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Wargame-Creation Skills and the Wargame Construction Kit

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Summary

The U.S. Naval War College (NWC) is developing an elective course on wargaming theory and practice, the first session of which will be in the Fall of 2002. This course is designed to elicit ideas for the advancement of the art and science of wargaming, particularly elements of wargaming that address current operational problems.

The NWC asked CNA to support their development of this course by analyzing the skills important for creating wargames, and comparing those skills to the training content of the elective course. In addition, they asked us to develop a wargame construction kit for use in the course. This kit was intended to provide students with a baseline and framework for practical exploration of the processes of creating wargames.

Our analysis of the skills associated with the creation of wargames identified six critical skills.

- Perspective
- Interpretation
- Research
- Analysis
- Creativity
- Asking questions.

We also characterized the different levels of skills that wargame creators might possess. Simply described, these are:

- Introductory: Novices in the field frequently base their work heavily on existing games. They are mainly concerned with modifying the values of the parameters and variables associated with earlier games.

- Intermediate: Journeymen in the field still base their work on existing games, but begin to make modifications to the systems and components of earlier games, and to the interconnections between the parameters and variables.
- Advanced: Experts in the field frequently start from scratch when they approach a gaming project. The master practitioner will first examine the gaming topic with a sense of how best to represent it, focusing only later on the details of the representation, and on the balance between old and new techniques to incorporate into the game.

The NWC elective is designed primarily for the novice in the field of wargame creation, but it touches also on the intermediate level of skill. It addresses the advanced level to a much lesser extent—not surprisingly for a survey course like this. The elective addresses the full range of tasks and skills associated with wargame creation, using a mixture of lecture, classroom activity (much of which is built around the use of the WCK to construct an in-class wargame), and independent research projects. The projects seem especially important. Although they do not require the students to create a complete wargame—indeed, such a task would be impractical—the projects do help tie together the individual tasks of wargame creation, and "fill in the blanks" associated with some of the less obvious elements of the process.

The Wargame Construction Kit, which we include in this paper, has the potential to play a useful role in the exploration of wargame concepts and how to implement them practically. We designed the WCK as an operational-level (that is, focused on a campaign or theater) *distillation*. A *distillation* has more detail and surface fidelity to the real world than an *abstract* game, but does not represent the detailed processes of reality to the same extent or depth as what might be classes *simulation*. Nevertheless, the WCK does have somewhat more detail than other games to which the term *distillation* has been applied.

That said, the WCK is by no means a completely finished and highly polished system—though it is a workable one. Indeed, any problems or issues the players and instructors may have with the way we

designed the system, although not intentional on our part, do have the benefit of serving to highlight discussions of game-design and development issues that will prove helpful to meeting the objectives of the course.

As presented here, the WCK is a tabletop, paper-and-cardboard game. We explored the prospects for using commercially available software to create a computer-based, on-line version of the game for possible use with distributed teams of players. We concluded that such a project is possible, but that the time and expense of carrying it out demand careful consideration. Simpler and less expensive alternatives may provide a high proportion of the value of such a system at a fraction of its cost.

Introduction

The NWC's role as the DON Title X wargaming activity requires the Wargaming Department (WGD) at the NWC to investigate advances in art and science of wargaming that might provide advances in analysis of operational problems, doctrine, planning, future force development, or transformational opportunities. The NWC seeks to build on the wargaming foundation and operational analysis developed by CNA. CNA's work in wargaming and operational analysis provides a uniquely independent and objective intellectual foundation for developing an educational and research activity to expand the state of art and science of wargaming applied to current important operational problems.

Purpose and approach

CNA's research and development efforts focused on advancing the state of the art and science of wargaming, particularly on beginning to understand how to teach the skills associated with creating wargames. We have chosen to use the word *creating* rather than the more frequently used term *designing*, because there is more to the art and science of creating a wargame than design alone. Our goal in this research was to develop generally applicable concepts and methods that go beyond the usual scope of current approaches to introducing military professionals to game-design as a task and process. Design is central to the creation of a wargame, but linking design to objectives, reality, players, and means is essential if the game is to be more than an intellectual curiosity.

CNA worked with the WGD's researchers and other members of the WGD's research team to help develop this elective. We focused on the task of teaching students how to design and develop a wargame. We considered this process from the initial identification of game objectives with a potential sponsor, through research, design, testing,

execution, and analysis of the game. The WGD's planned approach for the course is based on a combination of case study and practical exercise. The students will learn the various aspects of employing wargames by actually carrying out a condensed form of the process.

To that end, CNA assisted with developing such a course in the following ways:

- We assisted with the creation of a reading list for the course, and with the creation of other course materials embodying key concepts, including a discussion of failure modes for wargames.
- We analyzed the skill-sets required for wargame practitioners, in order to help create the final syllabus to teach those skills.
- We designed and produced a tabletop, two-sided, distillation-style "wargame construction kit." This kit embodies a system to represent terrain, forces, sensors, and command and control systems, and will serve as the foundation for the students to explore the concepts associated with game design. It will also give them a starting point to develop a working game-assessment system for a wide variety of game types and scenarios.
- We conducted a preliminary evaluation of the level of effort required to develop and extend this tabletop system to a web-based game system. We examined commercial-off-the-shelf authoring software to assess the requirements for creating a version of the construction kit's game system that would be capable of supporting internet-based play of the games developed with that system.

Organization of the paper

The remainder of this paper consists of four main sections.

In the first section, we draw heavily from earlier CNA research to discuss some basic concepts underlying the development of training programs. We consider the basic notion of skill and skill level, and describe our approach to skills-based analysis. We then apply that

approach to analyzing the skills associated with wargame design, focusing on identifying *critical skills*.

The second section takes a close look at the syllabus for the NWC's elective course as it existed at the end of our research. We examine the syllabus for the course and use our analytical approach to extract a description of the skills the syllabus seems to focus on teaching. We then compare those skills to the sets we derived in the previous section, to identify insights that might improve the design of the course.

The third section of the paper provides an overview of our wargame construction kit (WCK). It discusses the basic concept of the WCK, the design philosophy, and our recommendations for how to use the WCK to help teach critical wargame-design skills. The full documentation of the WCK is provided in the appendix.

Finally, we conclude the paper with a discussion of possible future directions for this work, including the possibility of using commercially available software to convert the paper version of the WCK into a computer-based version that would support on-line play by distributed players and teams. We also briefly discuss the possibility of developing a capabilities maturity model for creating wargames.

Developing wargame-creation skills

In this section of the paper, we will outline much of the theoretical framework for our approach to exploring the process of training and education in the art and science of wargame creation. First, we consider some of the ideas that form the foundation for any training program. Then we probe the nature of skills, the levels of expertise in their application, and the process of learning them. Throughout this discussion, we apply the broad principles to the specific skills involved in the creation of wargames, and we characterize the specific skill levels we identified. Through this process, we identify what we consider to be the *critical skills* of wargame creation.

Training programs

The process of developing a training program can be described simply in terms of the following steps:

- Identify required skills.
- Identify the training formats or media that permit acquisition of specific skills.
- Sequence the individual training opportunities into an overall program of instruction.[1]

1. This characterization is taken from CNA Research Memorandum (CRM) D0000563.A2, I*ntegrating Wargaming into the NMITC Curriculum: Background and Analytic Methodology*, by William D. Brobst and Alan C. Brown, July 2000, p.8.

To develop the actual instructional material to support a learning process, the following steps provide a good starting point:[2]

- Analyze the requirements for learning.
  - — Describe tasks.
  - — Perform task analysis for instructional design.
  - — Perform learning analysis.
  - — Derive external conditions for learning.
- Select media for instruction.
  - — Assess the instructional situation.
  - — Consider learning effectiveness of media.
- Design instruction for learning.

Gagne defines an internal learning process of eight steps, and he associates instructional events with each step.

Table 1. Gagne's model for designing instruction for learning (from Brobst and Brown)

Steps in the learning process	Supporting instructional events
Attention: alertness	Gain attention
Expectancy	Inform learning objective and activate motivation
Retrieval from working memory	Stimulate recall of prior knowledge
Selective perception	Present stimulus materials
Encoding: entry into long-term memory storage	Provide learning guidance
Responding	Elicit performance
Reinforcement	Provide feedback and assess performance
Cueing retrieval	Enhance retention and transfer

2. From Brobst and Brown (2000), based on Robert M. Gagne. *The Conditions of Learning and Theory of Instruction*. New York: Holt, Rhinehart, and Winston, 1985.

The Department of Defense provides specific guidance for the development of military training programs.[3] The DoD systems approach is similar in structure to Gagne's model. Table 2, taken from Brobst and Brown, summarizes these steps.

Table 2. DoD steps in systems approach to developing military training programs

Step	Sub-step
Analyze mission and job	Determine specific inventory of tasks, knowledge, and skills required to perform mission Identify tasks, knowledge, and skills requiring training Determine number, type, and skills of personnel required to support performance requirements
Design training based on analysis results	Convert tasks into learning objectives Sequence training Prepare course outlines Select media Plan for trainee evaluation Construct written/performance tests Identify facility and resource requirements
Develop training based on the design	Develop lesson plans Develop trainee materials Develop media Develop other training materials Review developed materials for technical and doctrinal accuracy
Implement developed training program	Conduct validated and approved training program Manage validated and approved training program
Evaluate implemented training program	Evaluate accuracy and effectiveness of the training program Use evaluation feedback to modify existing program as necessary

These processes provide guidelines for how to apply our research into the skills associated with wargame design to the task of developing a training curriculum for teaching such skills. The NWC elective, while not exactly a training program in and of itself, may be considered a survey course designed to introduce students to the broad field. As such, it would do well to touch on as many of the various elements of

3. Department of Defense, MIL-STD-1379D, *Military Standard: Military Training Programs*, December 1990.

such a training program as feasible within its constraints of time and resources.

To help focus those limited resources on key elements of the learning program, it is useful to summarize some of the key insights derived from CNA's earlier research into this subject. Again, turning to Brobst and Brown, we can summarize much of CNA's earlier research on training programs in straightforward terms:

- Training programs are designed to support operational requirements.
- Operational requirements can be broken down into their component skills.
- Training programs can use a variety of training formats or media.
- Within a training program, the use of a particular training formats or media should be based on their ability to permit the acquisition of specific required skills.
- The learning process entails developing proficiency in performing those component skills, as well as recognizing the connections between individual skills, and, as a result, developing expertise in supporting the operational requirement.[4]

With this theoretical background, we turn next to a discussion of skills in general and skills specifically related to wargame design and development.

Learning, skills, and expertise

The sequencing and structuring of any training program revolves around the process of developing skills. Based on earlier CNA research[5] into this process, we will discuss:

- Identifying skills to be learned

4. Taken from Brobst and Brown (2000), pp. 21-22.
5. The theoretical discussion in this section is largely based on Brobst and Brown (2000), pp. 16-17.

- Characterizing levels of skills performance and expertise
- Learning at different levels of skill performance, from novice through expert.

Identifying skills to be learned

One of the first steps in developing any training course or program of instruction is to identify the skills you are trying to teach. In the military environment, many training programs begin this process by identifying the operational requirements the training program is attempting to meet. In this case, we first must determine the "operational requirements" for designing and producing wargames. We derive these requirements by examining the existing literature, particularly some of the required readings already identified for the course.

Sources for determining required skills

Our principal sources for this analysis are as follows:

- In a series of books published in the 1970s,[6] Richard D. Duke proposed a general construct for thinking about the use of what he called "gaming-simulations" in training, education, and research. Duke, a professor of urban planning, focused much of his attention on gaming as a communications tool—a language of its very own, in fact—for exploring social interaction in an increasingly complex world. His work includes an extraordinarily detailed breakdown of the tasks associated with creating and using games.
- During the 1970s and 1980s, James F. Dunnigan was the publisher and creative engine for a company called Simulations Publications, Incorporated (SPI) and its flagship magazine, *Strategy & Tactics*. SPI was one of the industry leaders in the

6. Richard D. Duke. *Gaming: The Future's Language*. New York: John Wiley & Sons, 1974. Cathy S. Greenblat and Richard D. Duke. *Gaming-Simulation: Rationale, Design, and Applications*. New York: John Wiley & Sons, 1975. Richard D. Duke and Cathy S. Greenblat. *Game-Generating Games: A Trilogy of Games for Community and Classroom*. Beverly Hills: Sage Publications, 1979.

niche hobby of board wargaming, and Dunnigan has been called the hobby's high priest. Dunnigan articulated many of the ideas that drove his and SPI's approach to the design of wargames in two books published during those periods.[7]

- One hobbyist who grew up during the heyday of board wargames in the late 1960s and 1970s went on to become a defense analyst (and one of the authors of this paper). After several years of working with U.S. Navy wargames and other analytical efforts, Peter Perla synthesized some of the insights from both hobby and DoD wargaming into a handbook applicable for both audiences.[8]

Steps in the process of creating a game

Each of these sources describes, in more or less detail, a series of steps, or tasks, associated with the creation of games in general or wargames in particular. Not surprisingly, perhaps, Dunnigan and Perla have similar views on these tasks, as shown here:

Table 3. Dunnigan's and Perla's steps in wargame creation

Dunnigan, 1980	Perla, 1990
Concept development	Specify objectives
Research	Identify players, roles, and decisions
Integration	Collect information the players will need to make decisions
Flesh out the prototype	Devise tools to make the game work
First draft of rules	Document the result of the effort
Game development	Validate models, data, and scenario
Blind testing	Play testing, preplay, and blind testing
Editing	Preparing the final rules
Production	Execution of the game
Feedback	Feedback and analysis

7. The staff of *Strategy & Tactics* magazine. *Wargame Design*. New York: Hippocrene Books, 1977. James F. Dunnigan. *The Complete Wargames Handbook: How to Play, Design, and Find Them*. New York: William Morrow and Company, Inc., 1980.

