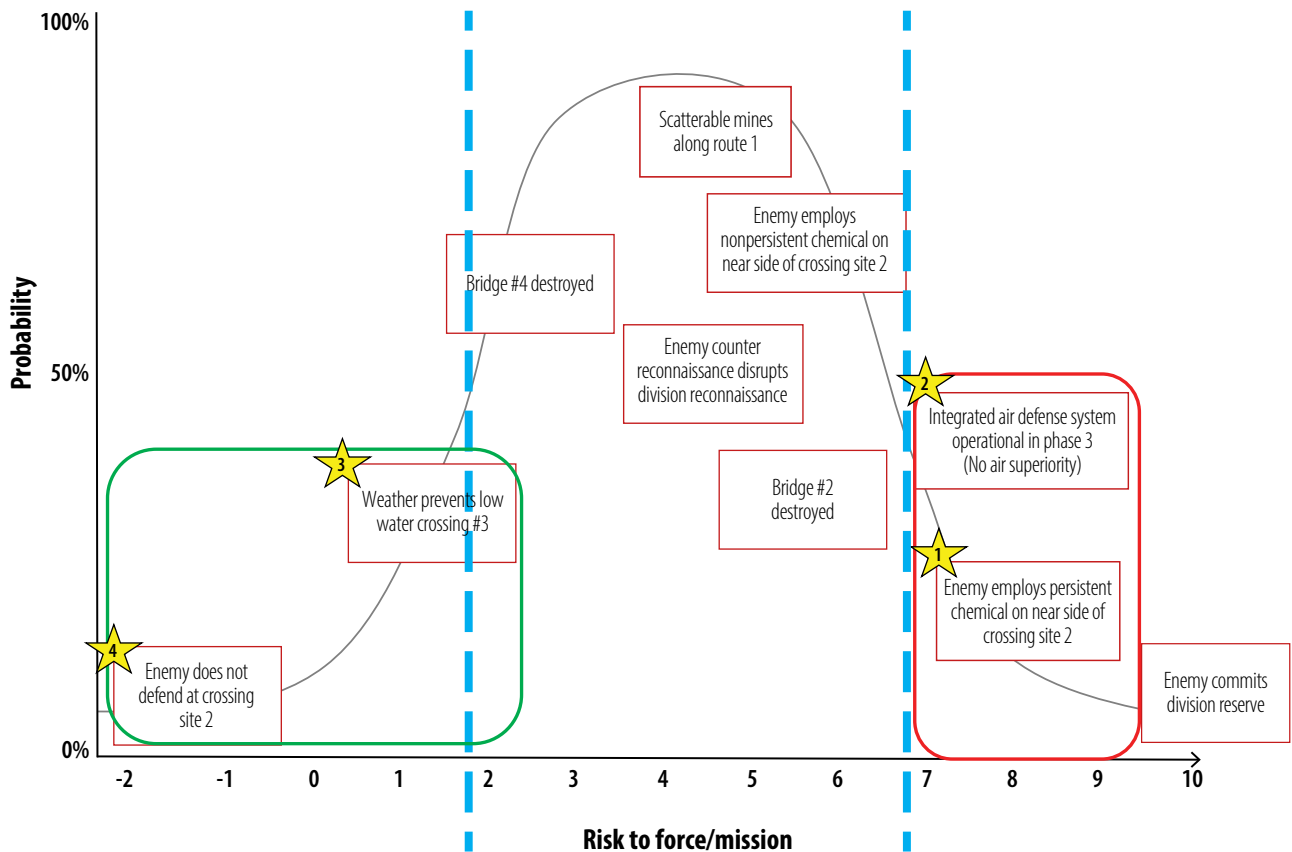
In the world of finance, stockbrokers use probability algorithms to identify when to buy and sell stocks.<sup>16</sup> In high-stakes poker, the top players study the range of probabilities of their hands beating an opponent’s hand and constantly adjust their probability assessments as the game progresses.<sup>17</sup> In sports, Michael Lewis’s *Moneyball* chronicled the success of probability-based models for reorganizing the Oakland Athletics baseball team during the 2002 season.<sup>18</sup> In industries in which uncertainty is prevalent, fierce and repeated competition demand systems that understand and embrace probability. The very best traders, poker players, and

baseball franchises complement the science of probability with experience and judgment to narrow the scope of possible actions to execute bold and decisive actions.

