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Should We Rethink How We Do OPORDs?

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THE U.S. ARMY has used a structured order format and process for more than 80 years. The 1924 version of the *Field Service Regulation* prescribed "formatted orders, with annexes, maps, and tables."[1] Staff procedures have evolved since then, but the basic structure of the operation order (OPORD) has remained essentially the same—five paragraphs or sections that describe the situation, mission, execution, service support, and command and signal. The basic process for creating, sharing, and using OPORDs has also remained essentially the same and is "time-consuming and effortful." It needs to be revised.[2]

OPORDs begin when a higher echelon communicates its OPORD to a lower echelon. The lower echelon commander and staff review the OPORD and conduct a mission analysis. The lower level commander provides guidance to the staff, and the staff enters into the military decisionmaking process. Typically, the staff presents the commander with multiple courses of action (COAs), the commander chooses one COA and expresses his intent, the staff creates an OPORD and passes it to the next lower echelon, and the process is repeated until all Soldiers have been told what is expected of them. OPORDs are also passed back up for an iterative sweep through the echelons and final approval.

OPORDs can sometimes be hundreds of pages long. However, clear, concise communication, especially of the commander's intent, is a critical aspect of military planning, replanning, and operations. The effort devoted to training in writing and interpreting OPORDs in the Reserve Officer Training Corps, at the U.S. Military Academy, and throughout the U.S. Army Training and Doctrine Command school system indicates how important this is.[3] Having recently evaluated OPORDs and conducted empirical studies of how OPORDs are understood, we propose a change to the existing OPORD format and a new procedure for creating OPORDs, to amplify adaptive decisionmaking at all echelons and improve planning for joint and coalition operations.

Conceptual Analyses of OPORDs

U.S. Army Field Manual (FM) 5-0, *Army Planning and Orders Production,* includes detailed specifications of the structure of OPORDs. A "good" OPORD is characterized by the following:

- Military reasoning and operations effectiveness. The OPORD should avoid ambiguous directives and make all assumptions explicit.
- The plan. The OPORD should balance centralization and decentralization.
- Communication effectiveness. The OPORD should be simple, brief, clear, and unambiguous.[4]

The Concept Map (Cmap) in figure 1 expresses what an OPORD *should* be like, but we have found that this does not match reality**.** We examined in detail 10 representative OPORDs, which included orders used in combat from company level through echelons above corps, and orders used during training, command and control (C2) research, and battle command experiments. The sample OPORDs did not adhere to FM guidelines concerning ease of communication. Statements were ambiguous, acronyms were used even when they were not necessary, and sentences included multiple relative clauses. The commander's intent was spread throughout the document like peanut butter.

At any level, the intent statement must support the next higher commander's intent and come after the heading for paragraph 3, Operations, and before paragraph 3a, Concept of Operations.

