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# How Can the Coast Guard Use Gaming?

**G**ames are widely used to better understand and prepare for a diverse set of challenges. *Gaming* is a generic term for a suite of structured methodological approaches that can qualitatively (and occasionally reinforced using quantitative data) support decisionmaking in many contexts. What makes a game a game is interactive,<sup>1</sup> rule-based problem solving that includes adjudication of outcomes. Games can be played in formal or more relaxed settings and be supported by different communication tools, such as printed media, whiteboards, digital devices, and applications. Gaming is often associated with the U.S. Department of Defense (DoD), but many types of organizations outside of defense—governmental, commercial, nonprofit, and academic—develop and use gaming to support decisionmaking or other functions. The U.S. Coast Guard employs some approaches—largely informally—that fall under the umbrella of gaming. Conducting gaming more formally could help the service expand its analytic, training, and engagement tool kits. Here, we discuss what more the service might do to employ gaming, and why.

Preparing for future challenges, such as changing Coast Guard roles as the United States competes in the Indo-Pacific and Arctic regions, requires thoughtful analysis to inform the plans, policies, and decisions that need to be made well in



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advance. Other types of contingencies and events for which the service must prepare can be complex and lack straightforward planning or training approaches. Crises, such as the September 11, 2001, attacks; the *Deepwater Horizon* spill; the 2010 Haiti earthquake; and the 2019 coronavirus disease outbreak, can strain the service, as can extreme versions of traditional Coast Guard activities, such as responding to more-frequent and -intense hurricanes. Even reexamining year-to-year needs to support the service's 11 statutory missions through such processes as planning, programming, budgeting, and execution (PPBE) requires an ability to anticipate problems, capitalize on opportunities,<sup>2</sup> and weigh different courses of action.

Gaming offers a versatile approach to tackling a wide variety of necessities for an organization like the Coast Guard, from concept development and strategic planning (see, e.g., Resetar et al., 2020; Savitz, Davenport, and Ziegler, 2020; Tingstad, Savitz, et al., 2018; Tingstad, Wilson, et al., 2020) to engagement and training. Importantly, it encompasses more than tabletop exercises and workshops, with which the service is more familiar. Here, we suggest that the service has additional benefit to gain from expanding access to gaming (perhaps alongside other analytic approaches, such as modeling and simulation) and some important challenges for which the gaming community can contribute analytic tools. Formalizing and expanding a Coast Guard approach to gaming opens the door to access more resources, including within the established and diverse gaming community; enables more-rigorous use of established methods; and helps ensure curation of game results to support intended purposes. In what follows, we offer a brief overview of gaming, a taxonomy for how it could intersect with service

needs, and a proposal for how the service might practically expand its use of gaming. In particular, we highlight the idea of deployable gaming: a low-cost, scalable, structured scenario-based approach that can help gather information, aid decisionmaking, and promote learning at different echelons within the service.

## **Games Are Versatile Tools That Support Many Types of Functions**

Gaming has a long history of use for strategy development, training, and other purposes within DoD, which has had a history of gaming since shortly after the Civil War. Within DoD is also considerable gaming activity, a large community of practitioners, senior leader interest, and educational opportunities offered by defense schools (Wong et al., 2019, pp. 19–24; Perla, 2012, pp. 64–65; U.S. Army Command and General Staff College, undated). Gaming is also used by various public and educational organizations, as well as by the private sector. Other examples of organizations that use gaming for policy decisions, training, and other purposes include the Federal Emergency Management Agency, the Cybersecurity and Infrastructure Security Agency, the Federal Reserve, and the American Red Cross.<sup>3</sup> Gaming is employed in diverse thematic contexts, such as pandemic response and other infectious-disease outbreaks, emergency preparedness, humanitarian response, peacekeeping, critical infrastructure security, maritime security, threat analysis (e.g., a nonstate actor's use of drones), and even monetary policy (American Red Cross, undated; Brynen and Milante, 2012; Cyber and Innovative Policy Institute staff, 2019; Delahunty, 2019; Drees, Geffert, and Brynen, 2018; Federal Emergency Management Agency, 2020;

Federal Reserve Bank of San Francisco, undated; FireEye, undated; C. Hall, 2017; Horn, 2011; Lane, 2016; PAXsims, undated; Smith et al., 2020; Solomon and Forbes, 2020; Zegers, 2011).