8. Peter P. Perla. *The Art of Wargaming*. Annapolis: Naval Institute Press, 1990.

These processes do not track precisely in parallel, but the differences are primarily in emphasis, based on the different target markets for the end result: the hobby gamer or the DoD sponsor.

Duke's process, on the other hand, is far more generic and far more more detailed.

At its extreme, Duke's process is embodied in a large wheel-like display to emphasize the connectedness of the various pieces. As a standard outline, it would run to a total of 628 lines. (The game-design process alone runs to 154 lines.) Table 4 summarizes only the upper levels of the breakdown. Each column outlines one of the three main subdivisions: design, construction, and use.

Tasks derived from the processes

Perla and Duke both explicitly point out the need for documentation throughout the course of the project. This attitude stems from their environment, in which the game creator is not self-sponsoring—instead, the game is being created for some customer other than the prospective game players, usually, to help that customer explore some issue or communicate some message. Dunnigan's emphasis is more directly commercial. His customer is the purchaser and player of his game, and the main objective is to create a game that potential customers will purchase.

Nevertheless, we see similarities in the three approaches.

In all three, there is always a goal or objective to orient and focus the creative effort. This goal may be as simple as selling many copies of a commercial boardgame, or as complex as helping DoD commands to develop national strategy or operational concepts.

Underlying the effort to create a game to meet those objectives is some version of reality that the game must somehow capture. The reality may be historical, it may be current, it maybe speculative, or it may even be fantastic. To construct this reality, the game creators must dig deeply, into the historical record, current reality, or their own imaginations to identify what is important, what is critical, and what is not relevant to the world they intend to present to their players. This investigatory research and development of a particular point

Table 4. Duke's game creation process (from Duke, 1974)

Design	Construction	Use
Determine conceptual map	Pre-player	Ethics
• Generate conceptual map	• Set up project management	• Designer related (public vs. private domain, copyright, royalties)
-Define game objectives	-Schedule tasks	• User related
-Define game message	-Establish administration	-Designer to participant
• Express verbally and graphically	-Budget	-Operator to participant
-Overview schematic	-Hire personnel	-Designer to operator
-Tables	• Establish order of processing through accounting system	Dissemination
-Flow charts	• Build components	• Design appropriate packaging
• Conceptual map vs. reality?	-Define explicit output from accounting system	• Distribute the game
• Ascertain appropriate level of abstraction for intended communication purposes	-Role descriptions	-Distribute the package
Game design implementation of conceptual map	-Models	-Train operators
• Does concept report express conceptual map adequately	• Assemble components	-Maintain the game over time
• Express the synthesis verbally and graphically	-Trial test	Use standard system to classify game (e.g., Dewey Decimal)
-Use appropriate graphics	-Adjust	Use standard description and evaluation form
-Synthesis of words	• Data	
-Outline game construction	-Data loading	
• Determine the form each game component will take	-Store data	
• Review game design in light of the conceptual map	-Establish storage plan	
	-Collect data	
	-Establish acquisition plan	
	• Calibrate models	
	-Rough tuning	
	-Fine tuning	
	With player	
	• Test run critique	
	-Play at least 10 times	
	-Adjust material, forms, etc.	
	-Check validity of construct	
	-Check players' response	

of view about reality provides the foundation for the game creators to build the world in which their players must operate and in which the situations that arise must be internally consistent.

To help the creators depict this world dynamically, and to ground the players in it, the game designer must create new—or draw upon existing—tools. Typically, these tools take the form of data that describe the world, and models that represent how the world works and how the players may influence it. Collecting data and building models is sometimes incorrectly thought to be the totality of game creation. It represents an essential, but incomplete, part of the entire process—one not to be overlooked, but also one not to be overemphasized.

The the components of the game thus must derive from the game's objectives. They must be built to specifications derived from thorough research and analysis. They must be linked to the way the players will use them to make decisions and perceive the effects their decisions have on the world of the game. They must also be tested.

All three of our sources agree on the need for testing. Testing is, of course, an integral part of game development. In addition, blind testing (testing of an essentially finished form of the game by players unfamiliar with the game's development process), is explicitly mentioned by name in Dunnigan's and Perla's books, and is implied strongly in Duke's description of the final stage of the design process—the test run critique. To conduct successful testing programs, the game creators and testers must be unblinking in their honest assessment of how the game is functioning. The tests should be structured to strain the system to the breaking point, not merely to be a dry run of the simplest path through the game's created world.

Thus, wargame creators must be able to forge links between and among the objectives, reality, tools, and players. The skill level of the game creators can be judged by their ability both to build the individual links and to test their creation to ensure that:

- All elements of the game work well to represent the game-world's reality.

- They allow the players to make the decisions necessary to achieve the game's objectives.
- No one link is so much weaker than the others that the players' perspectives become unbalanced and unproductive.

Combining and expanding on the process descriptions given above, we define a synthesized outline for the process of wargame creation. This outline will serve as the basis for our subsequent assessment of both the critical skills involved in creating wargames and also for the skill content of the elective course. Table 5 presents this outline in terms of the major tasks and a brief description of the content of each.

It is interesting to compare the process of wargame creation we define in table 5 to the steps of the DoD systems approach for developing training programs as shown in table 2. Table 6 summarizes this comparison. Our process for wargame creation corresponds closely to the major steps for developing training.

Six critical skills of wargame creation

Based on the research sketched out above, our analysis of that information, and our own experience in the processes of creating wargames, we have identified what we believe to be six *critical skills* that cut across the entire process:

- Perspective
- Interpretation
- Research
- Analysis
- Creativity
- Asking questions.

Table 5. Process for wargame creation

Task	Description
Develop the concept	Determine suitability of wargaming for problem
	Identify what information and insight the wargame might provide
Specify objectives	Define the overall purpose of the game
	Define specific, achievable objectives
	Sort goals into those associated with research, education, problem solving, and training
Do basic research	Identify the necessary primary and supporting players, their game roles, and the decisions they will have to make to achieve the objectives
	Identify the information the players will need to make informed decisions and the sources for that information
	Gather the information into the game data base
Integrate design elements	Identify the elements of information necessary to define the critical path of the game
	Identify, explore, and define the interconnectedness of the basic information, key player decisions, and possible outcomes of the decisions
Prototype the design	Devise the necessary tools (models and procedures) to represent the dynamics of the situation
	Build the physical components and materials
Produce a first draft	Summarize the results of the design process
Develop the game	Test mechanics and procedures for full functionality under the full range of circumstances
	Validate models, data, and scenarios based on historical data or available prospective analysis
	Assess how well the entire package reflects reality and the critical elements defined during the integration stage
	Make any necessary adjustments
Do blind testing	Test the game using players unfamiliar with the design and development process
	Stress the system and procedures, identify problems, and implement corrections
Edit the game	Prepare corrected and refined documentation of design, procedures, data, models, and other game materials
Produce the game	Produce final version of game materials
	Carry out the game with actual players
Analyze the game	Collect and analyze feedback on game play
	Analyze play and document insights on substance

Table 6. Comparison of wargame-creation process to DoD training-development process

DoD Process (from table 2)	Wargame-creation process (from table 5)
Analyze mission and job	Develop the concept Specify objectives
Design training based on analysis results	Do basic research Integrate design elements Prototype the design Produce a first draft
Develop training based on the design	Develop the game Do blind testing Edit the game
Implement developed training program	Produce the game
Evaluate implemented training program	Analyze the game

Perspective encompasses a broad view of the overall subject matter the game must address, and the specific objectives the game must meet within that context. It also includes the practical appreciation for what it will take to accomplish these objectives, including managing the entire effort and producing the physical realization of the game and the play of it. Within those two bookends, perspective helps ensure that the definition of the players' positions and the decisions they are called upon to make in the game will create the opportunity for the game to meet its objectives.

Interpretation cuts across the entire spectrum of activities in creating a wargame. The creator must interpret a wide variety of information and experience, from working with the sponsor to identify the true objectives of the effort, through understanding the real import of data and information on the design and play of the game, to drawing insights from the play of the game.

Research is, of course, a fundamental skill. It involves both understanding what you need to know to create the game, and identifying how and where you can learn it. Historical games rely on documentary research. Contemporary games combine such documentary research with more operationally oriented research. The ability to look for true primary sources, those that can reveal what really happened and why, is at the heart of this skill. All too frequently, time and practical constraints may limit the range of such research. Nevertheless, the more the wargame creator can learn about the reality the game world

must reflect, the sharper that reality will appear to the players, and the more faithful their reactions to it will be.

Analysis must go hand-in-hand with research. Facts alone are seldom enough because facts tend to be slippery. One source's fact is another's rumor, and both may stem from deliberate falsification in an older source. The better the wargame creator's ability to analyze data and information from the variety of sources acquired through research, the more likely it is for the game to be as accurate a representation of its chosen reality as it is possible to be.

Creativity is one of the most important of these critical skills. It is also the most difficult to characterize. At the most practical level, the wargame creator must be able to devise game mechanics that implement the ideas developed throughout the earlier stages of design in a way that can be understood by the players and can be used the operators of the game—game directors, facilitators, rules, computers, or whatever persons and mechanisms monitor and enable the players to play the game. At the broadest level, creativity underlies the entire process, which is one of the very reasons we have chosen to characterize the process as game *creation*. In essence, the game must embody a world that does not actually exist, and the game's creator must literally create that world.

In our experience, one of the most important processes involved in carrying out all of these critical skills is *asking questions*. Indeed, the art of questioning, particularly the knack of asking the right question at the right time, is so fundamental to successful wargame creation that it may rate the term *meta-skill*. As you will see later, the form of questions that game creators ask is one of the indictors of their level of skill.

Expertise: the levels of skill performance

Previous CNA research[9] into the subject of expertise, though focused on tactical and operational tasks associated with combat and military

9. See Brobst and Brown (2000), pp. 18-20.

intelligence, has identified three distinct levels of expertise. These levels apply to the creators of wargames very well.

- *Introductory*, where the focus is on performing individual skills, and supporting training is designed to specify individual measures for each skill
- *Intermediate*, where the focus is on connecting the individual skills within the context of the mission, and supporting training is designed to specify critical mission skills (as training objectives) and relational performance measures that help to establish the connections between the critical skills
- *Advanced*, where the focus is on tactical mastery, applying mission skills as required in the tactical environment, and supporting training is designed to teach the tactical concepts that control the employment of skills.

A common progression of a hobby wargame designer shows how these levels of expertise develop and manifest themselves. The description below does not necessarily reflect the course of any one individual, but is based on the experience of the authors and ton much anecdotal evidence.

The introductory level

The novice game designer (the more apt term for this limited perspective of hobby wargaming) usually begins as a player—a consumer rather than a producer of wargames. At some point, however, the consumer becomes a critic, and the critic becomes a designer.

In most cases, the first game such a novice designer creates is based heavily on some existing game or game system. “If only they had included the effects of morale on the ability of the Old Guard to break Wellington’s line at Waterloo, this game would be much more realistic.” And so it begins. The novice takes an existing game and creates a variant of it. He retains most of the components and the game system but adds, subtracts, or changes some things. Typically, the underlying reason for creating a variant is a disagreement with the original designer about what was important in the actual historical campaign or battle, or a desire to streamline some of the rules and play systems.

Alternatively, a designer at the introductory skill level may take an existing game system—unit-, time-, and map-scale; basic rules and combat procedures; and perhaps even the same combat resolution data and mechanics—and apply it to a new but similar historical situation. For example, a game system designed to represent the fighting at Waterloo may be readily adapted to simulate the battle of Borodino.

The novice can use the existing game system to define the variables and procedures he will use in his variant or new game. One of the easiest ways to characterize this stage of expertise development is through the kinds of questions the designer is probably asking himself. At heart, they ask, "What should I use for the values of the system variables?"

The intermediate level

After designing his first wargame, the novice designer may try it out among his friends and learn from their reactions. Incorporating his experience and new ideas based on research and analysis, the novice may begin the transition to journeyman status. He probably now has increased his familiarity with multiple game systems, and has sorted things out according to his own tastes. For example, he may like the combat system of one game and the command system of another. But he may also feel that no one has quite managed to integrate logistics effectively into the game.