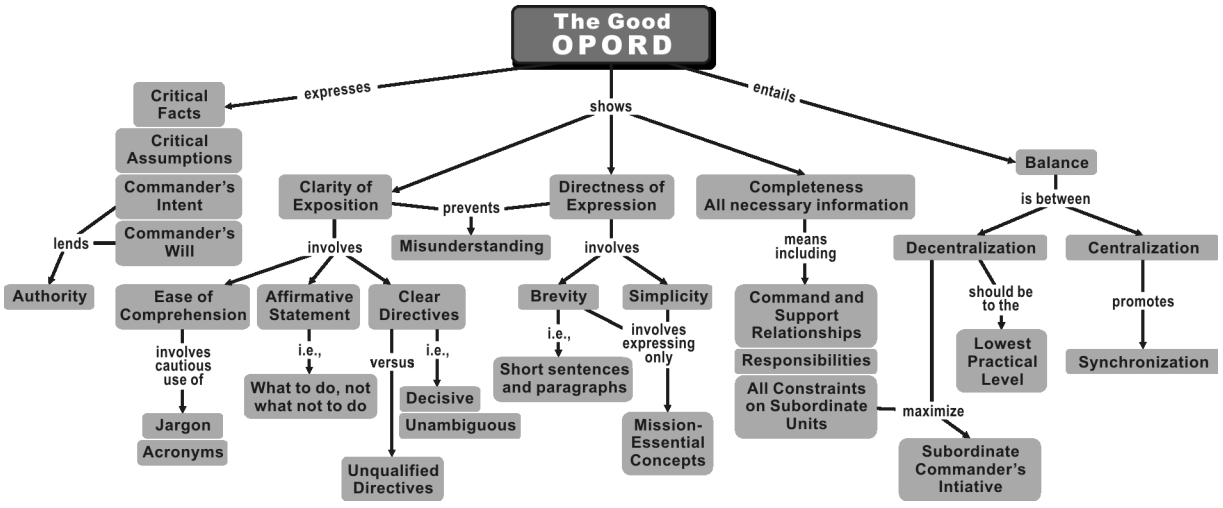

Figure 1. According to FM 5-0, *Army Planning and Orders Production*, the characteristics of the "good" OPORD.

Paragraph 1b of the OPORD or operation plan (OPLAN) contains the statements of the next two higher echelon commanders to ensure the staff and supporting commanders understand the intent two echelons up. At the battalion level and higher, the order is also written to decrease the chances of misunderstanding.[5] While decreasing such chances is a sound goal, it is not always achieved. Apart from the statements' locations in designated subparagraphs, the OPORDs were not consistent in presenting the intended level of the intent statements (brigade, battalion, unit). In other words, the intent information was not always in the same place and, in some cases, was absent altogether, placing a considerable burden on the reader's memory.

This "peanut butter effect" occurs for additional reasons. OPORDs often contain expressions of conditionality that force cross-referencing among intent, mission, and goal. For instance, one OPORD stated: "End state for Apache Company is to control key intersections." It later adds that its purpose is to facilitate logistics flow. Another OPORD provided a method ("Balanced task force [TF] in the north, positioned forward in sector") and then added the intent ("Force enemy into successor brigade east along AA1"). Good OPORDs contain sufficient information to "[enable] subordinates' initiative by setting limits beyond the established plan or order while retaining unity of effort."[6] Hence, statements in the intent paragraph, expressing rationale, must be strongly linked to statements in the mission paragraph.

We see here the difficulty of presenting complex interrelations among complex events within the confines of traditional linear text. OPORDs often embed descriptions of conditional dependencies and decision points in intent statements. For example, "If the enemy attacks solely on AA1, then northern TF attacks enemy in the VIC (vicinity) AREA HURT."

OPORDs sometimes contain information in a way that is at direct odds with FM guidelines. For example, the good OPORD is supposed to involve affirmative statements, but commanders quite often express "concerns" and "anti-goals": "Enemy control of lines of communication could restrict flow of logistics into the BDE (brigade) AO (area of operation)."[7]

These findings dovetail with analyses of Army replanning and studies of how the best corporate executives communicate their intent.[8] This research suggests that effective communication of intent involves calibrating it by a command-staff dialog to ensure that all staff members are on the same page. This would be covered, at least in part, by the situation paragraph in an OPORD. A script that decisionmaking researcher Gary Klein developed for the expression of intent also includes the categories of rationale and task, which conform to guidance, including expressions of purpose, suggested method, key tasks, end states, and follow-on activities.[9] But the Klein script also includes concerns and antigoals. Although these are not part of the traditional OPORD format, commanders sometimes do have a clear need to express concerns and antigoals.

Our discussions of these matters with experienced commanders revealed additional considerations. Some claimed there is widespread misunderstanding or misuse of the key tasks category. Some see this category as the place to convey specific COAs. Field Manual 5-0 says: "Key tasks are not tied to a specific COA; rather, they identify what the force must do to achieve the end state (FM 6-0). In changed circumstances—when significant opportunities present themselves or the COA no longer fits the situation—subordinates use key tasks to keep their efforts focused on achieving the commander's intent."[10]

Some commanders also see a general misunderstanding of the purpose statement, in which the purpose statement merely recapitulates the mission statement. Field Manual 5-0 provides the following guidance: "If the commander's intent addresses purpose, it does not restate the 'why' of the mission statement. Rather, it addresses the broader operational context of the mission."[11] Clearly, issues of individual differences in belief, preference, and style exist despite FM 5-0's goal of serving as clear, unambiguous guidance.