Many approaches, methods, and techniques fall under the gaming umbrella. All forms of gaming can be oriented toward one or more basic steps in problem solving: (1) understand the problem, (2) generate potential solutions, (3) evaluate potential solutions, and (4) choose and implement solutions.<sup>4</sup> An array of techniques shape games and how they are executed and can be applied to one or more of these problem-solving steps (Curry, 2020; Heuer and Pherson, 2015; Lipmanowicz and McCandless, 2014; Rosenhead, 1992; U.S. Army Training and Doctrine Command [TRADOC], undated). Some techniques, such as concept mapping, alternative-futures analysis, and matrix gaming, are more formal, meaning that there is considerable methodological structure and depth on which to draw. Others, such as expert panels, whiteboarding a scenario, and informal group consensus building, can be much less formal.<sup>5</sup> What makes gaming different from other qualitative techniques, such as interviewing, and separates it from quantitative approaches, such as computer simulation, is the unique focus on rule-based problem solving with one or more humans at the center of it.

Several factors are involved when selecting a specific gaming approach, three of which—scenario-based gaming, design thinking, and red teaming—we discuss below. The objective of the gaming activity (concept development, training, or something else), topical focus area, intended players, type of facilitator training, and time and resources available all guide the choice of gaming approach.<sup>6</sup> It is vital to get a good sense of each factor during game design.

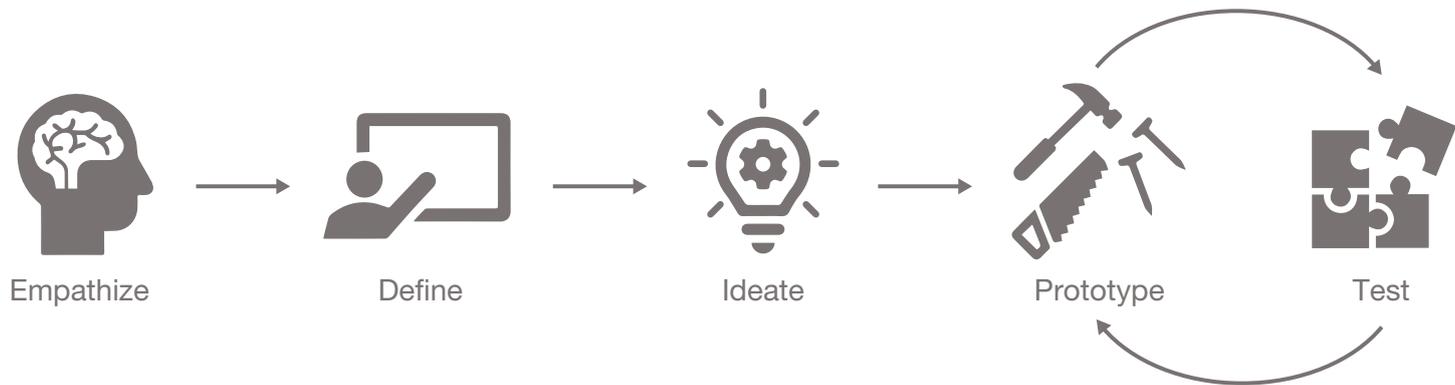
One type of scenario-based game is wargaming:

A wargame is a warfare model or simulation in which the flow of events shapes, and is shaped by, decisions made by a human player or players during the course of those events. (Perla, 2012, p. 280)

Classic defense wargames are characterized by cycles of decisions made by players and adjudication of results (Perla, 2012, p. 280). This approach is flexible but most appropriate to situations involving human decisionmaking in a crisis or conflict setting (Bartels, 2019). Organizations within DoD frequently use wargame results to support future planning (for example, by incorporating findings into strategic documents or using results to help prioritize focus areas or investments; see, e.g., Heath and Svet, 2018). The Coast Guard has participated in defense wargames<sup>7</sup> and has developed an Arctic-focused game of this nature through the Deputy Commandant for Operations, Office of Emerging Policy (DCO-X), and the U.S. Coast Guard Academy. Coast Guard areas and districts can also use tabletop exercises and scenarios to develop plans for prevention and response. These are distinct from wargaming but have some similar elements.

Design thinking is a philosophy of design that can be applied to gaming. It is known for supporting product design, animation, health care, education, architecture, library sciences, and digital communication (Bell, 2008). It is taught at several schools, including Stanford University and the Massachusetts Institute of Technology (Liedtka, 2018). The major steps in design thinking are empathize, define, ideate, prototype, and test. The defining feature of design thinking is the iterated prototype–test loop, illustrated in Figure 1 (Dam and Siang, 2020).