So he takes on the next level. To his practical experience of tweaking and modifying existing system variables, he may begin to connect the dots. He sees how the command, movement, and combat systems of different games can interact to produce new and better representations of his own views of how the battles went. Within the context of existing techniques, he begins to see new applications and combinations.

At this level, the developing game designer may take a baseline system but apply it to an entirely new situation in a new way. Instead of modeling Napoleonic combat, he may adapt a Napoleonic system to represent the fighting in the American Civil War. This may require him to replace the method of resolving fire combat, because of the

change in weapons performance and tactics over the intervening 45 years. Or he may decide that, in fact, despite the improvements in the performance of individual weapons, battlefield performance of large formations of musket-armed infantry changed only a little, and the real factor of critical importance was the relative lack of training and experience of the troops.

Now instead of simply changing the values of the systems variables, the journeyman designer also begins to change their interconnections. He does more and deeper research and analysis, and as a result changes his perspective on what was important. He begins to interpret what he reads with greater insight, distinguishing between what is likely to be an honest statement of what happened and what is more likely to be post-war *apologias*.

The questions he asks himself also begin to change. Now the emphasis is on transformation and integration. "What can I change about this system to make it better reflect my view of the world?"

The advanced level

As pointed out in Brobst and Brown, "The behavior of individuals with a great deal of experience (i.e., experts) in a variety of domains, from medicine to chess to fighter pilots, has been compared to that of beginners (i.e., novices). ... One element of expertise is that experienced decision-makers in a variety of domains ... make decisions very differently from novices."[10]

As our fictional game designer progresses, the details of many games systems form the backdrop for new thought processes. He has a much greater base of experience of things that worked and things that did not. Even more importantly, he is beginning to understand *why* he

10. Brobst and Brown (2000), p. 19. Additional references they give to important research into these topics include: K. Anders Ericsson and Jacqui Smith (eds.). *Toward a General Theory of Expertise: Prospects and Limits*. Cambridge: Cambridge University Press, 1991; Alexander Kotov. *Think Like a Grandmaster.* Dallas: Chess Digest, 1971; Roger W. Schvaneveldt et al. *Structures of Memory for Critical Flight Information*, June 1982 (Air Force Human Resources laboratory AFHRL-TP-81-46).

feels that they did or did not work. From copying, then modifying, the expert game designer has advanced to creating.

At this level, the designer frequently starts to create a game from scratch. The idea for a new topic and a new approach to representing it on the game board (or even more radically, without a game board) comes first. He may draw upon his experience to sort through some options for representing the factors he has now decided to focus on, but it is the reality and his interpretation of it that comes first, not the mechanics. At its core, the game is fresh and new, despite the use of some classical elements (the ubiquitous and iniquitous hexagonal grid being perhaps the best example) and tried-and-true basic mechanics. There is a fresh twist, a new perspective, an innovative mechanic.

The designer continues to ask himself the old questions. But the order is reversed. Elements of old systems and values of system variables will still have to be chosen, but the answers to the questions are dictated by the new—and first—question the designer asks himself, "How do I represent this situation to my satisfaction?"

Learning at different levels of expertise

"Training needs to support learning at each level of skill performance, from novice through expert. Many training programs address the introductory level of performance, focusing on teaching individual skills."[11] This, of course, is not surprising. The introductory skills form the foundation for any progress a learner can make. In addition, the novice learner is seldom expected to do more than the very basic tasks.

In a field such as wargame creation, with its complex mix of art and science, research and creativity, practitioners who strive to develop their expertise continually learn new skills and new approaches. This is similar in many ways to the situation of strike-fighter aircrew studied

11. Brobst and Brown (2000), p. 20.

by Brobst and Brown in some earlier work.[12] They summarized the results of this analysis in the 2000 paper already cited.

> [O]nly a fraction of the complete set of skills required for a mission was expected from nugget aviators. More experienced aviators on the mission performed the remainder, such as planning and decision-making skills. Therefore, the overall training program for all aviators needed to consider both initial acquisition of individual skills and periodic maintenance or refresher training of previously learned skills.
>
> Training programs also address the more advanced levels of skill performance, considering linking skills within the context of the mission and using tactical concepts to guide skill employment. However, we found that learning by individuals at those more advanced levels of skill performance is also not well understood.[13]

The NWC elective course is to be a broad overview of wargaming and its uses. Thus, we will confine our attention to training at the novice, and possibly intermediate, levels. We will speculate on training for advanced expertise at the end of this paper.

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12. CNA Research Memorandum (CRM) 96-128, *F/A-18 Aircrew Task Identification and Analysis*, by W. D. Brobst and A. C. Brown, FOUO, December 1996 and CNA Research Memorandum (CRM) 96-129, *Developing Measures of Performance for F/A-18 Aircrew Skills* by W. D. Brobst and A. C. Brown, FOUO, December 1996.

13. Brobst and Brown (2000), pp. 20-21.

The NWC elective

Armed with our assessment of the skills important for creating wargames, we can now examine the details of the NWC elective itself. To do so, we will use the draft syllabus for the course, as it exists at the time this paper is being written. We will compare the syllabus and the skills it addresses with our analysis of the skills of wargame creation presented in the preceding section, to identify any insights that might improve the design of the course.

Overview of the course

The overall objective of the elective course, as described in the draft syllabus, is to provide the students with an introduction to "the essential intellectual discipline that underpins the theory and practice of wargaming."[14] The learning goals are to help students become capable of:

- Translating research and decision requirements into game design
- Judging the validity and quality of a given game design and execution
- Judging the applicability of various models and simulations to a given wargame design
- Designing a scheme for capturing game results
- Critically interpreting game results
- Recognizing strengths and weaknesses of game reports.

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14. The various quotations and detailed descriptions of the course are taken from the on-line course description posted on the WGD Wargaming Elective portal as of 30 September 2002. The URL for this page is https://nwcportal.nwc.navy.mil/ward/el599/Lists/Proposed%20Syllabus/barneys%20view.htm

The course comprises ten three-hour sessions. These sessions are envisioned to be a mix of lectures, discussions, case studies, and in-class exercises. In addition, the students will be assigned to produce an appropriate game design to deal with one of a set of specific topics. This practical exercise in wargame creation is cast in terms of a tasking from a sponsor, which the students must address. Their tasking will require them to:

- Determine how wargaming can contribute to answering the question, including the number of games and the expected knowledge to be gained.
- Determine the type of wargame(s) to be played and their structure, including assessment methodology and role of computers.
- Determine who should be the players.
- Describe how game collection and analysis will be conducted.
- Provide rationales for all design decisions.

The proposed topics for the exercise include:

1. What is the impact of projected defense on global aircraft carrier operations?
2. How should global maritime intercept policy be structured?
3. Should high-speed combatants be attached to battle groups or operated as independent squadrons?
4. Of what utility is an afloat C-130 base to battle group and MPF(F) operations?
5. What is the most effective mix of manned and unmanned platforms for strike operations?
6. What is the proper composition for an expeditionary strike group for counter-terror operations?
7. What is the optimum Navy ISR mix in the joint context to support time-sensitive strike operations?

8. What set of rules of engagement best support time-sensitive strike operations?
9. Which capabilities have the highest “payoff” in assured access operations?
10. How should the USN counter small boat swarm operations?
11. What is the optimal mix of national capabilities (sea and air lift, prepositioning afloat and on land) for strategic mobility, deployability, and sustainability?
12. What is the best tasking method for service and joint ISR assets?

The course is thus an ambitious attempt to provide students with both the theoretical background and understanding they will need to apply wargaming techniques to solve problems, and the practical experience of facing a realistic situation that a wargame creator may well confront and dealing with that situation by applying the lessons they have just learned.

Table 7 presents the complete outline of the ten sessions of the course. It describes the objectives of the sessions and provides some additional background discussion. This table contains the basic data we use to analyze the set of skills the course is designed to teach, using the framework we constructed in the preceding section.

Table 7. Outline syllabus for NWC elective course on wargaming

Session	Objectives	Discussion
1. Course Introduction and the Nature of Wargaming	• Acquaint students with faculty and each other • Establish detailed understanding of course flow and requirements • Acquaint students with NWC wargaming capabilities • Establish a common understanding of terms and basic concepts	This course will employ active learning techniques such as case studies, exercises, and seminar discussions. For these techniques to be effective, the class and faculty must have a firm basis for interaction, and an accurate set of mutual expectations. This session will establish class familiarity with each other, with the basic terms and concepts of wargaming, and with the history, philosophy and capabilities of the Naval War College Wargaming Department. Note that this session will introduce the Wargame Construction Kit. Students will use this kit to build an in-class wargame that they will play later in the course. Teams will be assigned to different aspects of the game. The class will devote 30 minutes of each session to a discussion of the development of this game.
2. Why Wargame?	• Understand the relationships between gaming and other forms of analysis • Understand the nature of indeterminacy and its impact on analysis and wargaming • Understand the characteristics of wargames that make them useful for supporting decision making • Recognize the kinds of problems that are suitable for wargaming	Aside from entertainment and education, wargames are primarily used to support, either directly or indirectly, military decision making. However, wargames are not a panacea for finding the solution to a problem. To arrive at a quality decision, the nature and structure of a problem must be discerned and the appropriate decision support technique applied. Wargaming is only one of a number of decision support tools that can be used, and it is important to understand when its use is appropriate, along with its benefits and limitations. This session will explore the nature of military problems, the particular characteristics of wargames, and how they can be used to best advantage in problem solving and decision support. In-class cases will be analyzed.
3. The Structure and Elements of Gaming	• Enhance student understanding of how wargames work • Establish a basis for critiquing wargames • Provide knowledge necessary to engage in wargame design and analysis	Wargames have a well-defined internal structure that must be understood in order to be able to judge the quality of a particular game. Moreover, understanding of game dynamics is necessary to effectively link objectives to game design. This session will focus on the general mechanics of wargames and the principles underpinning their design and execution.

Table 7. Outline syllabus for NWC elective course on wargaming (continued)

Session	Objectives	Discussion
4. Analyzing Wargames	• Develop understanding of wargame data collection and analysis techniques and principles	Wargames constitute, in a sense, artificial military history. Players live an experience, and how they react to that experience, through their plans and decisions, can provide useful insight for both educational and research purposes. However, extracting valid insights and lessons from games requires careful planning to ensure that critical information is captured during the game, and that only supportable conclusions are drawn from this data. Too often, valuable information is lost due to a defective collection process and unsupportable conclusions are drawn. This session will address basic principles of collection and analysis.
5. Modeling and Simulation	• Understand the intellectual underpinnings of models and simulations used to support wargaming • Understand how computer models are used to support wargaming	
6. Wargame Design	• Understand the process and principles of game design • Be able to link game design to problem definition	The success of a wargame is principally influenced by the quality of its design. This session will examine the major principles of game design and students will work on refining the design of the in-class wargame.
7. Playing Red	• Understand the relative benefits and limitations of one-sided and two-sided games • Understand the impacts and implication of free-play Red teams • Understand the requirements of playing Red	Most wargames involve opposition by some agency. Red is the conventional name for the opponent to the principal players in a wargame, and can consist of either simulated opposition by means of umpires or a computerized opponent, or a set of opposing players who are free, in varying degrees, to select their own courses of action. How Red is portrayed and played has a profound impact on the dynamics of game design and play.
8. Wargame Play I	• Execute the tabletop game designed by the seminar • Gain experience with game play	This session will be the first of two in which students will play the game they have designed.

Table 7. Outline syllabus for NWC elective course on wargaming (continued)

Session	Objectives	Discussion
9. Wargame Play II	•Execute the tabletop game designed by the seminar •Gain experience with game play	This session will be the second of two in which students will play the game they have designed.
10. Wargame Hot Wash and Course Wrap Up	•Extract lessons learned from the in-class wargame project and synthesize the learning achieved in the course	An effective hot wash session is critical to the success of most wargames. In this session we will review the events of the in-class game with the objective of extracting lessons learned within the game context and conducting a critique of the design and execution of the game itself. Class members will draw on their learning throughout the course to contribute to the discussion.

Skills analysis

In Table 5, we developed a task list for wargame creation based on our analysis of the existing sources. To reiterate, this list identified eleven broad tasks.

1. Develop the concept.
2. Specify objectives.
3. Do basic research.
4. Integrate the design elements.
5. Prototype the design.
6. Produce a first draft.
7. Develop the game.
8. Do blind testing.
9. Edit the game.
10. Produce the game.
11. Analyze the game.

To analyze the skills content of the NWC elective course, our first step is to associate these 11tasks with the learning objectives defined in table 7. We do this in table 8.

From this analysis we see that, at least at this broad level, the course plans to touch on the full range of tasks and associated skills. In some cases, however, virtually the only means of addressing the tasks is through the medium of the class project to develop a wargame design to meet some hypothetical sponsor's needs. The project itself, of course, gives the players a taste of the entire process at some level of detail.