### Step 3. Focus Attention on Most Likely and Relevant Events

The commander’s plan cannot address every possible mission event. The Prussian king Frederick the Great famously said, “He who defends everything, defends nothing.”<sup>19</sup> The plan must focus on the range of actions that are both likely and relevant to the mission. The probability curve lends itself to this effort through quickly identifying those events that are both likely and relevant to the mission. During step 3, the planner reviews the range of possible mission events and draws two dashed lines, capturing the events in the middle of the curve (see figure 2).

By focusing on the events in the center of the curve, the staff resolves a critical “catch-22” of military planning in which the planner desires an enemy COA prediction



(Figure by Scott Pence)

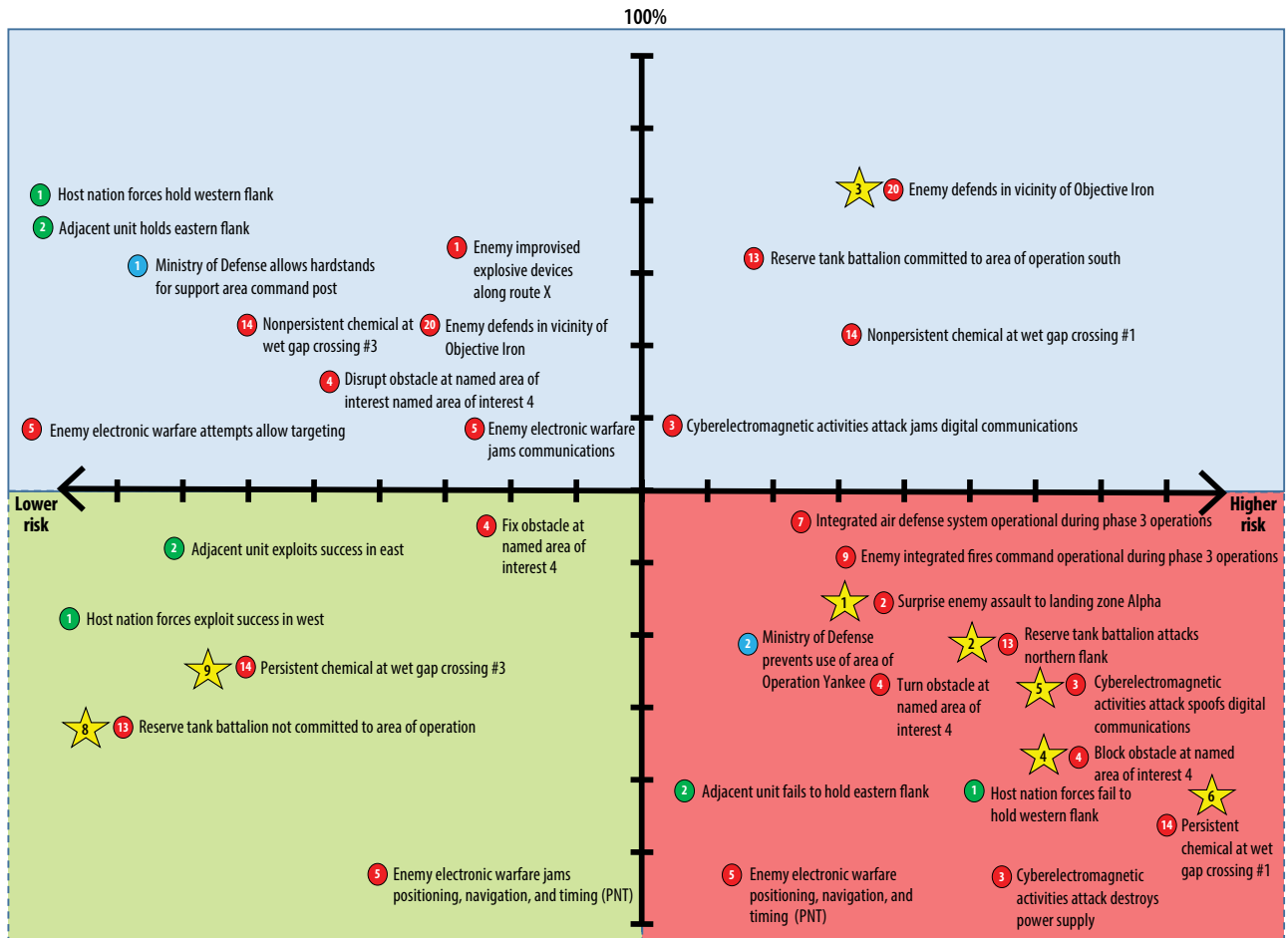
**Figure 3. Identify Branch Plans on Either Side of the Curve to Facilitate Adjustment Decisions**