In one of our studies, we presented a brigade OPORD to battalion commanders and asked them to generate an OPORD for their companies.[12] Company commanders were asked to generate OPORDs for their platoons. Next, both sets of commanders were told that a plausible but unexpected event had derailed the mission. The task for the company commanders was to go back to the battalion- and brigade-level intent and generate an appropriate fragmentary order (FRAGO). When these FRAGOs were presented to the battalion commanders for comment, the typical response was, "Why would he do that?" Only one in three FRAGOs made sense to the battalion commanders. When the battalion commanders' evaluations were presented to the company commanders, their response was, "How'd he expect me to know *that*?"

Cmap OPORDs

As it happens, the features of a good OPORD are also the features of a Cmap diagram. (See figure 1.) Cmaps include concepts (enclosed in boxes) and relationships among concepts (indicated by labeled connections between related concepts). Cmapping has foundations in the theory of meaningful learning, and it benefits from decades of research and application, primarily in education.[13] Cmaps have been used as knowledge representations in cognitive science and are being used by astrobiologists at NASA, curriculum designers in the U.S. Navy, university professors preparing distance-learning courses, corporations and communities of practice that share and manage knowledge, and trainers in the electric power utility industry.[14]

Research suggests that it might be possible to improve OPORD procedures by expressing OPORD information using meaningful diagrams. The literature on diagrammatic reasoning (in education, cognitive science, computer science, and geography) includes studies of how people understand a great many types of diagrams, including topographic maps, matrices, schematic diagrams of machines, and semantic networks.[15] The literature converges on a set of conclusions: Good diagrams are effective because they can—

- "Externalize" cognition.
- Guide/constrain and facilitate cognition.
- Require fewer "cognitive transformations."
- Support memory because spatial layouts can have mnemonic value (as opposed to overloading working memory).
- Support information integration at a glance.
- Reduce cognitive demands.
- Support inference-making.
- Facilitate understanding by shifting some of the burden of processing text onto the visual-perception system.

In other words, diagrams can quickly convey information that is ordinarily conveyed in text, facilitate the learning of concepts and relationships among concepts, and allow instructors to evaluate knowledge (for example, expert versus novice differences). Diagrams that work well rely on proximity; that is, the spatial organization or connection of information induces people to see the relationships among the ideas and to draw inferences about them. Proximity requires coordinating in space and time; that is, information that is meaningfully related is consistently presented at the same time and in spatial proximity.

These findings relate directly to the human factors of warfighting, especially information overload during periods of stress or fatigue. Therefore, we have created Cmap versions of OPORDs so that

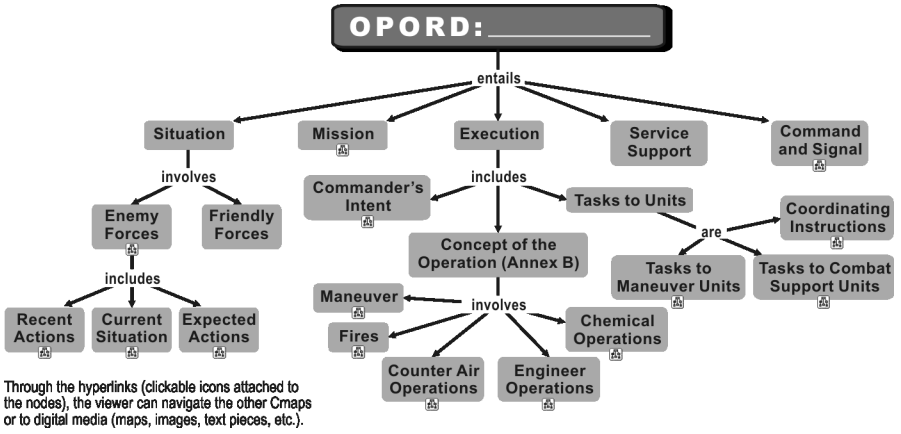

Figure 2. An example top-level Cmap for an OPORD.

viewers can see connections easily. The organizing or top Cmap expresses the five-paragraph OPORD structure (figure 2). Through hyperlinks (clickable icons attached to the nodes), the viewer can navigate to and through other, more detailed Cmaps. Figure 3 is suggestive of the depth of detail required to Cmap an entire OPORD. Twenty-six Cmaps were necessary to capture the entire OPORD. They covered everything from the brigade's mission to maneuver unit tasks.