Perhaps the task that seems to receive the least amount of emphasis in the syllabus is that of conducting basic research. Indeed, the course objective we placed in this category—"Understand the process and principles of game design"—is likely to touch on the research issue only lightly. Given the experience of the prospective students, it is reasonable to assume that they have fundamental skills in conducting such research in general terms. However, research to support game design and development may have unique characteristics, and it is again likely that only the course project will expose the students to the need for such skills.

Another observation that we can make based on this analysis is that there appears to be little formal structure in the course for teaching the skills associated with testing games and game systems. The use of the Wargame Construction Kit and the in-class gaming of sessions 8 and 9 are the primary elements of the course that touch on testing.

In our experience, the lack of adequate testing is the single biggest contributing factor to wargame failures.

This is a major problem in DoD gaming. Wargames often have to be created quickly, and practitioners seldom devote enough time to testing and refining their games. Experienced designers may be able to get by with limited testing, but the novice and even the intermediate-level designer usually cannot—at least not without the risk of serious problems.

Table 8. Sorting of syllabus objectives by game-creation tasks

Task	Syllabus objective (Session #)
1. Develop the concept	• Understand the relationships between gaming and other forms of analysis (2) • Understand the nature of indeterminacy and its impact on analysis and wargaming (2) • Recognize the kinds of problems that are suitable for wargaming (2) • Enhance student understanding of how wargames work (3) • Understand the relative benefits and limitations of one-sided and two-sided games (7)
2. Specify objectives	• Understand the characteristics of wargames that make them useful for supporting decision making (2) • Be able to link game design to problem definition (6)
3. Do asic research	• Understand the process and principles of game design (6)
4. Integrate design elements	• Provide knowledge necessary to engage in wargame design and analysis (3) • Understand the process and principles of game design (6) • Be able to link game design to problem definition (6) • Understand the impacts and implication of free-play Red teams (7) • Understand the requirements of playing Red (7)
5. Prototype the design	• Understand the intellectual underpinnings of models and simulations used to support wargaming (5) • Understand how computer models are used to support wargaming (5) • Understand the process and principles of game design (6)
6. Produce a first draft	• Course project[a]
7. Develop the game	• Establish a basis for critiquing wargames (3) • Execute the tabletop game designed by the seminar (8 and 9) • Gain experience with game play (8 and 9)
8. Do blind testing	• Execute the tabletop game designed by the seminar (8 and 9) • Gain experience with game play (8 and 9)
9. Edit the game	• Course project[a]
10. Produce the game	• Course project[a]
11. Analyze the game	• Develop understanding of wargame data collection and analysis techniques and principles (4) • Extract lessons learned from the in-class wargame project and synthesize the learning achieved in the course (10)

[a]The course project provides practical experience with all elements of the process, but is the primary means of exposing students to this task.

The way the course deals with the question of modeling, so fundamental to the core of game design, is not well described in the syllabus. At the time of this writing, the session dealing with modeling centers around a guest speaker and associated discussion. Once again, the experience base of the students may well include more formal courses in the kind of modeling associated with operations research and systems analysis in DoD. A broader concept of models—which includes the entire game under that rubric, as well as the supporting topic-specific models that may support play—may be a useful addition to the discussion.

In terms of the five critical skills—perspective, interpretation, research, analysis, and creativity—we can make essentially the same comments as above. The course syllabus touches on all of the critical skills to one degree or another. In particular, the early sessions concentrate heavily on helping players develop a coherent perspective on gaming and its application, as well as on how to deal with the needs of sponsors. The use of guest speakers, case studies, and class discussion will exercise and sharpen interpretive and analytical skills. Research and analysis seem to receive less, or at least less obvious, attention, but will come to the fore in the course projects and the in-class gaming and discussion. The scope for creating new concepts and new game mechanics is also tied tightly to the projects and the discussions of the WCK.

Our overall conclusion from the preliminary skills-based analysis we have been able to conduct in the time available to us is that the course as described is well focused for the introductory level of wargame creation. It will also have value for practitioners making the transition from introductory to intermediate skill levels. The more difficult transition from intermediate to advanced levels of expertise remains elusive, in practice as well as in training and education programs.

The Wargame Construction Kit

This section of the paper provides an overview of our Wargame Construction Kit (WCK). It discusses the basic concept of the WCK, the design philosophy, and our recommendations for how to use the WCK to help teach critical wargame-design skills. The full documentation of the WCK is provided in the appendix.

The WCK concept

The idea of a wargame construction kit can be traced in one form or another all the way back to the origins of what we would consider modern wargaming. The underlying idea is for such a kit to provide the basic framework and fundamental concepts for a game system that individual users can adapt to represent situations of interest to them.

To assist with the NWC's elective course, we designed and produced a tabletop, two-sided, distillation-style "wargame construction kit." This kit embodies a system to represent terrain, forces, sensors, command and control systems, and other aspects of modern warfare. We created the WCK to provide a foundation for the students in the elective course to explore the concepts associated with game design. It will also give them a starting point to develop a working game-assessment system for a wide variety of game types and scenarios.

Each of the adjectives used above to describe the WCK has specific implications for the creation and use of the product. First, it is a tabletop game system. That is, it is played on a tabletop, using, in this case, paper or cardboard components. It is two-sided. That is, it is intended as a competitive game between opposing players, either individuals or teams. It is a distillation-style game. That is, it reduces real-world problems and entities into a simplified representation focused on a few prominent elements of that real-world environment. (One way of distinguishing distillations from abstractions is that real-world language

and concepts can be used to describe situations, actions, and outcomes in a distillation without a lot of mental gymnastics.)[15]

One of our principal goals in creating the WCK was to provide the instructors of the elective course with a training tool they could use to give the students some practical experience in designing wargames at the introductory and intermediate levels of skill. Using the WCK as a basis, the students could modify the values of the parameters and variables included in the WCK to represent different situations or different views of what is important in a military confrontation. They could also use the WCK as the game adjudication "engine" in seminar-style games they might develop during the course.

Design philosophy

The WCK is an operational-level game system, adaptable to a notional or actual geographic theater of operations. The design objective is to provide a flexible, consistent, and simple set of mechanics for wargaming contemporary and near-term conflicts (out to about 2015), with emphasis on joint command and control. Players—or teams—typically take the role of national command, or theater, army, fleet, or air force commanders, depending on the scenario. Land units represent divisions, brigades, and some specialized regiments (or battalions). Naval units represent individual submarines, carrier battle groups, and task forces or flotillas of smaller vessels. Air units represent sorties generated by a group, wing, or squadron, which are generally based "off-board" (for simplicity, unless the scenario designer needs to represent airbases).

Basic concepts

First, as the name implies, the Wargame Construction Kit is a tool for constructing wargames. Second, and perhaps more importantly, it's

15. For a more complete discussion of the concepts of abstractions, distillations, and simulations as applied to wargames, see CNA Research Memorandum (CRM) D0006277.A1, *Game-Based Experimentation for Research in Command and Control and Shared Situational Awareness*, by Peter P. Perla, Michael Markowitz, and Christopher Weuve, May 2002.

an example of how wargames are constructed. To that end, we made an extra effort to incorporate extensive design notes into the rules. These notes discuss the various tradeoffs we made during the game-development process, how the various parts of the design affect each other (every decision has at least the potential to affect every other decision), and (hopefully) provide insight to those who are using the kit to design their own games.

We originally conceived of this WCK as a distillation-style system. In the event, it has crept ever farther along the continuum from a distillation to a simulation, probably more so than we originally envisioned. This process, too, is part of the educational value of the WCK—it is far easier to add more and more detail (also known as "dirt") to the system in the name of realism than it is to design elegant solutions to keep the detail low but the realism high. Nevertheless, we have tried to avoid the temptation to add special capabilities, special factors, more tables, and more die rolls to account explicitly for every exception, or special interest, or hidden agenda that might be injected during the creation of the game.

The system is designed to be played as a tabletop game and as such it embodies many of the traditional concepts of board wargame design. The playing surface is a map, over which a stylized grid is imposed to help regulate movement and combat. Unlike the vast majority of board wargames, however, that grid is not necessarily an hexagonal field, but presumably uses irregularly shaped areas to represent the terrain. (We say "presumably," because the users of the WCK are certainly free to use hexagons, squares, or any other type of system to perform the same function.)

We also assume that military units and capabilities will usually be represented by flat playing pieces (as opposed to miniature vehicles, ships and aircraft). Typically these pieces (traditionally known as counters) are constructed of cardboard of various shapes and sizes to suit the circumstances. The playing pieces for the WCK illustrate the type of unit or capability they represent along with certain alphanumeric values that encode their identities and capabilities. We designed the standard format for the playing pieces so that they would have no more than a single number and a single letter on every unit (aside from any unit identification).

Combat and other interactions are mediated by a set of rules and charts. Random numbers are provided by the roll of dice of various types and numbers, typically the classic six-sided dice or the more exotic ten-sided dice. To the extent we were able, we limited the use of complex charts and tried to keep things clean. The basic combat system, for example, uses only a simple, two-column chart.

Wargame failure modes

During the design and development of the WCK, we tried to remain conscious of the primary modes of failure for wargames. A wargame can fail to achieve its objectives in several ways. The major failure modes are:

- Bad research.
- Bad design.
- Bad development.

Bad research

A game can fail by being technically or historically inaccurate. This is essentially a failure of research. Errors of fact (wrong Order of Battle, incorrect terrain) are relatively easy to spot and correct. Errors of analysis (combat or movement dynamics that fail to reflect real physical or human limits, game processes that ignore or distort logistic constraints) are harder to identify, and will often require rethinking a design.

Wargamers typically delight in endless bickering over the relative capabilities of various weapons, platforms, and sensors, and precisely how these are quantified and modeled in games. They often neglect the hard work of trying to understand the system-level interactions of military forces in conflict. A good game should provide insight into command and control processes of decision-makers. The “God's-eye view” of most tabletop wargames (perfect knowledge of your own and the enemy’s situation) does not automatically produce a fatally flawed model of the fog of war. It does demand creative design, however, to force players to deal with uncertainties analogous to those faced by the real-world commanders—that is, uncertainties that result from

incomplete intelligence and imperfect communications. An accurate game helps players develop valid insights: it rewards historically or doctrinally correct tactics, and punishes their opposite. The really difficult part is to ensure it does that while still allowing the players some scope for creative and imaginative solutions to the problems they confront without allowing them to stray into the realms of fantasy and delusion.

Bad design

A wargame can simply be unplayable, because of contradictory or missing rules, unworkable mechanics, or—most commonly—excessive complexity for the available time and patience of the players. As mentioned earlier, game designers are often tempted to add complexity (special cases, intricate graphics, elaborate processes) to exhibit their mastery of the subject. Because reality is infinitely complex, a game that aspires to "simulate" or model reality is driven—in the designer's mind—toward a proliferation of complexity. The result can be that the players spend more time trying to understand and carry out a set of rules and procedures than they spend making the actual decisions those rules and procedures exist to implement. Game developers try to counteract this tendency by "adding simplicity." Good wargame rules are well written—as in William Strunk's classic definition:

> Vigorous writing is concise. A sentence should contain no unnecessary words, a paragraph no unnecessary sentences, for the same reason that a drawing should have no unnecessary lines and a machine no unnecessary parts. This requires not that the writer make all his sentences short, or that he avoid all detail and treat his subjects only in outline, but that every word tell.[16]

A good design is like a good lesson plan. After playing the game, the players should have learned something. If the game fails to teach, or teaches invalid lessons, then the designer failed to meet the objectives.

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16. William Strunk, Jr. and E.B. White. *The Elements of Style, 3rd ed*. New York: Macmillan, 1979, p. xiv.

Bad development

A game can also fail by not being fun to play. Gamers often use the term “fiddly” to describe game mechanics that are needlessly cumbersome, counterintuitive, or excessively burdensome to players' short-term memory. The engineering term “kludge” comes to mind here:

> Kludge (pronounced KLOOdzh) is an awkward or clumsy (but at least temporarily effective) solution to a programming or hardware design or implementation problem. According to Eric Raymond, the term is indirectly derived from the German *klug* meaning clever. Raymond considers “kludge” an incorrect spelling of *kluge*, a term of the 1940s with the same general meaning and possibly inspired by the Kluge paper feeder, a “fiendishly complex assortment of cams, belts, and linkages...devilishly difficult to repair...but oh, so clever!”[17]

What players experience as “not fun” is typically the result of inadequate development. “Game development” is the common term for a process somewhat akin to editing. But development encompasses a wider variety of activities. Essentially, development takes the good ideas in a design and magnifies them—and it takes the bad ideas in a design and eliminates, or at least minimizes, them. A well-developed game is polished; its rough edges have been filed off through extensive testing with a variety of players. A well-developed game is intuitive; it works the way players expect it to work, events flow smoothly, processes are logical, and the rules explain things clearly.

Our overall success in avoiding the worst of these failure modes will only be judged by the users of the WCK. To the extent that problems remain in the system, however, the students may benefit from the task of trying to correct them and improve the utility and accuracy of the system. The next section outlines some of the other uses we envision the WCK serving for the elective course.