before writing the plan and the intelligence officer desires a friendly plan with which to predict enemy COAs.<sup>20</sup> Collaborative staff development of multiple horizons, grounded in the most likely and relevant events, fosters parallel and overlapping visualizations from enemy and friendly perspectives. An 82nd Airborne Division planner, Maj. Bruce Roett, noted after a division Warfighter exercise, “The more that initial concept addresses multiple enemy actions, the more anticipatory and responsive the overall plan will be. Risks and opportunities will already be built into the DSM [decision support matrix] and EDSM [enemy decision support matrix] and the friendly commander is empowered to operate within the enemy commander’s decision space, and win.”<sup>21</sup> The staff holistically develops a product that focuses attention primarily on the concept of operations. The concept of operations and coordinating instructions for the mission address all of the mission events in the center of the curve between

the two dashed lines. Since “Scatterable mines along route 1” is a highly likely event, the coordinating instructions paragraph of the operations order automatically needs to contain risk mitigation measures for scatterable mines, regardless of the final concept of the operation. Warning Order 2 can easily highlight likely mission events in order to allow subordinate commanders to integrate them into mission planning, preparation, and rehearsals.

#### Step 4. Identify Branch Plans and Adjustment Decisions

The probability curve also allows commanders to visualize the less-likely events possible during the mission. These events require adjustment decisions consistent with guidance in ADRP 5-0, *The Operations Process*, which states, “Adjustment decisions modify the operation to respond to unanticipated opportunities and threats. They often require implementing unanticipated operations and



(Figure by Scott Pence)

**Figure 4. Mission Probability Quad**

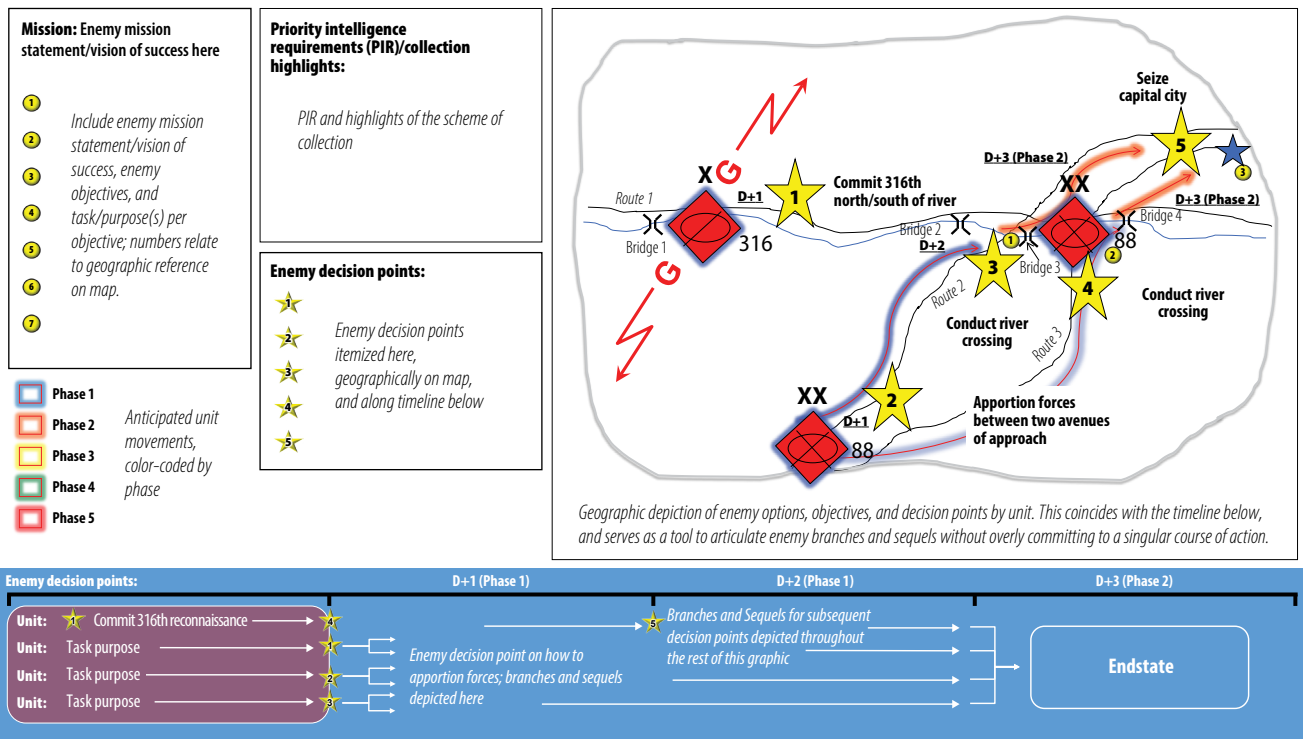
resynchronizing the warfighting functions. Commanders make these decisions, delegating implementing authority only after directing the major change themselves.”<sup>22</sup>