FIGURE 1  
Steps in Design Thinking



SOURCE: Dam and Siang, 2020.

Organizations that use design thinking include the motion picture company Pixar Animation Studios and U.S. Special Operations Command (Black et al., 2018, p. 42; Coyle, 2018, pp. 98–99).<sup>8</sup> Some of the Coast Guard’s efforts to gather information about future needs, such as through mission analysis and Evergreen strategic foresight activities (Tingstad, Wilson, et al., 2020), have elements of design thinking. These types of inputs can help inform service future years’ investments through PPBE. Aspects of design thinking can be used in more-general workshop formats; one Coast Guard example of this is the typically twice-annual senior leadership conference.

Red teaming is yet another set of methodologies that constitute gaming. This approach is designed to challenge assumptions and bias. Its purpose is to allow participants to view complex situations from multiple perspectives and to expand the variety of solutions that a group considers, using an approach that encourages dissent or divergence

in thought (TRADOC, undated, p. 3). Red teaming can include specific tools, such as simulations or tabletop exercises (Zenko, 2015, pp. 133–141). One organization that has helped develop red-teaming approaches is the U.S. Army, through its red-teaming school at the University of Foreign Military and Cultural Studies. Here, students are taught red-teaming methods in a way that overlaps with design thinking, as well as the structured analytic techniques that the intelligence community uses (TRADOC, undated, p. 73). Red teaming is also used by other U.S. government organizations (Wong et al., 2019, p. 94),<sup>9</sup> U.S. law enforcement agencies (Zenko, 2015, pp. 116–141), and myriad private-sector companies (Zenko, 2015, p. 168). The Coast Guard may employ forms of red teaming within individual offices—for example, for requirement definition during acquisition planning.

## Gaming Is Relevant to Coast Guard Activities

The Coast Guard may employ gaming—especially semi-structured brainstorming and workshops—much more regularly than is formally recognized, as described in some of the examples above. Likely reasons for the lack of formalization include service culture and history, and limitations in formal guidance, processes, and organizations to support gaming within the Coast Guard.

Starting from existing gaming examples, we sought to understand how the service uses gaming within a broader taxonomy and whether there are areas into which the service might consider expanding and formalizing its gaming in order to take advantage of a richer range of tools and resources. We did this by adapting an existing taxonomy for gaming into a format relevant to service functions. Games can be categorized according to purpose, style, size, or many other factors. In the table on the next page, we categorize some potential intersections for the service based on function because purpose is central to service decisions to employ gaming. Note that gaming is but one way to carry out some functions, such as concept development or training; it provides a robust (but not the only) option for these, especially in cases in which an issue or problem is complex and stimulating human critical thinking is important. For the functions listed, gaming offers a way to add further structure and rigor to Coast Guard processes that may already be using some elements of games.

We started with a functional taxonomy recently developed for the U.S. Marine Corps. We adapted this through a Coast Guard lens based on dialogues with Coast Guard members familiar with gaming in DCO-X, the Office of

Contingency Preparedness and Exercise Policy, the Office of Counterterrorism and Defense Operations Policy Joint Strategic Planning Division, Office of Performance Management and Assessment, and the U.S. Coast Guard Academy; examination of key topics from senior leadership conference agendas from fall 2017 through spring 2020;<sup>10</sup> a game lab conducted by DCO-X at the 2020 Military Operations Research Society virtual symposium; and prior RAND work (e.g., K. Hall et al., 2019; Savitz, Willis, et al., 2015; Tingstad, Wilson, et al., 2020; Wong et al., 2019) on gaming and (separately) Coast Guard issues. The first column of the table provides a list of possible functions that gaming outputs could serve, the second suggests an existing Coast Guard tie-in to that type of game function, and the third ties these functions to possible topics of relevance to the service. These examples are not exhaustive but demonstrate the breadth of ways in which games already do (to some extent) and could apply to the Coast Guard.