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17. http://whatis.techtarget.com/definition/0,,sid9_gci212446,00.html

Using the WCK

When we began this study, the primary purpose and projected use for the WCK was to provide a system to represent key elements of a military campaign in a relatively straightforward and easily implemented game format. It was to serve as the foundation for the students of the elective course to explore the art and science of wargame design by expanding on the basic WCK to produce their own scenarios to represent specific campaigns, and variant rules to modify the values and concepts presented in the basic WCK. We also envisioned the possibility that the WCK could provide the students with the basis for developing a working game-assessment system for a wide variety of game types and scenarios, particularly to support the play of high-level seminar games.

As we developed the WCK, our thinking about how it could be used effectively coalesced into three broad categories:

- Playing the game.
- Building new scenarios.
- Changing the game system.

Playing the game

Most wargamers and wargame designers believe that to design wargames well one must first be able to play games—although not necessarily to play them well (indeed, it is rare that a top-notch designer is also a first-rate player).

"Play" appears to be an innate instinct for social-mammal predators, such as orcas (killer whales) and humans (killer monkeys). Play evolved as rehearsal and practice of survival skills. Sports are play in the locomotor domain; games (as wargamers understand the term) are play in the cognitive domain. Games are mind sports.

Both sports and games are rule-based activities. The ability to grasp, internalize, and use rule sets is a fundamental game-playing skill. Both sports and non-sport games require decision-making under uncertainty. ("Should I pass the ball right now, or keep it? Should I

go left, right, or straight up the middle? Can I take Moscow before the snow falls? Should I fire torpedoes now, or close the range?")

Games (other than the special case of solitaire games) are a social activity. Game-playing skills must therefore subsume some social skills—such as the ability to cooperate, communicate, and (perhaps) negotiate.

Many games require the skill of roleplaying, a form of "make-believe." Roleplaying is an ability to take on, and act in accordance with, one or many alternative contrafactual identities under imaginary conditions. "I am not a real estate developer, but the game Monopoly allows me to take on this role. I am not a detective, but the game Clue requires me to play this role. I am not Hannibal, or Napoleon, or Yamamoto, but a wargame may put me in their places."

Game playing is an act of imagination. Game design is an act of meta-imagination: the creation of an alternate reality for others to enter, inhabit, and transform through their actions.

As we stated above, all games are rules-based activities. The rules of wargames, as a special sub-class of games, generally focus on representing the classic command cycle of Observe–Orient–Decide–Act, or the OODA Loop.

Many wargames present a highly visual environment, so observation skills may be highly visual: scanning the battlespace in a systematic or insightful way to detect opportunities, vulnerabilities or gaps. In a seminar-style game, with limited visual content, observation skills may require awareness of the verbal and nonverbal behavior of others (including other participants and any audience).

Orientation skills must address and integrate at least three different things: one's own situation, the enemy situation, and the battlespace (terrain, environment, time, and space).

Wargames involve decision-making under uncertainty. The gamer is continuously (and often unconsciously) evaluating the risks and payoffs of alternative courses of action. The evaluation process depends critically on how well the player has observed and oriented

his decisions to the real situation confronting him. Explicitly or not, gamers tend to think probabilistically. This is most evident in games that use random mechanics (dice, card shuffles, pseudo-random algorithms). In all cases, however, the player must arrange the alternative courses of action according to their probable outcomes and the values he associates with each.

At their heart, of course, wargames involve conflict in pursuit of objectives. The wargamer must be able to visualize goals, formulate courses of action that lead toward the goals, revise these courses of action in response to unfolding events (particularly enemy actions), implement these actions in accordance with game rules, and recognize when goals have been attained ("quit while you're ahead").

The wargame designer's job is to weave this complex tapestry of information, decisions, and the dynamics of resolution into a believable world for the player to operate in. Only by experiencing the ways that players perceive their artificial world and learn how to act within it can the designer begin to understand the basis for creating such a world.

Building new scenarios

As described in the earlier section that details our skills-based analysis, a good starting place for fledgling wargame designers to begin is to modify an existing game system to reflect their own interests and viewpoints. We created the WCK specifically to provide the basis for that sort of effort. The WCK proper comprises a set of rules and procedures—the natural laws, as it were—of the wargame's universe. To set those laws in motion, the game designer must create a setting, or a scenario, and apply the rules to it.

Along with the basic WCK, we have provided a single scenario as an example of how to carry out this procedure. This scenario is included in the appendix along with the WCK rules.

Throughout the rules themselves, we have interspersed a series of design notes. These notes explain some of the rationale behind various key rules sections. They also describe how a novice designer may apply the concepts behind these rules to help guide the development

of new scenarios based on them. Particularly important in this regard is the discussion of representing time-distance factors through terrain and movement, and the description of how to create playing pieces to represent combat forces.

As a practical introduction to game design, we think that the creation of new scenarios, particularly those that require new maps and new playing pieces, is the best approach. Design is the application of creative effort to the solution of practical problems. Good design aims to create solutions that are functional, pleasing, economical, simple, seamless, and elegant. There are at least two distinct sets of design skills that are relevant to wargames built from the WCK. The rules systems require process design. The physical systems require information design.

Process design involves the selection, visualization, representation, and modeling of key aspects of war, such as maneuver, combat, logistics, and command and control. Process design may be expressed in written rule sets, in software, or in other ways.

Information design involves the display and manipulation of key elements of information, such as force positions, force status, and lines of communication. Information design is usually expressed through the use of type, colors, geometry, and symbols to represent forces, battlespace, and game processes. The information so encoded then becomes available to the players through screen displays, seminar handouts, or physical components such as miniatures or counters.

By building on the basis of both the process- and information-design elements provided in the WCK and the sample scenario, a novice designer can focus attention on basic skills. The designer may create new scenarios that can depend heavily on the existing process design. The designer can also use the existing templates and guidelines to ease the task of information design.

Changing the game system

Once a novice wargame designer has acquired experience at playing games and developing new scenarios using existing systems, the lure

of making more substantive changes to the basic game system becomes stronger.

By the very nature of this process, creativity becomes more and more important. Thus, it is difficult to predict where any individual designer may find potential changes in the existing system. Once again, we created the WCK in a manner that we hope will facilitate the development of new ideas and new ways of implementing them.

The chance that a novice designer will continue on to the intermediate level of game-creation skill increases dramatically if he takes time to "build a little, test a little"—followed by "test a lot!" There is no good substitute for testing new ideas repeatedly, refining them, and sharpening them until they capture the essence of the designer's vision in elegant and effective ways—ways that players can adapt to quickly and intuitively.

Future research

Our efforts in this current study have taken a form readily characterized as a proof of concept. The major components of the effort were:

- A preliminary skills-based analysis of the tasks associated with wargame creation and how the NWC's elective course teaches the skills associated with those tasks
- The initial design of a paper-based wargame construction kit for use as a training element for the NWC's course.

Each of these topics can be the basis of more extensive research and analysis. In addition, we conclude the paper with some speculation as to the possible contributions of applying a concept known as the "capability maturity model" to the subject matter of wargame creation.

Expanding the skills-based methodology

CNA has previously developed an analytical approach to using mission skills as a basis for assessing training programs. We applied a simplified version of that methodology to the "mission" of creating wargames. This approach has been consistent with the attitude that wargaming as a discipline is more of an art than a science. Such an attitude is often reflected in the contradictory beliefs that "anyone can design a wargame" or that only a very select type of person, based on background and innate talent, can create wargames successfully.

None of the sources we drew on for this study probed much below the surface of these beliefs. In many ways, Dunnigan's *Complete Wargames Handbook* reflects the first attitude. Wargame design is a process. Follow the rules and you, too, can produce a wargame that "works," whatever that might mean. To the extent that it addresses the issue, Perla's *The Art of Wargaming* seems to reflect the second attitude. Creating wargames is an art form that only a few select practitioners

can master to a level that makes their work even marginally acceptable.

But since those books were written, gaming of all types has become far more commonplace. Computer games were in their infancy in 1990, the date that *The Art of Wargaming* was first published. In the succeeding decade, new ideas and new applications of "wargaming" have been percolating beyond the confines of DoD. A deeper and more thorough exploration of the conceptual, theoretical, cognitive, and epistemological bases for gaming—and its potential to provide new modes of thinking about problems—is overdue. A more thorough application of the skills-based methodology is a potentially useful step in advancing this research.

Computerizing the WCK

From theory, let's move to practice. The Wargame Construction Kit is another idea that we have demonstrated in this study, not really completed. It is an example of the very processes of wargame creation that we created it to explore. It is, in reality, a work in progress. As the previous section discussed, the WCK is only a starting point for discussion and adaptation.

As a tabletop, paper game, it has all the advantages and disadvantages of its genre. Nothing is hidden. Players can see how the game is constructed and how the models work. They can easily understand the processes, even if they do not always agree with the rationales. This makes it easy for them to change things, to add or subtract their own ideas—in other words, to practice the introductory and intermediate levels of wargame-creation skills.

The disadvantages of the paper game restrict some of the other potential uses of the WCK. Primary among these restrictions is the awkwardness involved in playing the game with distributed participants.

As part of this study, we conducted a preliminary evaluation of the level of effort required to develop and extend the WCK's system to a web-based game system. We examined commercial-off-the-shelf

authoring software to assess the requirements for creating a version of the WCK capable of supporting internet-based play of games developed with that system.

The commercial software we examined was the Macromedia suite of Director, Shockwave, and Flash. This suite of applications appears to have the full capability we would need to implement an internet version of the WCK with full interactivity and automatic processing of game functions.

Macromedia Director Shockwave Studio 8.5 using Multi-User Server 3.0 and Xtras will allow a user to build a real-time internet multiplayer game.

> ShockWave MultiUser Server 3.0 is the drag and drop solution for creating and running scalable, multi-user communities, multi-player games, and entertainment for Web content. The SWMS3 lets you enhance your site with crowd pleasing group interactivity and magnetic destination content in a matter of minutes…In fact, SWMS3 content can be a key facet in any application… where community is the key to a better, more engaging user-experience.[18]

Shockwave incorporates multi-threading, which means that if one users is downloading information, other users do not have to wait until the downloads is finished before they can do something. Similarly, execution of different game scripts can occur simultaneously.

All components of the Director-based solution (client, authoring, server) are cross-platform. In addition, on the server side, the system supports Windows 95, Windows NT, and Macintosh PPC servers.

The Director application can create stand-alone executable applications. The Windows version of Director creates files executable on the computer running Windows. The Macintosh version of Director creates files executable for Macintosh computers. Cross-platform delivery of executable files requires using both Director for Windows and Director for Macintosh.

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18. According to *Shockwave Multiuser Server 3 White Paper*, available at the site http://www.macromedia.com/software/director/multiuser/whitepaper/

There are no run-time fees required to create and use software developed with this package. Developers must simply complete and abide by the Run-time Distribution Agreement. The most obvious element of this agreement is that the software developed with the Director suite must indicate its origins explicitly in the packaging and the software.

Director and Shockwave both are designed to use supplementary programs called Xtras. An Xtra is a program designed to implement specific capabilities within the Macromedia suite. Xtras are usually created by third-party software companies. They provide a Director-based application with special built-in functionality, such as the ability to play back Flash movies within a Director movie without requiring the user to have a Flash plug-in. There are hundreds of Xtra's for Director that allow the user to implement a wide variety of features. The one drawback to employing Xtras is that each one used must be packaged with the final product. This is usually not a problem for software delivered on CD-ROMs, but the capability must be used with care when the software is designed for web-based delivery. The use of large numbers of Xtras could expand the file size beyond the effective bandwidth for web-based applications.

Perhaps the most important requirement for wargame play is the ability to integrate the game application with database structures that embody the various parameters and variables associated with the game. Director does not integrate with database applications without the use of third-party Xtras. Several companies have developed possibly Xtras for Director's ShockWave MultiUser Server 3.0 that might facilitate the creation of an on-line version of the WCK or similar wargames.

- *Datagrip & Datagrip Net* (Sight and Sound Software, Inc.) allows Director and Authorware to communicate with Access databases.
- *EasyBase* (Klaus Kobald Software Design) is a fast and easy-to-use database engine for Director.

- *FileFlex 3 Database Engine* (FileFlex Software, Inc.) claims to be the fastest, most powerful, most compatible embedded relational-database engine for multimedia and the internet.
- *MUSTARD Xtra* (Smart Pants Media, Inc.) allows connection to any external database via the multi-user server.
- *Valentina* (Paradigma Software) is an SQL capable, multi-platform, cross-developer to object-relational database back-end for Director projects.

Unfortunately, as with all software, power comes at the price of complexity. As advancements are made to the program, Macromedia's Director, Flash, Shockwave, and MultiUser Server will provide even greater capability. The expert user will be able to create and implement complex scripting actions faster and easier than before. But the design of highly intricate systems, though more feasible, will become more complicated at the same time. New advances continue to emerge to give game developers more powerful tools, but with each new feature more complexities develop in implementation of the entire package.