We studied reactions to these diagrams and whether the Cmaps supported comprehension.[17] We thought that experienced commanders would be skeptical about Cmap OPORDs because the technique would not be familiar to them because they are accustomed to the traditional OPORD format. However, we anticipated that less experienced military participants, such as U.S. Military Academy cadets, would be somewhat less skeptical or cautious. Younger people of the Web generation are sometimes more comfortable with Cmapping and take to it more easily.

The first study confirmed our expectations.[18] The results also suggested that we reconsider how to "slice" traditional OPORDs to find an appropriate level of detail to use in the Cmap version. All participants, inexperienced and experienced, gave valuable feedback, including suggestions for making Cmap OPORDs a feasible tool to use in a military environment.

A second study involved having cadets and experienced officers read traditional text and Cmap versions of an OPORD and then answer questions from memory.[19] The participants also engaged in a timed information-search task. This study design actually biased the results against any hypothesis of Cmap effectiveness because none of the participants had ever seen Cmaps before, so it was interesting to find that on a comprehension measure, recall memory for OPORD information was just as good for the Cmap version as the traditional text, for both cadets and experienced officers.

Perhaps the most important finding was that experienced officers were much faster in reading the Cmap version and considerably faster (more than 2 minutes faster, on average) in searching for information using Cmaps rather than looking through the traditional text version. This suggests that performance

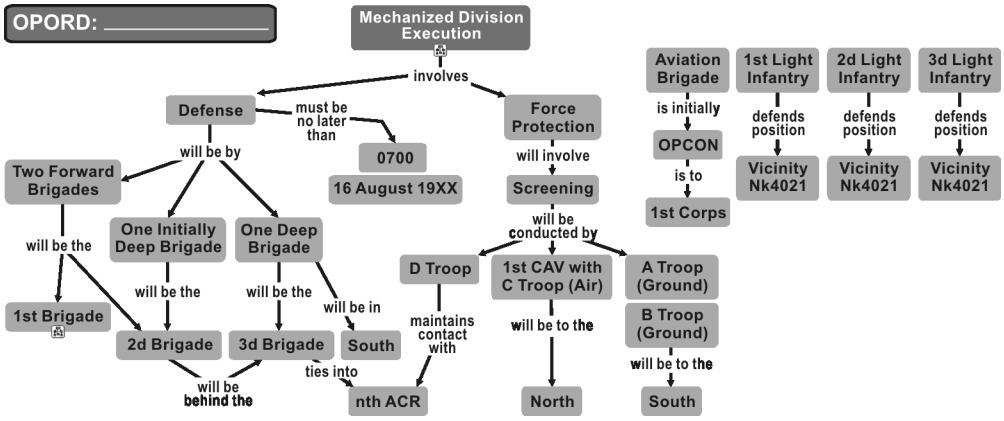

Figure 3. One of the particular Cmaps for an OPORD. (Specific identifiers have been changed.)

is not just an issue of modularity: OPORDs in text form are supposed to be sectional. Rather, the benefit from Cmaps might stem from their morphology (or arrangement of the diagrammed elements), which allows meaningful clusters and their relationships to be scanned at a glance.

The results also affirmed that participants were reluctant to switch to a new format, and suggested that to make a practical Cmap version of OPORD information we would have to find an appropriate level of analysis—a point beyond which diagrammatic representation of meaning uses hyperlinks to text rather than to more diagrams. Thus, we began to pursue the notion of making templates for expressing the commander's intent, the mission statement, and enemy COAs.