Irrespective of careful planning, in every operation there is risk of catastrophic failure. The chance of “catastrophic” success, however, is also a feature in operations. Mediocre planners account for catastrophic failure while brilliant planners account for spectacular success. Once the staff identifies positions of advantage, it plans to exploit those temporary positions and take actions to make them permanent. Using a probability curve explicitly identifies enemy actions that have a beneficial effect on the mission and enables commanders and staffs to build branch plans and sequels to encourage and allow those events to occur (see figure 3, page 60). For example, the mission event “ENY does not defend at crossing site 2” is actually beneficial to the mission, so it receives a negative risk (-2) while also being very unlikely (10 percent).

Therefore, it plots on the chart at the (-2,1) position. This event occurred at Warfighter 18-04 when the opposing force decided not to defend a possible crossing site, allowing elements of 3 Division, United Kingdom, to cross unimpeded. Fortunately, the planning staff postured the force to take advantage of that possibility.<sup>23</sup>

There are other ways to present this information. Intelligence sections should experiment with methods that best allow their commander and staffs to visualize the range of possible events. The method depicted in figure 4 is another possibility. To use it, plot the points just as steps 1 and 2 direct. Planners draft the plan to address the mission events in the shaded blue portion on the top half of the quadrant. The lower right quadrant contains the most dangerous possibilities and cues the S3 (operations officer at battalion or brigade level) or G3 (operations officer at division level and above) to create decision points to mitigate risk. To exploit the initiative and make





(Figure by Mike Adamski, Zach Alessi-Friedlander, Brian Bloomquist, and Jeremy Hobbs)

## Figure 5. Multi-Horizon Event Template

temporary positions of advantage more permanent, the S3 or G3 creates decision points to capitalize on events shaded in green on the bottom left.

### Step 5. The Multi-Horizon Event Template

Once planners identify branch plans and adjustment decisions, they package the key takeaways for the commander. A technique for accomplishing this is the MHET.<sup>24</sup> The MHET takes the staff work developed in step 4 and arranges it into an overarching visual depiction of the enemy's vision of success (see figure 5). It depicts enemy options, decision points, and objectives in space and time. It serves as a mechanism to communicate enemy branches and sequels without overcommitting to a singular course of action. By including priority intelligence requirements and a basic scheme of collection, it communicates how an S2 or G2 continues to adapt enemy options at a given point in the fight. It is updated on an appropriate recurring timeline. The MHET serves as an effective mechanism to assist planners as they visualize variables.

Figure 5 uses a fictional storyline to depict the philosophy and flow of the MHET. The intelligence team integrates enemy decision points along chronological, physical, and cognitive horizons. In this instance, at D+1, the 316th Reconnaissance Brigade conducts a guard in order to facilitate movement of the 88th Mechanized Division late on D+1 or early on D+2. Also on D+1, the commander of the 88th will make decisions associated with the apportionment of forces along two potential avenues of approach. On D+2, the commander of the 88th makes decisions for the commitment of forces to cross the river at two potential locations, and to eventually seize the capital city on D+3. Subsequent enemy decisions and actions in following phases are color-coded accordingly, and depicted both on the map and the timeline at the bottom of the chart.

From here, the staff returns to the military decision-making process. The intelligence section generates priority information requirements to support the most critical adjustment and execution decisions required by the commander. Then, the section nests

the priority intelligence requirements with essential elements of information and other information requirements and, finally, assigns sensors to answer specific information requirements. All of this is eventually captured in the intelligence collection matrix.

## Conclusion

Intelligence professionals owe commanders a clear articulation of the probability of relevant events that can affect the mission; however, it is not possible to accurately predict precisely all the actions of a cunning

and free-thinking enemy. As a result, commanders should question assertions of certainty during all phases of the operation and demand techniques and procedures that incorporate ambiguity in a way that enables the exploitation of temporary positions of advantage as they emerge. Armed with sound fundamentals in our doctrine, our staffs have an opportunity to revise their habitual routines and develop techniques and procedures that embrace uncertainty. As leaders test and develop these techniques, they will steadily enhance the probability of thriving in uncertainty. ■

## Notes

**Epigraph.** Carl von Clausewitz, *On War*, trans. and ed. Michael Howard and Peter Paret (Princeton, NJ: Princeton University Press, 1976), 46.