## Expanding and Formalizing Gaming Would Help the Service Exploit Analytic and Training Tools

Taking further advantage of gaming to support some or all of the functions highlighted in the table will provide the Coast Guard with additional tools for analysis and training. This is important for at least two reasons. First, it will help provide additional resources (e.g., through increased awareness of documented approaches, via new collaborations within the gaming community) and rigor to existing Coast Guard processes and methodologies that already employ techniques similar to gaming. This will shape

## Functions That Games Support, with Coast Guard Examples

Function (How Gaming Outputs Are Utilized) <sup>a</sup>	Example Coast Guard Activity	Coast Guard–Relevant Example Topics <sup>b</sup>
<b>Concept development:</b> Explore how future operations might be performed, given evolving technologies, challenges, and changes to the operational environment. It contributes most directly to concepts of operations.	Evergreen strategic foresight workshops	<ul style="list-style-type: none"> <li>• Reduction of costs and timelines associated with acquisition and logistics</li> <li>• Cyberspace operations</li> <li>• Recruitment and retention of women</li> <li>• Updated processes for intelligence</li> <li>• Competition with China</li> </ul>
<b>Capability analysis and development:</b> Support analysis and decisions about how to enhance capabilities, informed by scientific and technological developments. In contrast with concept development, this gaming function focuses on technology and tactical employment.	Mission analysis	<ul style="list-style-type: none"> <li>• Applications for artificial intelligence</li> <li>• Commercially available unmanned aircraft systems that can support Coast Guard missions</li> <li>• Arctic capability gaps</li> <li>• Emerging DoD capabilities most aligned to specific Coast Guard missions</li> </ul>
<b>Strategic discussion and senior leader engagement:</b> Foster discussion and garner feedback from senior decisionmakers.	Senior leadership conferences	<ul style="list-style-type: none"> <li>• Evolving priorities in the Indo-Pacific</li> <li>• Impact that a breakup of the North Atlantic Treaty Organization could have on operations</li> <li>• Coast Guard intersection with the space domain</li> </ul>
<b>Operational and interagency coordination:</b> Walk through operations, often with interagency partners, to ensure that organizations can work effectively together.	Participation in DoD wargames	<ul style="list-style-type: none"> <li>• Collaboration with interagency and private-sector partners during a cyberattack on the maritime transportation system</li> <li>• Coordination with the Navy and other actors to respond to mines in a U.S. port</li> </ul>
<b>International and diplomatic exchange:</b> This is similar to operational and interagency coordination but with an emphasis on international partners.	DCO-X and Coast Guard Academy Arctic game (with Norway)	<ul style="list-style-type: none"> <li>• Impact of capability and capacity gaps in the Arctic</li> <li>• Mechanisms for sharing information about illegal, unreported, and unregulated fishing</li> </ul>
<b>Training and education:</b> Help participants absorb information that is already known in other parts of the organization.	Office of Contingency Preparedness and Exercise Policy–planned mass-rescue operation game, part of the Multi-Year Training and Exercise Plan	<ul style="list-style-type: none"> <li>• Preparing for making decisions with limited information</li> <li>• Responding to hurricanes and other natural disasters</li> <li>• Responding to evolving unrest in the Middle East</li> </ul>

NOTE: In execution, each gaming function–example theme pair in this table would be associated with a Coast Guard office that would oversee game development, execution, and dissemination of results.

<sup>a</sup> Note the difference between function (purpose) and game structure (approach). Various types of game structures or methods (e.g., matrix or “day-after” games) might be applied to fulfill different functions. There is not an explicit one-to-one correspondence between a type of gaming methodology and a particular function. Selection of gaming method depends more heavily on parameters besides the purpose of the game, such as the explicit research question at hand, scenarios or other context, as well as people, time, and tools available.

<sup>b</sup> Not necessarily the recent subject of any formal or informal gaming within the Coast Guard.

analytic processes that can support Coast Guard personnel and decisions. Importantly, the gaming community not only has analytic tools to offer for designing and executing games but can also offer insights on topic framing and documenting game results that will help ensure applicability and engage decisionmakers.

Second, it will expand Coast Guard options for analysis, engagement, and training. A wealth of tools under the gaming umbrella could be advantageous for the service to use as it considers new safety concerns in the Arctic, gray-zone competition in the Indo-Pacific, how to employ underwater vehicles in different missions, recruiting and training the workforce of the future, responding to contingencies in the midst of a pandemic, and many other important problems for which it must be “always ready,” or *Semper Paratus*.