We are confident that an expert in the Macromedia suite can develop software to accomplish the desired goal. But the process is more akin to a full-scale software development effort than to PowerPoint engineering. The effort would take several dedicated, knowledgeable designers and programmers to develop the package. This is by no means a quick, easy, fast-turnaround project. At best it would take months to take an already existing game such as the WCK and turn it into an interactive, on-line board wargame. And the cost will be commensurate with the expertise and effort required.

The bulk of the development effort as we envision it, would revolve in this case around using the computer to perform the assessment and adjudication functions that the players themselves carry out in the paper version of the game (for example, resolving the movement and combat of opposing forces). A less sophisticated approach could continue to rely on the players—or on a non-player referee or game controller—to carry out those functions. In that case, the players would only require a means to designate their actions and communicate

them to their opponents and the controller. The latter would then adjudicate the results, adjust the situation on the electronic "game board," and send the resulting situation back to the players.

A much simpler and less expensive software package already exists to provide such a limited capability to hobby board wargamers. This package, Aide de Camp, by HPS Simulations, provides users with some simplified graphical routines to allow them to design (or import) game boards, playing pieces, cards, or other standard board-game components. Players use a simple point-and-click procedure to select pieces to move. Designating combat situations requires the same actions as in a boardgame, but a random-number generator allows the player to "roll the dice" and record the results to pass back to the opponent. Each player takes his turn as in the play of a board-game, generates results, and then sends the updated state of the game to the opponent (or controller) via e-mail.

Although it does not provide the immediacy of truly interactive on-line play, Aide de Camp has been in popular use for several years. Similar software packages in shareware implementations also exist. Although a compromise, such a hybrid approach might provide at the very least an interim capability to employ the WCK to play games with distributed players. It is also possible that a combination of Aide de Camp's player/controller-driven adjudication system with Macro-media's interactive game server could speed the communication pathways to allow something closer to real-time game updates. Such an approach may well be worth exploring as an interim solution before investing the much higher level of resources required to produce the truly interactive web-based system.

A wargaming capability maturity model?

Finally, we conclude the paper with a brief discussion of the possibility of developing a capability maturity model (CMM) for creating wargames. The idea of a capability maturity model originated with the Software Engineering Institute in 1991.[19] One of the principal goals for creating such a model was to provide organizations involved in the software development process "with more effective guidance for

establishing process improvement programs."[20] The approach pioneered in the software industry has been expanded to other subject matter.

To explain why we think there may be some value in investigating the application of the CMM idea to the process of wargame creation, read the following. It is a direct quote from the CMM technical report cited in the footnotes, but with some minor changes. Everywhere you see Italic text in the quote, we have replaced the word "software" in the original text with the italicized word or words.

> After two decades of unfulfilled promises about productivity and quality gains from applying new *wargaming* methodologies and technologies, industry and government organizations are realizing that their fundamental problem is the inability to manage the *wargaming* process. The benefits of better methods and tools cannot be realized in the maelstrom of an undisciplined, chaotic project. In many organizations, projects are often excessively late and double the planned budget. In such instances, the organization frequently is not providing the infrastructure and support necessary to help projects avoid these problems.
>
> Even in undisciplined organizations, however, some individual *wargaming* projects produce excellent results. When such projects succeed, it is generally through the heroic efforts of a dedicated team, rather than through repeating the proven methods of an organization with a mature *wargame-creation* process. In the absence of an organization-wide *wargame-creation* process, repeating results depends entirely on having the same individuals available for the next project. Success that rests solely on the availability of specific individuals provides no basis for long-term productivity and quality improvement throughout an organization. Continuous improvement can occur only through focused and sus-

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19. For a complete exposition of the idea of a capabilities maturity model and its origins in the software industry, see *Capability Maturity Model*[SM] *for Software, Version 1.1*, by Mark C. Paulk, et al., Technical Report CMU / SEI-93-TR-024, ESC-TR-93-177, February 1993. All the discussion and quotations in this section are based on or taken from this paper. Hereafter, it will be cited as *CMM*.

20. *CMM*, p. vii.

> tained effort towards building a process infrastructure of effective *wargame* engineering and management practices.[21]

These words are readily applicable to many organizations that practice wargaming today. Individuals develop high levels of expertise in, and a solid reputation for, creating successful wargames but then move on to other tasks. Organizations discover, that no matter what level of individual skills their staff develops, it is difficult to leverage those individual skills into organizational capabilities. It is even more difficult to develop a process to improve organizational capabilities when those capabilities are non-existent or not well understood.

We have not been able to pursue the idea of a CMM for wargame creation during this study. But our analysis of individual skill and learning indicates that a similar effort at the organizational level, based on the CMM approach or some other framework, may provide useful insights, especially to an organization such as the NWC's Wargaming Department.

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21. Taken from *CMM,* p. 1. Where the word *software* appeared in the original, it has been replaced by the italicized words above (for example, *wargame).* Two citations in the original text have been removed because they are not relevant to the pastiche presented here.

Appendix: The Wargame Construction Kit

This appendix contains all the components of the WCK:

- The basic rules defining the general system.
- The specific scenario rules relating to the example game, *Morning Calm*, dealing with a fictional war in Korea.
- Charts, and tables associated with the basic rules and the specific rules.
- Images of the map and game pieces necessary to play the *Morning Calm* game.

We have formatted the rules to allow the reader to distinguish between the rules proper and the design notes that discuss some of the choices we made during the creation of the WCK and some suggestions for how to implement a game design based on the system.

The WCK was designed by Michael Markowitz, and developed by Christopher Weuve and Peter Perla. Leesa Woodard created the layout for the components. Arius Kaufmann provided assistance and moral support during the final days of development and production.

Wargame Construction Kit: Basic Rule Set

Table of Contents

1.0 Introduction

1.1 Scope. The ***Wargame Construction Kit (WCK)*** is an operational-level game system, adaptable to a notional or actual geographic theater of operations. The WCK is a flexible and consistent set of mechanics for wargaming contemporary and near-term (out to ~2015) conflicts, with emphasis on representing joint command and control. Specific scenarios or games may be developed using these rules as a basis. Players—or teams—typically take the role of national command, or theater, army, fleet or air force commanders, depending on the scenario. Land units represent divisions, brigades and some specialized regiments (or battalions). Naval units represent individual submarines, carrier battle groups, and task forces or flotillas of smaller vessels. Air units represent sorties generated by a group, wing or squadron, which are generally based "off-board" for simplicity (unless the scenario designer needs to represent airbases).

1.2 Purpose. First, as the name implies, the Wargame Construction Kit is a tool for constructing wargames. Second, and perhaps more importantly, it's an *example* of how wargames are constructed. To that end, the designers of the WCK have incorporated extensive design notes into the rules. These notes, discuss the various tradeoffs made during the game development process, how the various parts of the design affect each

Design notes: Time and distance scales

Why choose one day rather than a week or a month as the time step? Modern wars tend to be either high-intensity events measured in days ("Six Day War," "100-hour War"), or protracted low-intensity conflicts measured in years or even decades (Vietnam, Angolan Civil War, Colombian Drug War). For this reason, we decided that the default standard of day-long turns would be short enough to allow the examination of issues such as command and control, yet long enough that the players could fight a conflict to a reasonable conclusion.

How do you decide the size and shape of an "area?" There are a lot of factors that can go into that decision. If you are designing a game in which a detailed representation of ground combat is one of the primary issues, then terrain becomes one of the primary determinants of the size and shape of areas. Thus, valleys can be long areas, where

other (every decision has at least the potential to affect every other decision), and give insight to those using the kit to design their own games. To avoid verbal gymnastics, these system rules will describe game components and concepts according to a "default" view of how a scenario may be defined and constructed. .Designers may not always choose to follow these guidelines.

1.3 Player terminology.

1.3.1 The *phasing player* is the player who is currently executing action. The other player is the *non-phasing player*.

1.3.2 *Friendly* units are units which belong to a particular player. *Un-friendly* units belong to the opponent.

1.4 Scale. A game turn is notionally one day of real time. Map scale is abstract or variable. You can generally think of an area as roughly a county or a province. Sea areas typically represent several hours' steaming at 6-12 kt. Scenario designers may want to distinguish between Littoral sea areas ("brown water") and Open Ocean ("blue water"), if that distinction enhances play.

1.5 Note on Areas: The "system default" is area movement, but the map designer an substitute "hexagon" or "grid square" for "area" with no fundamental changes in other game systems.

Design notes: Time and distance scales (Cont.)

movement is easy, while the surrounding mountain areas can be small areas, where movement is difficult.

If, on the other hand, the game has a heavy focus on the political elements of a country, then political boundaries may be a more important consideration. Or the political jurisdictions can be set off from each other by grouping terrain-determined areas by color. Indeed, many historical boundaries became political boundaries because of geographic reasons—it's as far as the local hegemon could extend its power, or it was a salient geographical point, like a mountain range or river.

In general, a well-designed game map will have areas that are not so large as to make movement impossible or difficult, while not have so many as to make movement trivial. If your game bogs down because you can't move very many areas per turn, or it is too fluid because units can move from one end of the board to the other in a single turn, then you may want to reconsider the size of the areas, the timescale of the turns, or both.

2.0 Game Components

2.1 General. In addition to these system rules, a complete game based on this WCK will normally include a scenario description and special rules, a map divided into land and sea areas, a set of double-sided cardboard counters and markers, and some 6-sided and 10-sided dice. Sets of charts and tables summarizing key aspects of play and procedures are frequently useful additions to the package. In addition, reduced versions of the map may allow players to record their plans and actions, and so can facilitate after-action discussion.

2.2 The Map. The game map represents significant military geography in the theater of operations.

2.2.1 Areas. The map is divided into land and sea areas, which regulate the placement and movement of units.

2.2.2 Terrain and Features. Colors and symbols represent different kinds of terrain, or man-made features, which affect movement and combat. These are explained in the scenario's Terrain Effects chart.

Sample Terrain:

Clear

Mountains

Rough

Desert

Sample Features:

Rivers

Topographical points

Roads

Cities and Towns

Military Objectives

2.2.3 Some units may be based "off the map" or may arrive in-theater after the start of play. When in play off the map, they will usually be located in "holding boxes" that define their current tasking.

2.3 Counters and Markers. Cardboard counters represent Red and Blue land, naval, air and command units. These counters may have information regarding the unit's size, identity, and capabilities printed on them. A scenario may also include noncombatant counters representing refugees, POWs or target entities (such as an enemy leader). Most scenarios use markers to indicate unit condition (out of supply, fatigued, etc.) or area status (demolished, contaminated, mined, etc.). Some counters may have printing on both sides, with the printing on the reverse indicating a reduced state of capability. Counters can come in different sizes and shapes, to speed setup.

Design Note: Terrain

Some wargames have many different types of terrain—others have only a few. Determining what types of terrain ar appropriate for a particular wargame depends, obviously, on the setting of the game.

How to represent terrain effects in a wargame may not be so obvious. In many commercial wargames, it's in the form of a "movement point cost" that is paid upon entering the area affected. Each unit is assigned a number of "movement points," which are expended as one moves through different terrain features. For instance, it might be that a clear hex or area costs 1 MP, while a broken or rough hex costs 2 MPs. Since different units might have different movement costs for a particular type of terrain, the cost is often expressed as a difference from a baseline: if clear is 1 MP, then broken might be +1, for a total of 2. Thus, you can differentiate between various mobility types (foot, tracked, wheeled) and various terrain types.

In the commercial sphere, some games require the units to pay a cost upon entering the area, some upon leaving. Some attach the cost to the area itself, some to the area border, or hexside (in games with hexes). That sounds like a gratuitous difference, but it's often done to keep things consistent in games where areas might have multiple terrain types.

Terrain types also can affect combat. It's not unusual to see rules that state that "armored units have their combat powered halved in Mountain terrain," or "defender's combat value is doubled if the attacker is trying to move across a river."

Sometimes a particular terrain feature causes its effect by forcing the unit into a particular state. For instance, it's not unusual to find a rule that says "movement point costs are halved on roads, if the player chooses to use Road Movement." It's also not unusual to see "if a unit is using Road Movement, it's combat strength is halved," because a unit moving in column formation on a road is not deployed in a combat formation.

All of these mechanisms express the idea that all types of terrain are not created equal. Oftentimes the exact mechanism chosen is more a matter of personal idiosyncracy than detailed analysis. Choose whatever mechanism best captures the feel of the terrain, and that is most consistent with the rest of the game.

2.4 Attributes of Units

2.4.1 Movement. Most units are capable of moving from area to area. If there is a limit to how many areas a unit can be moved, it might be indicated on the counter or in the scenario special rules.

2.4.2 Combat Rating. Units are rated according to their combat strength. The higher the number, the greater the combat strength.

2.4.3 Quality. Units are rated according to their quality, from A (high quality) through D (low quality). A unit's quality affects its performance, primarily in combat.

2.4.4 Range. Some units (e.g., surface-to-surface missiles) have a range printed on them. The range is the maximum number of areas through which the missile may travel.