Cmap Templates

We devised a template for commander's intent (figures 4, 5, and 6) based on:

- Statements actually in OPORDs.
- Statement categories suggested by empirical studies of effective intent communication.
- The traditional five-paragraph structure.

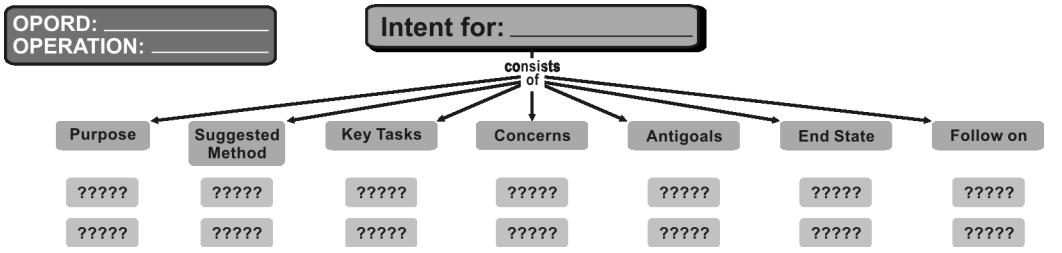

Figure 4. The Cmap template for intent.

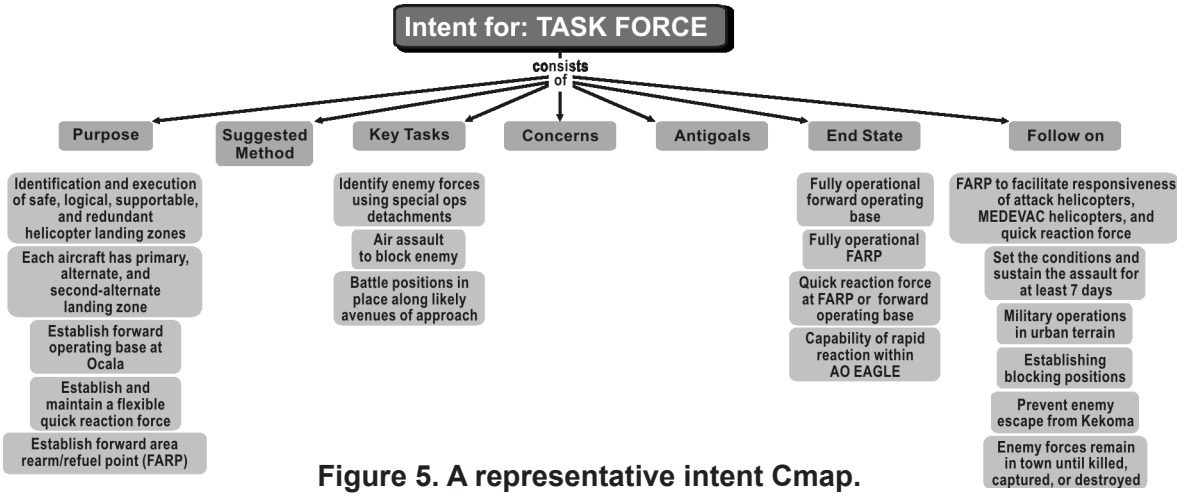

Figure 5. A representative intent Cmap.

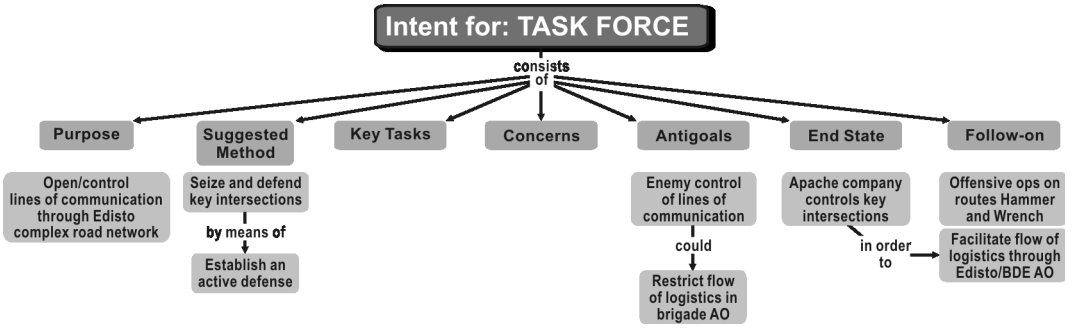

Figure 6. A representative intent Cmap.