The question is how the service can leverage gaming to a more formal, fuller extent. Any approach must recognize central hurdles for the service, such as limitations in budget and personnel availability, as well as need for decisionmakers to buy in to the idea of gaming. We recommend that any expansion of gaming activities consider following this sequence of objectives:

1. Demonstrate the utility of gaming on a small scale to build momentum.
2. Expand the use of games for immediate Coast Guard purposes.
3. Build additional organic gaming capabilities and capacity within the Coast Guard.

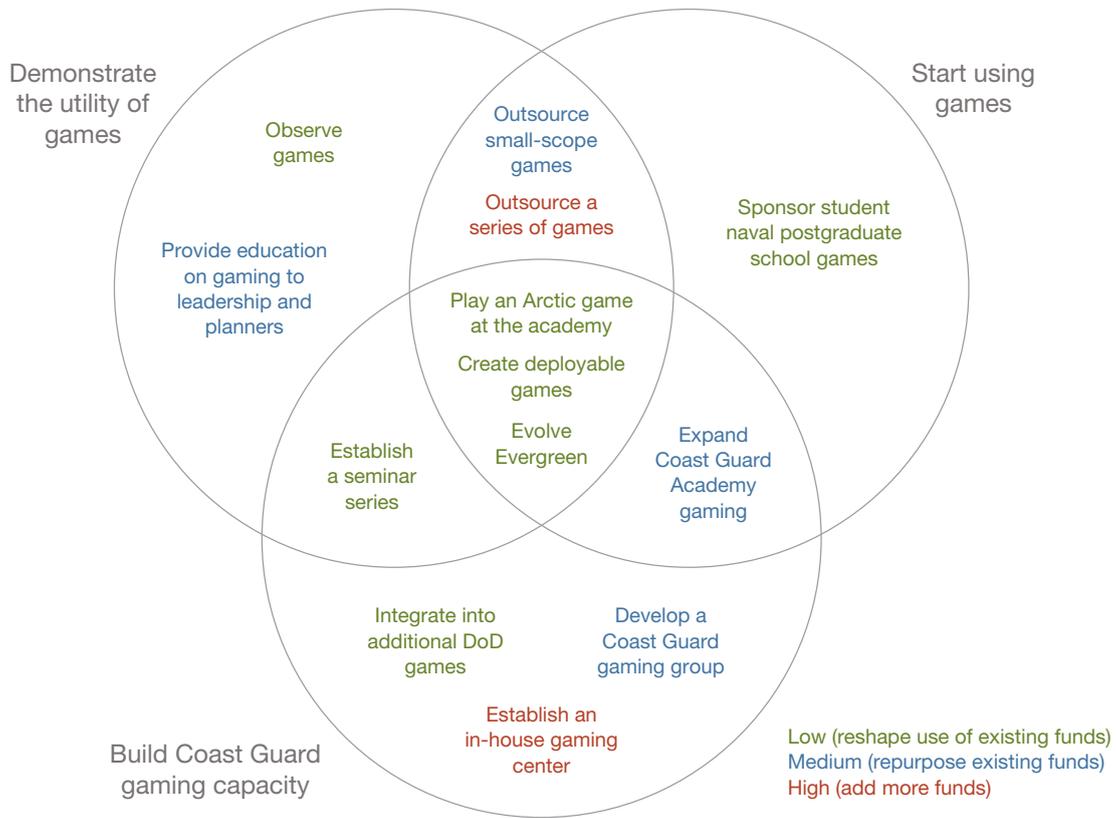
Figure 2 illustrates some alternative ways, at different levels of effort, that could help achieve one or more of these objectives. For example, establishing a seminar series about

gaming would be a low-resource action that would help demonstrate the utility of gaming and might help build Coast Guard gaming capacity over time. Outsourcing a few games is a moderately resource-intensive effort that would allow the service to demonstrate the utility of gaming and begin expanding the use of different approaches.

One option that might be particularly well suited for Coast Guard processes and needs is the concept of deployable gaming. We define this as the proliferation of a low-cost, multipurpose structured analytic method that is centrally designed but played in a distributed fashion, perhaps at different times. The objective is to create more-systematic access to gaming across the service to provide additional planning, training, and information-sharing tools. A deployable game for the service would ideally be designed centrally, with features that users shape to their needs. Central design would help ensure consistency but should leverage input from intended users—for example, through inputs to a topical focus and a universal set of scenarios. The outputs of games could then feed into a centralized process as inputs, for example, to PPBE, the development of new strategies or commandant instructions, prevention and response planning, or agreements for future collaboration.<sup>11</sup>