1. Army Doctrine Publication 2-0, *Intelligence* (Washington, DC: U.S. Government Publishing Office [GPO], September 2018), 2-1.
2. Army Training Publication (ATP) 2-01.3, *Intelligence Preparation of the Battlefield* (Washington, DC: U.S. GPO, forthcoming).
3. Russell H. Rector, "Enemy Course of Action Predictions: Can We, Should We?" (monograph, Fort Leavenworth, KS: School of Advanced Military Studies, 1995), 33.
4. ATP 2-01.3, "Step 4 of the IPB Process—Determine Threat/Adversary Courses of Action," chap. 6 in *Intelligence Preparation of the Battlefield/Battlespace* (Washington, DC: U.S. GPO, November 2014).
5. Field Manual 3-0, *Operations* (Washington, DC: U.S. GPO, October 2017), 1-17–1-18.
6. Army Doctrine Reference Publication (ADRP) 5-0, *The Operations Process* (Washington, DC: U.S. Government Printing Office, 17 May 2012), 1-1.
7. Assessment based on conversations with Mission Command Training Program (MCTP) and combat training center observer-controller/trainers as well as the experiences of the authors themselves.
8. Personal reflections from author Scott Pence during exercises at Joint Readiness Training Center Rotation (JRTC) 17-01, September 2016.
9. Yaneer Bar-Yam, *Making Things Work: Solving Complex Problems in a Complex World* (London: Knowledge Press, 2004).
10. Sun Tzu, *The Art of War*, trans. Samuel B. Griffith (New York: Oxford University Press, 1963).
11. For more information on assessing and mitigating risk, see ATP 5-19, *Risk Management* (Washington, DC: U.S. GPO, 14 April 2014).
12. Personal reflections from author Scott Pence and Capt. Gregory Valentine, as 5-73 Cavalry Squadron tested this method during JRTC Rotation 18-02, October 2017.
13. ADRP 3-0, *Operations* (Washington, DC: U.S. GPO, 6 October 2017), 1-21.

14. B. A. Friedman, *On Tactics: A Theory of Victory in Battle* (Annapolis, MD: Naval Institute Press, 2018), 142.
15. Clausewitz, *On War*, Book 1, chap. 3.
16. Glenn Shafer, *Probability and Finance* (New York: John Wiley & Sons, 2001).
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18. Michael Lewis, *Moneyball: The Art of Winning an Unfair Game* (New York: W. W. Norton, 2003).
19. Frederick the Great, "The King of Prussia's Military Instruction to His Generals," trans. Lt. Col. T. Foster in 1797, ed. Ed Allen, U.S. Air Force website, updated 27 January 1997, accessed on 21 November 2018, [http://www.au.af.mil/au/awc/awcgate/readings/fred\\_instructions.htm](http://www.au.af.mil/au/awc/awcgate/readings/fred_instructions.htm).
20. Rector, "Enemy Course of Action Predictions"; see also Daniel Podgorski, "Rocks and Hard Places Galore: The Bureaucratic Appropriation of War in Joseph Heller's *Catch-22*," *The Gemsbok*, 27 October 2015, accessed 21 November 2018, <https://thegemsbok.com/art-reviews-and-articles/book-reviews-tuesday-tome-catch-22-joseph-heller/>. The term "catch-22" references Heller's novel in which a fictional illogical form cannot be completed before or after the event.
21. Written feedback on inherent friction between concurrent intelligence and operations planning as derived from Maj. Bruce Rott, a planner for 82nd Airborne Division and currently the Brigade S4, 2BCT, 82nd Airborne Division, 19 November, 2018.
22. ADRP 5-0, *The Operations Process*, 4-33.
23. Notes from author Scott Pence, acting brigade commander during Warfighter 18-04, April 2018.
24. The Multi-Horizon Event Template was created in 2017 by Maj. Zach Alessi-Friedlander, Chief Warrant Officer 3 Brian Bloomquist, and Chief Warrant Officer 2 Jeremy Hobbs. The team was inspired by a format used by Col. Bryan Love and his opposing force team when he was the senior intelligence officer at MCTP.