To use such templates, commanders need only open the template, click on a node containing question marks, and type in the appropriate information. Thus, using the template does not involve doing anything radically different from what commanders presently do; that is, type text. The commander can add cross links through a simple drag-and-drop procedure, and he can easily type in additional linking phrases that might be needed (as figure 6 illustrates).

As commanders become familiar with Cmapping, we expect them to use more cross links. But our immediate goal is to provide a template to leverage the benefits of diagrammatic comprehension. As familiarity with Cmap OPORDs grows, Soldiers and officers will find that the regular diagrammatic layout has mnemonic value, which might be helpful in situations where they have to remember information or search through OPORDs under conditions of stress. We have also created a template for enemy COAs (figure 7). Figure 8 is an example of an enemy COA. We also created a template and give an example for mission (figures 9 and 10).

A Vision for the Future

Army missions have evolved during the last 80 years. The Army is less likely to engage in the campaign planning of World War II or the general defense planning of the Cold War. The Army is more likely to participate in large-scale, decisive offensive operations involving coalitions and joint forces and repetitive, small-unit peacekeeping missions. These operations require efficient planning methods and effective means of communicating the plans to subordinates at all echelons, across force types, and among coalition partners.

Cmaps are flexible and adaptable. As our research shows, Cmaps can easily be set up as templates that prompt planners to consider information for the OPORD as well as provide linkages to express real-world realities, and to coordinate and synchronize

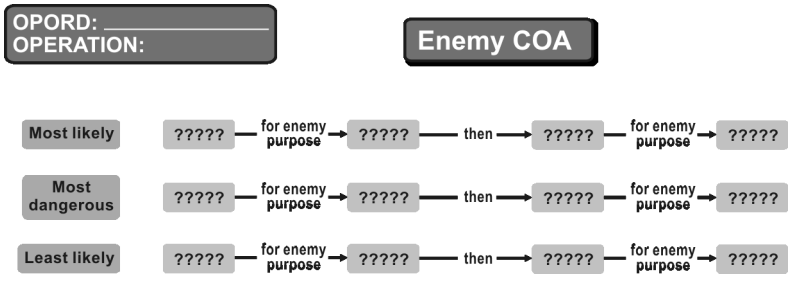

Figure 7. The Cmap template for enemy COAs.

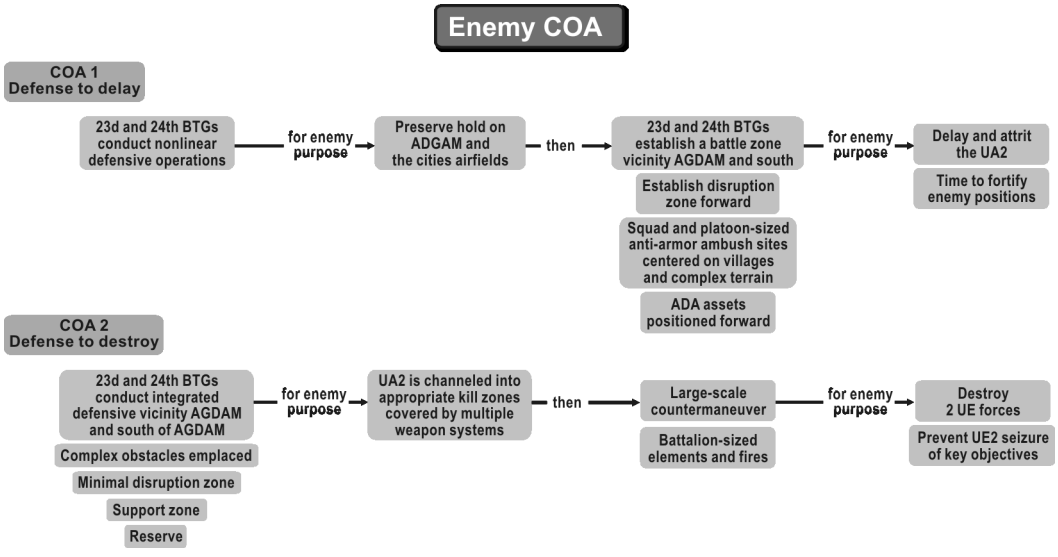

Figure 8. An example Cmap for enemy COAs.