2.4.5 Stealth. Units designated by a triangle are covert or "stealthy." They may not be attacked unless they are first Detected (see Section 6: Detection) and they may ignore ALL adverse results when they attack in normal combat. (These special effects will be described in the scenario rules.)

2.4.6 Unit Step Reduction. A Unit may consist of up to three steps, which

Design Note: Counters

When designing counters, keep the following points in mind:

The counters should be easy to read while laying on the board.

The counters should be physically easy to manipulate.

The physical size of the counters and the physical size of the map are related.

The counters should fit comfortably on the map.

The counters should be easy to use during play. For instance, if each counter requires three different state markers on it, you might consider recording some of the state information on the counter itself, and flipping the counter over to show a change in values.

The counters should be easy to produce.

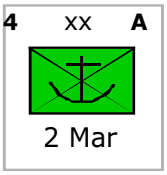
Ideally, the details of the counters can also be used to facilitate set-up. For instance, you might make all of the ground units a shade of green, with units that are reinforcements a lighter shade, so that they stand out. Or you might use size and shape to differentiate units by function — for instance, large squares for air units, medium squares for regular ground units, small squares for special forces, and rectangles for naval forces.

represent increasing degrees of damage, disruption and loss of cohesion. Lost steps may be reconstituted (see Section 11: Reconstitution.) When a unit suffers step loss as a result of combat it is flipped onto its backside, which has a white horizontal stripe and reduced unit values. If the unit has three steps and is already on it's reverse side (which will indicate the existence of a third step), a "hit" marker is placed on it. If the unit has no more steps, then it is eliminated—see section **10: Combat** for details.

Example: The Blue 1st Armored Division has three steps with strengths of 6, 4 and 2 respectively.

2.5 Sample Counters

2.5.1 Sample Land Unit. The counter below represents the Blue 2nd Marine Division, with a strength rating of 4, and a quality rating of A.



2.5.2 Sample Naval Unit. The counter below represents the USN CV 63 aircraft carrier and minimal escort of destroyers, with a strength rating of 4, and a quality rating of B.

Design Note: Why list Missile Range in terms of areas?

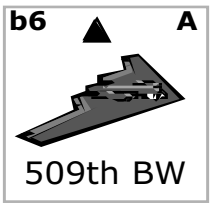
Obviously, an "area" is sort of a nebulous measurement of missile performance. We used it for the following reasons.

First, missile ranges aren't absolute- — different sources list different ranges. We wanted to stay out of that argument.
Second, we didn't want to introduce a second movement system on top of the area movement.

Finally, missiles aren't the primary focus of this game. We felt we could live with a little ambiguity.

Of course, if we were designing a game about Tactical Ballistic Missile Defense, then we would have treated the subject a little differently. The right answer in one type of game isn't necessarily the right answer in other types of games.

2.5.3 Sample Air Unit. The counter below represents the US 509th Bombardment Wing with a strength rating of 6, and a quality rating of A. The lowercase letter "b" indicates a bomber that can conduct strike or (under special conditions described in scenario rules) close air support (CAS) missions. Other air units include multirole fighters (f), good for all air missions, attack aircraft ("a") that can only conduct CAS, and interceptors ("i") that can only perform counter-air (CA) missions. Scenario designers should feel free to define additional aircraft types and missions as required.



2.5.4 Sample Command Units. The counter below represents off-board command & control node that affects many game functions. The Blue Eighth Army command unit has a C2 level of 4 (indicated by the 4 diamonds) at full capability (front side), and a C2 level of 3 at degraded capability (back side). Similarly, Command & Control capabilities are explained in Section 5 of these rules.

2.6 Sample Markers

2.6.1 Detected Markers. Detected markers are placed on enemy stacks that are not collocated with friendly units and that are detected, to mark their detected status. See section 6**: Detection**, for details.

2.7 Player Aids.

We have included various displays to help players organize their force, and present other useful information.

2.8 Dice.

The system usually employs both six-sided and ten-sided dice. One a ten-sided die, the "0" is read as a "10."

Design Note: Player Aids

Player aids can make or break a game. A player's perception of the difficulty of a game is sometimes directly related to the number and usefulness of the play aids.

Types of player aids include flow charts (especially useful for walking players through difficult combat procedures), charts and tables, small planning maps, mnemonics, and production and victory point tracks.

3.0 Set Up and Play

3.1 Players. In a two-player game Players simply choose sides. In a multiplayer game, each player takes a role represented by a Command unit, such as Theater, Land, Naval or Air commander.

3.2 Units. Units are placed on the map according to Scenario instructions, either in specific locations or at the owning player's option. All units are initially Undetected. Land units may only be placed in Land areas. Naval Units may only be placed in Sea or Port areas. Air Units and Command Units are placed face up off the map.

3.3 Victory conditions. Victory conditions are specified in the Scenario instructions. In general, a side's level of victory will depend on control of objective areas and the level of losses suffered by both sides. Victory is determined at the end of the last turn, or when an event triggers game termination.

3.4 Area Control. A land area is controlled by the player that has a Land unit in the area, or who was the last to occupy the area. If opposing Land units are present, neither side has control. A player controls an Ocean area if that player has one or more uncontested Naval units present. A Dummy unit cannot control a sea area. Air units cannot control any area.

3.5 Break Points. Scenario instructions may specify Break Points for both sides or for specific Commands. A break point is a percentage of losses that will cause the affected side or Command to disintegrate or lose the will to continue the conflict. **Example**: The Red Army begins the game with a total of 67 strength points. The Red Army's Break Point is 30%. When accumulated losses reach 21 points, all remaining Red Army units are removed from the map, and Red Army Command units cease to function. The Red Navy and Air Force (if they are separate Commands in this scenario) are not affected.

3.6 Turn Sequence

3.6.1 General. A game consists of a variable number of Turns divided in Phases in which players move, conduct combat and perform other actions. Phases may be subdivided into a number of steps. Scenario designers should feel free to modify the suggested sequence for one or both sides in order to represent desired capabilities, constraints or effects. For example, some phases may be skipped on the first turn, to model the effect of surprise.

3.6.2 Sequence of Play. Play proceeds through the following phases. Some phases involve simultaneous action (so noted), whereas others involve sequential action by the players. (Note that scenario rules will frequently modify the sequence of play.)

Air Allocation Phase
- Blue Air Allocation
- Red Air Allocation

Operations Phase
- Red Operations
- Blue Operations

Reconstitution Phase (Simultaneous)
- Remove detection counters from eligible stacks
- Reorganize stacks in the same area
- Reconstitute Units
- Determine if Victory Conditions are met
- Receive Reinforcements
- Reset Command Point Tracks

3.6.3 Game Turn Indication. Advance the game turn Marker one space on the game turn track. At the end of the last game turn, evaluate the outcome, as specified in the scenario instructions.

Design Notes: Sequence of Play

The Sequence of Play is one of the trickier—and more important—elements of elegant game design. You can capture subtle and important elements of the model by relatively simple variations in the order of events.

Early commercial board wargames relied exclusively on an "I-Go-then-You-Go" alternating move system (often called "Igo-Ugo"), where players would alternate performing all of their functions (either Move-then-Shoot or Shoot-then-Move) before play moved on to the other player. Later games added other elements, such as phases where both players performed a specific function (e.g., movement), then both players performed the next function (combat), etc.. Then designers really began to get fancy, adding things such as Exploitation Movement for armored units (a second movement phase which allowed armored units to take advantage of their success in the combat phase), asynchornous movement (sometimes implemented through a "chit-pull" system, in which a randome draw of chist from a cup would determine who would move the next unit.

Two such systems in particular deserve mention. First, some games have used an asymmetric sequence of play, where one side's order and type of phases doesn't match the others. For instance, there was a game in the 1970s about a hypothetical Sino-Soviet war in the Far East. The designer represented the superior Soviet mobility and command and control capabilities by giving the Soviet player TWO movement phases per turn, one on either side of the Chinese phase. (Note that this also means that the soviet player got two movement phases in a row — the last phase of turn T, and the first phase of turn T+1.) Thus, the game modeled Soviet advantages, without having to add any explicit rules to do so.

A second sequence-of-play system worth mentioning is the variable sequence of play. Here is how it was implemented in one game: Each player was given 6-8 "Strategy Cards," each of which had two phases written on them, in a particular order. (Ex: MOVE then COMBAT, COMBAT then MOVE, COMBAT then COMBAT, PRODUCE then MOVE.) There were duplicates of some (but not all) of the cards, and the two different sets did not match exactly. Each player would start the turn by placing two cards face down on the table. Then each would roll a die, with the high roll determining who played first. The first player would then flip over his top card, and conduct the phases listed on that card in the order listed. Then the second player would do the same with his top card, the first player with his second card, etc.. This elegant system uses very simple phases and a very simple Igo-Ugo turn sequence which is easy to execute, but gives the players the ability to plan and execute reasonably sophisticated operations.

In this game, we've chosen to keep the sequence relatively simple, but we encourage any designer to feel free to throw out that simple sequence of play, and come up with your own. Keep in mind, though, that simple sequences of play are easier to execute.

4.0 Stacking.

4.1 Definition of stack. A "stack" of units refers to any number of units that are stacked on top of each other. A single unit is considered to be a 1-unit stack.

4.2 Stacking with other units. Units may stack with other units of the same type, i.e., ground units stack with ground units, Naval units stack with naval units, etc.. (Except that ***Submarines*** stack separately from surface Naval units.)

A stack of *air units* is defined as a group of Air units which from a single air-mission holding box which is moved as a group to a single area on the map.

4.3 Stacking order. When a stack is involved in combat, its owner must order the units of the stack into the order in which they must be attacked.

4.4 **Looking through stacks.** Players may always see the top unit of a stack. Players may only look through a stack of enemy units if that the stack has been detected.

Design Notes: Stacking Limits

Stacking limits represent the idea that while you can often cram many units into a given area, when deployed for combat each unit takes up a certain amount of space, and if there are too many units they will get in each other's way. Stacking limits appeared in the earliest commercial board wargames, were it was usually just a limit on the number of counters in an area. Later the limits got more sophisticated, and you began to see different limits in different kinds of terrain, limits based on strength points or size points of the units, limits based on whether the units were using road movement or not, etc..

Why have stacking limits at all, in a game with as large as the default scale in the WCK? Because in our mind, stacking represents more than just the physical ability of the units to fit in the area — it represents C2 and logisitical factors as well. It represents the ability of the road net to support the logistical requirements of the units. It represents the ability of the units to maintain cohesion and coordination in a given terrain. And it represents the ability of the units to fight according to their doctrine.

For what it's worth, we decided to treat stacking a little differently in the WCK than it is treated in most games. We decided to allow an unlimited number of stacks, but to limit the size of each stack and the number of stacks that can move or engage in combat. This is because we wanted to explore how we could make the C2 system interact with the terrain type, while avoiding ridiculously small unit densities in large areas. (Note that this only works because we have relatively large areas to physically fit many stacks of counters in.) As always, designers are encouraged to explore other ideas.

Remember, though: there is no reason why each player has to have the same stacking limits. In fact, giving different limits to each player is potentially a good way to simulate command and control issues.

4.5 Number of units per stack. The number of units that may be in each stack is determined by the number of *stacking points* of the unit and the terrain of the area.

4.5.1 Stacking points. Each unit has a number of stacking points equal to the size of the unit, as determined by it's NATO map symbol. Thus, a brigade (X) has a size of 1, a division (XX) has a size of two, and so on.

4.5.2 Air and Naval Stacking limits. There are no stacking limits for naval or air units.

4.5.3 Ground unit stacking. The default limit for ground unit stacking is 12 stacking points. Scenario designers should treat this as a variable, depending on the scale and scope of the game. Specific terrain types may impose different stacking limits, at the discretion of the scenario designer. For example, the stacking limit may be higher than 10 in cities and less than 10 in mountains.

4.5.4 Overstacking. Ground units may not move into an area in violation of the stacking limit. A stack of ground units may retreat into an area in violation of the stacking limit, but it must reorganize immediately into two or more stacks that meet the stacking limit. If this is not possible (for example, retreating into a city, which allows only a single stack) all units in an overstacked area suffer one level of degradation in quality. The penalty is canceled as soon as the overstack situation is corrected, either by movement or combat.

4.6 Number of stacks per area. There are no limits to the number of stacks that may occupy an area, except for cities. Only one stack from each side may occupy a city area.

4.7 Combining and Recombining stacks. Operations are conducted by stacks. The phasing player may not combine units from two or more stacks during the operations phase. If desired, the phasing player may select a subset of units from a single stack and designate them as a new stack to activate, leaving the remaining units from the original stack in the area they began the phase in. In addition, the phasing player MUST split up a stack in this fashion to meet the stacking requirements of a space he attempts to move a stack into. In this case, the excess units from the moving stack must remain in the area and can not enter the area with the stacking restriction. Otherwise, stack composition may only be changed intentionally during the Reconstitution Phase.

4.8 Movement restrictions. Movement restrictions that apply to an individual unit apply to the stack as a whole. You may not "drop off" some units of a stack and continue moving the others in order to avoid this problem, except in the case of violating stacking limits.