An example of a deployable game would be a scenario-based activity played at districts to understand the applicability of technological advances in such areas as computing or robotics to their missions. Each district would inform scenario elements based on its day-to-day operations and contingencies particular to its responsibilities. Then, a set of broad scenarios and materials for facilitating a scenario-based red-teaming or 1–2–all (for example) game would be provided back to each district.<sup>12</sup>

FIGURE 2  
 Example Future Steps to Expand Coast Guard Gaming



Participants drawn from district personnel would be divided into groups, each of which would be presented with a different scenario. Groups would identify the problems inherent in the scenarios, how these might change the nature of their existing missions and ability to apply resources against them, and whether and how the technology in question could serve to alleviate (or, perhaps,

exacerbate) problems. Participants would then prioritize subtypes of the technology (for autonomy, this might include unmanned vehicles operating in different domains, as well as machine learning–assisted communications and intelligence) most relevant to the problems at hand and perhaps also attempt to assess how the potential for successful operations in a given scenario changes with this

type of technology insertion. Results of deployable games would then be forwarded to a central office at Coast Guard headquarters. A broader game, perhaps focused on prioritization across a broader set of technologies or between district needs, would then be centrally played to achieve a final outcome, which would inform gaps and a future investment road map.

Deployable games might also aid in training or sharing centrally made changes with lower echelons. For example, new pandemic procedures and response to an active shooter are both cases in which a deployable game might help simulate actions that need to be taken in a real situation.

Pushing through the sequence of three objectives for gaming—from expanding understanding of utility to using more games to building a right-sized level of Coast Guard capability—will require deliberate focus in the near term on low-hanging fruit, such as observing more games and greater engagement with the gaming community. This could lead into more diversity in Coast Guard game participation and perhaps even sponsorship of a game in which Coast Guard interests are heavily featured. Finally, the service can explore what types of formalized gaming best serve needs, bearing in mind that game focus, design, and output all matter to the success of gaming. Further utilizing and communicating about informal gaming techniques will also be valuable, given how extensively used these are within the service.

The Coast Guard has much to plan and train for—numerous existing missions in the United States and around the world, and future changes related to competition with Russia and China, new possibilities for autonomy and artificial intelligence, and a workforce with changing

demographics and expectations, to suggest a few. Gaming offers a versatile suite of approaches to tackle ongoing demands of present missions, as well as the rapidly evolving problems and opportunities of the future. Taking steps to formalize use of games within the institution would enable the service to reap additional benefits from an extensive range of structured analytic tools curated by an enthusiastic community of practice with a long history. It would also encourage use of well-studied methods and additional tailoring of play and outputs to directly assist with key functions, such as planning, engagement, and training. Expanding access to games across the service can also be a relatively low-cost, easily executable approach to ensuring analytic consistency and preparing the workforce to take on the challenges of today and tomorrow.

## Notes

- <sup>1</sup> This often includes people interacting together but can be just one person interacting with a problem.
- <sup>2</sup> Opportunities can include partnerships or leveraging new technologies or approaches.
- <sup>3</sup> U.S. government organizations, such as the U.S. Department of Energy, the U.S. Department of the Treasury, the Federal Bureau of Investigation, other offices from the U.S. Department of Justice, and intelligence agencies, also send participants to various interagency games.
- <sup>4</sup> Gaming, as it is currently practiced, plays heavily in these first three stages of organizational problem solving.
- <sup>5</sup> Despite their flexibility, however, less formal activities are supported by the use of specific techniques that have been developed and studied.
- <sup>6</sup> Resources can include budget, facilities, equipment, personnel types, and other resources.
- <sup>7</sup> One prominent example is described in Hoyt and Winner, 2007.

- <sup>8</sup> Coyle describes a deliberately iterative process at Pixar that matches the description of design thinking.
- <sup>9</sup> We did not explicitly investigate whether the Coast Guard could receive an invitation to send participants to a future course or what specifically the service might derive from such a course.
- <sup>10</sup> Briefly, a senior leadership conference is a workshop that typically convenes all Coast Guard senior leadership twice per year to discuss pressing issues affecting the service.
- <sup>11</sup> This could include collaborations across the department, interagency, public and private sectors, or even internationally.
- <sup>12</sup> A 1–2–all game is a game in which individuals first work through a problem on their own, then deliberate with a partner, and finally present and discuss with an entire group before reaching a conclusion.

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