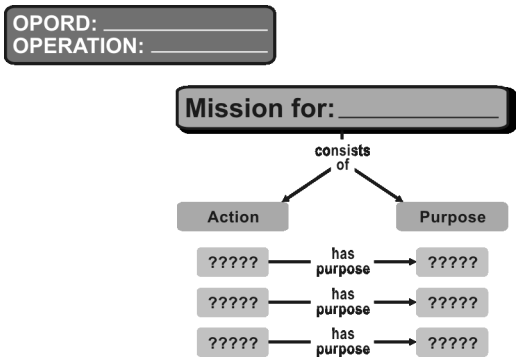

Figure 9. The Cmap template for mission.

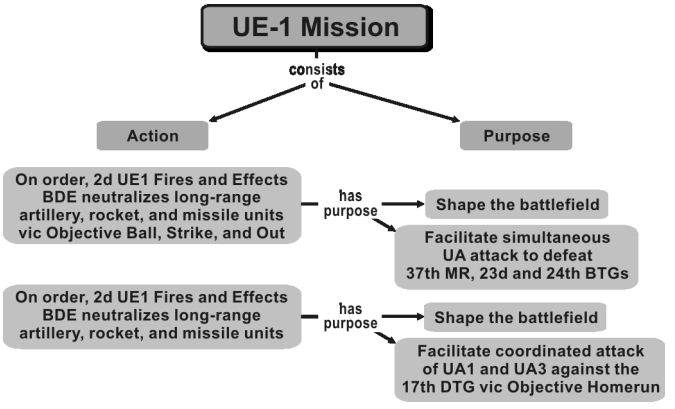

Figure 10. An example Cmap for mission.

events and organize the information that commanders feel is important. Creating a Cmap encourages and supports the clear expression of meaning.

Commanders and staff officers can insert concepts into Cmap templates and set hyperlinks to connect with additional Cmaps or information expressed in *any* form of digital media (maps, images, video, and so forth). Those resources can provide more detail on topic areas such as service support, maneuver unit tasks, and so forth. The resourced Concept Maps could then be refined across echelons.

Patterned after the CmapTools software, the Cmap OPORD planning process could be Web-enabled, allowing Soldiers and officers at all levels to view or work on OPORDs at the appropriate levels and view intent or mission two up, one down across echelons.[20] Indeed, it might be possible to avoid expending time and effort in developing plans "all the way down" and then refining them "all the way back up." A high-level Cmap that expresses commander's intent could be immediately passed all the way down the chain of command, "short circuiting" the extended process. Individuals who work at lower echelons might be able to begin planning (or replanning) immediately. ***MR***

NOTES

1. U.S. Army Field Service Regulation (1924, no other publishing information given), quoted in U.S. Army Field Manual (FM) 5-0, *Army Planning and Orders Production* (Washington, DC: U.S. Government Printing Office [GPO], January 2005), vii.

2. G. Klein and R. Lewis, "Replanning in the Army Brigade Command Post," report by Klein Associates, Fairborn, Ohio, 2003.

3. J. Graham, S. Hah, E. Kolasinski, D. Mulbury, L. Shattuck, and J. Shevlin, "Analysis of Information Contained in Division-Level Operations Orders," report by Engineering Psychology Laboratory, U.S. Military Academy (USMA), West Point, New York, 2003.

4. Field Manual (FM) 5-0, *Army Planning and Orders Production*, (Washington, DC: GPO, January 2005), G-3, G-4.

5. Ibid., 3-5.

6. Ibid.

7. G. Klein, "Executive Intent," in *Intuition at Work* (New York: Doubleday, 2003), chap. 12.

8. Klein and Lewis; Klein; K.E. Weick and K.M. Sutcliffe, *Managing The Unexpected: Assuring High Performance in An Age of Complexity* (San Francisco: Jossey-Bass, 2001).

9. Klein.

10. FM 5-0, 3-6.

11. Ibid.

12. L.G. Shattuck and D.D. Woods, "Communication of Intent in Military Command and Control Systems," in *The Human in Command: Exploring the Modern Military Experience,* eds., Carol McCann and Ross Pigeau (New York: Plenum, 2000), 279-91.

13. D.P. Ausubel, J.P. Novak, and H. Hanesian, *Educational Psychology: A Cognitive View,* 2d ed. (New York: Holt, Rinehart, and Winston, 1978); Novak, *Learning, Creating, and Using Knowledge* (Mahwah, NJ: Erlbaum, 1998).

14. G.E. Campbell, D.W. Dorsey, L.L. Foster, and D.E. Miles, "Assessing Knowledge Structures: Relations with Experience and Posttraining Performance," *Human Performance* 12 (1999): 31-57; S.E. Gordon, K.A. Schmierer, and R.T. Gill, "Conceptual Graph Analysis: Knowledge Acquisition for Instructional Systems Design," *Human Factors* 35 (1993): 459-81; G. Briggs, D.A. Shamma, A.J. Cañas, R. Carff, J. Scargle, and J.P. Novak, "Mars 2000: Multimedia-Based Knowledge Representation of Mars," report by NASA-Ames Research Center, California, 2003, on-line at <www.coginst.uwfedu/ projects/conceptMaps/index.html>, accessed 19 January 2006; Cañas, J.W. Coffey, M.J. Carnot, P. Feltovich, R. Hoffman, J. Feltovich, and J.D. Novak, "A Summary of Literature Pertaining to the Use of Concept Mapping Techniques and Technologies for Education and Performance Support," report to the Chief of Naval Education and Training by the Institute for Human and Machine Cognition, Pensacola, Florida, 2003; B.R. Gaines and M.L.G. Shaw, "Concept Maps as Hypermedia Components," *International Journal of Human-Computer Studies* 43 (1995): 323-61; L.F. Hanes and M.M. Gross, "Capturing Valuable Undocumented Knowledge: Lessons Learned at Electric Utility Sites," paper presented at the Institute of Electrical and Electronics Engineers 7th Conference on Human Factors and Power Plants, Scottsdale, Arizona, September 2002.

15. A comprehensive review appears in I. Vekirl, "What is the Value of Graphical Displays in Learning?" *Educational Psychology Review* 14 (2002): 261-98. See also D.P. Ausubel, "The Use of Advance Organizers in the Learning and Retention of Meaningful Verbal Material," *Journal of Educational Psychology* 51 (1960): 267-72; J. Glasgow, N.H. Narayanan, and B. Chandrasekaran, eds., *Diagrammatic Reasoning: Cognitive and Computational Perspectives* (Cambridge, MA: MIT Press, 1995); H. Mandl and J.R. Levin, eds., *Knowledge Acquisition from Text and Pictures* (New York: Elsevier, 1989).

16. B.D. Kint and L.R. Stanton, "Concept Maps: Understanding Military Operations Orders," report by the Engineering Psychology Laboratory, West Point, New York, USMA, 2003.

17. Ibid.

18. E. Wagoner, "Analysis of the Use of Concept Maps in the Place of the Military's Operations Orders," report by the Engineering Psychology Laboratory, West Point, New York, USMA, 2004.

19. CmapTools was developed at the Institute for Human and Machine Cognition with support from the U.S. Navy, NASA, and other branches of the Department of Defense. The tools are available for download (at www.ihmc.us) at no cost for government and educational purposes. The menus and interfaces have been extensively tested to ensure simplicity, meaningfulness, ease of use, and robustness. CmapTools is Java-based and has been approved to run on the unclassified Navy Marine Corps Intranet (NMCI). NMCI will test a single-port Concept Map server in the near future.

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