4.9 Effects of stacking

4.9.1 Movement. All units move according to stacks (including single-unit stacks) unless otherwise directed.

4.9.2 Combat—Attacking. When attacking, units that are in the same stack may combine their combat strengths to attack an individual enemy unit, according to the procedure discussed in section **10: Combat**.

4.9.3 Combat—Defending. When defending, units must be attacked in the order in the order defined by the defending player. This order is determined at the instant of combat and does not necessarily correspond to the stacking order of the units. This allows some units to "screen" or "escort" others.

4.10 Coalition Stacking. Units of different nationalities on the same side may be allies, partners or cobelligerents. Scenario rules will define the effect on stacking and operating together. Normally, the following rules apply.

4.10.1 Allies. Allies (example: NATO, US & ROK) are fully interoperable; they may stack together and combine strengths in attacks.

4.10.2 Partners. Partners (example: US & Taiwan or Israel) may stack together, but may not combine strengths in an attack.

4.10.3 Cobelligerents. Cobelligerents (example: US and Syria in the Gulf War) may not stack together in the same area, or conduct air operations in areas that contain cobelligerent naval or ground units.

4.10.4 Submarines. Submarines entering sea areas occupied by submarines or naval surface units of a cobelligerent may be detected and attacked — roll 1d10, and on a roll of 1 a "Blue on Blue" occurs, and the submarines must engage in combat as if they were on opposing sides.

5. Command & Control (C2)

Command and control (C2) is a fundamental game concept. Combat, movement, detection, and reconstitution are all affected by C2. C2 is generally exercised by off-board command units (sometimes also called headquarters or HQs), and consists of more than just the "usual" command and control functions. Command in this context refers to a whole variety of upper-echelon support functions, which are abstracted into a single command level.

5.1. Command Units. There are four different types of command units: Air, naval, ground, and joint. Air, naval, and ground command units may only affect units of that same type. Joint command units may affect units of any type.

5.2 Command units. Command Levels, and Command Points. Each command unit is rated with a number or a number of symbols, which define the command level of the unit. The command level is also the number of command points (CPs) the unit may spend each turn.

All Command units have a Command Level of between 1 and 4:
C1: Poor leadership, untrained staff, orders transmitted by courier or radio. Limited logistical support.
C2: Competent leadership and staff, encrypted voice and some data comms. Adequate logistical support.
C3: Good leaders and staffs, partly networked digital comms. Good logistical support.
C4: Excellent leaders and staff, fully networked advanced digital comms. Excellent logistical support.

5.3. Command Level and Command Point uses. Below is a summary of the types of actions that a Command unit may spend Command Points on. Unless otherwise specified, the cost to perform the action is one Command Point. See the referenced section for the details.

5.3.1 Controlling Units. For each of the C2 functions listed below, a unit will have a controlling command unit. The controlling command unit spends CPs to perform an enabling function on behalf of a unit.

A units controlling command unit is a command unit of the same type as the unit. For example, all of the air units may be controlled by an air command unit, but not by a ground command unit.

5.3.2 C2 and Detection. A command unit may spend CPs to conduct detection attempts. (See section 6**: Detection**.). Type-command units may only detect enemy stacks of similar type (e.g., ground commands may attempt to detect ground units, etc.), but joint command units may detect enemy stacks of any type.

5.3.3 C2 and Operations. A command unit may spend CPs to *activate* a friendly stack. An activated stack may move and attack. (Unactivated stacks may not move, and may only participate in combat when attacked during the enemy player's turn.)

Type-command units may only activate units of that type, but Joint Command units may activate any stack of any type. (See section **7: Air Movement and Operation**s; section **8: Naval Movement and Operations**; and section **9: Ground Movement and Operations**.)

5.3.4 C2 and Combat. Command units affect combat in three ways. First, only activated stacks may attack. Second, the *Command Level* of the controlling unit determines the number of units *per stack* that may engage in an individual round of combat against a single enemy unit. Third, a Command Unit may spend Command Points to "buy" combat result shifts to eligible combats (attack or defense). For example, a Air or Joint Command could buy one or more shifts to a battle involving Air units. (See section **10: Combat**.)

5.3.5 C2 and Reconstitution. During the Reconstitution Phase, a joint, air or ground command may expend any of its remaining CPs to reconstitute damaged units of their type. One CP spent allows the player to reconstitute one step of an eligible unit. For example, a ground command could reconstitute ground steps, while a joint command could reconstitute air or ground steps in any combination. Note that Naval units normally cannot be reconstituted (See section **11:, Reconstitution**).

5.4 Recording CP usage. The Player Aid sheet includes a command point track used to record expenditures of CPs from each command unit during the game turn.

Design notes: Command and Control

Early on we decided that we wanted C2 to be an important function in this game. In addition, we wanted to model it explicitly (if somewhat abstractly), rather than simply roll it into the combat and movement rates, as most games handle it. In this game, C2 represents a number of factors: logistics support, higher level staff support, the utilization of theater and national assets, etc..

This implementation of command units is a good illustration of competition between two potentially useful ideas. Using specific units in your game is a good way to add flavor. Such flavor can make the game more fun, and it aids in player "buy in," by giving them something concrete on which they can orient themselves. The downside is that real units come bundled with real expectations as to capabilities, organization, and other factors.

6. Detection.

6.1 Becoming Detected. Stacks may be in one of two states: undetected or detected. Detected enemy stacks that are not collocated with friendly ground or naval units are marked with a detected marker.

6.2 Beginning Status. Stacks start the game undetected unless otherwise indicated in the scenario rules.

6.3 Detection Attempt timing. Detection attempts are made during the player's operations phase.

6.4. Becoming Detected. A stack becomes detected in one of two ways:

6.4.1 Detection by movement. When a stack enters an enemy occupied area, or when an enemy stack moves into its area Detection is automatic against stacks not composed entirely of Stealth units. Stacks that contain only Stealth units are only detected by a successful command unit detection attempt, as described below.

6.4.2 Detection by Detection Attempt. A stack may become detected as a result of a successful Command unit detection attempt.

6.5 Becoming Undetected. A detected stack becomes undetected if, during the reconstitution phase, no enemy unit is present in its area.

6.6. Command unit detection attempts. Command units may conduct detection attempts anywhere on the board against any eligible undetected stack. Eligible stacks are stacks of the same type as the detecting command unit. For example, naval commands may attempt to detect naval stacks but not ground stacks, joint commands may attempt to detect any stack.

For each command detection attempt, roll 1d6. The attempt is successful if the die roll is **less than or equal to** the command level of the attempting HQ.

Example: A level 3 naval command attempts to detect an enemy submarine stack. The die roll is 4. The submarine stacks remains undetected.

6.7. Submarines. Submarines cannot be detected by surface naval units. Other submarines may detect enemy submarine stacks of lower quality in the same open ocean area (not in littoral sea areas) in a manner similar to detection by movement. If opposing submarines occupy the same open-ocean area, a player may detect and mark any opposing submarines whose quality is lower than that of one of his submarines in the area. Submarines only detect enemy submarines of the same or higher quality if those submarines make an attack. After resolving such an attack, the attacking submarine is marked with a detection marker if any opposing submarine is present in the area.

7. Air Movement and Operations.

7.1 Description. In general, eligible Air units may move once per Turn in any operations phase to carry out an air mission. Air units must be activated by the expenditure of a command point. They move from an off-board holding box, to a specific area on the map in which they will conduct their mission. They do not have to move across the map; simply place them in the target space. Once an air unit completes its mission, it returns to the off-board unassigned holding area. Some Air Units may be able to conduct more than one Mission per turn, as specified in the scenario.

7.2 Air Unit Range. Aircraft range is unlimited.

7.3 Air Mission Allocation. At the beginning of an air phase, players assign their eligible air units to a mission by placing the unit in the holding box corresponding to one of the three possible missions: counter-air (CA), close air support (CAS) or strike.

7.3.1 Counter-Air. During ANY operations phase, units in the CA box may move to any area containing a detected enemy air unit, and attack it.

7.3.2 Close Air Support. Air units in the CAS box may move to any area in which a friendly ground or surface naval unit is involved in combat. Units flying CAS may add their strength to that of any friendly surface unit involved in such a combat.

7.3.3 Strike. Air units in the strike box may move to any area containing a detected enemy ground or surface naval unit and attack those units directly. Strikes may also be conducted against fixed targets (cities, facilities, airbases, C2 nodes, etc.) depending on the scenario.

7.4 Air Mission Execution.

7.4.1 Air unit stack movement. At any time during either operations phase, either player may declare an air mission. That player expends one CP from an eligible HQ, and may move one stack of air units from any one holding box to any area on the map. The maximum number of air units that may be in the stack is limited only by the number of units in the holding box from which the stack originates. All combat in the area that the stack enters must be resolved before any other air units (of either side) may be activated to move to a different area. Air units moving from distinct air mission holding boxes to a single target area count as multiple stacks, and Command Points must be spent to move each one.

7.4.2 Command Point cost. The cost to move a stack from an air mission holding box is one command point, spent from a friendly Air or Joint Command unit.

7.4.3 Reactive Air Missions. There is no limit to the number of air stacks players may commit to a single target area once the first stack enters it. Once a player declares an air mission in an area, both players may declare subsequent missions

to the same area. Each stack committed to the area should be placed on the air combat display according to its mission. Once both players decide to stop committing air units to the area, combat is resolved as described in section **10: Combat**.

7.4.4 Air-to-Air combat. Aircraft engaged air-to-air combat resolve that combat as described in section **10: Combat**. Once all air-to-air combat in a space is resolved, surviving aircraft may carry out strike and CAS missions.

7.4.5 Air units in Ground or Naval combat.
Surviving CAS and strike air stacks are added to ground or naval stacks for purposes of combat. They do not count against the limit on the number of units per stack that may engage in combat. See section **10: Combat**.

Design Notes: Air Units and Range

We've made an assumption here that should be made explicit. For relatively compact regions the abstraction of "unlimited aircraft range" is a reasonable simplifying assumption at the operational level. For a wider theater of operations, however, air mission radius becomes a serious constraint. Heavy bombers still have unlimited range. Medium range aircraft have a mission radius of 800-1000 nm. Short-range aircraft have a mission radius of 300-350 nm. Scenario rules will specify ranges for each type in terms of areas.

This is not to say, though, that aircraft range isn't an important issue. Indeed, given the limited number of tanking assets available to even a superpower like the US, it may be a very important issue. If another conflict were to take place at the same time as a Korean contingency, even the US might find itself short of the necessary tanking assets to fly all of the missions it would like to fly. This could be represented in game terms by establishing a range for the particular types of aircraft, and allowing only a limited number of aircraft to fly beyond that range. Or the designeer could go one step further, and actually add tanker assets to the game, and assign them to missions.

8. Naval Movement and Operations.

8.1. Description. All Naval movement is enabled through the spending of command points. Naval units may move up to five sea areas in one phase — this is variable with the game scale, but should be based on a day's normal average cruising speed. Naval surface units must stop and move no further if they enter a sea area containing enemy naval surface units. Submarine movement is not affected by the presence of enemy naval units.

8.2. Amphibious Movement. Marine ground units may be transported by Amphibious Naval units and disembarked on coastal areas. This takes the ground unit's full movement allowance; it may not move further in the current turn, but it may engage in combat. If an amphibious transport unit suffers step loss or elimination, the transported unit suffers the same result.

Design Notes: Movement (General)

When determining the movement rate of units in a game, there are several things to keep in mind. Some of these things involve how the model in the game relates to the real world, and some are solely to promote satisfying game play.

In the real world, Rates of Advance are usually much slower than a purely mechanical assessment of vehicle speed would indicate. This is for a number of reasons — people need to rest, top speed is rarely the most efficient speed, there are delays for resupply, etc.. Many wargames therefore have unit speeds that seem low, sometimes even ridiculously low. It's a delicate balancing act, but here's a few questions for you to ask that might help you in the process:

At the time and map scale of the game, what would a "normal" rate of advance be? Under what conditions (doctrinal as well as physical) would you be able to exceed that rate of advance? What would the implications be of doing so? Are those implications worth adding to the game, and if so, how might you do it?
For example, a ground unit might have a normal rate advance in a notional game of one area per day. At this speed, all of the vehicles would get the proper amount of maintenance, all of the logistical support would be able to keep up, etc.. BUT, you could move twice as far — two areas per day — but at a loss of efficiency. You could include this in the game with a rule that says that if you move at that "fast" rate, your unit quality goes down one level until you spend a turn at rest (no movement). If you move a second day at the fast rate, you go down ANOTHER level of quality, and need to spend two days at rest to return to efficient condition. Etc..

The above discussion focuses on effectively modeling the real world. What about making the play of the game satisfying? You don't want to have your units zipping around the board, able to reach any area in any given turn. (Air units are sort of an exception to this, because of their greater speed compared to Ground and Naval units. Oftentimes Air units are best represented abstractly, off the map.) But you also don't want your units to be crawling. (Of course, all of that depends on balancing timescale, map scale, combat mechanisms, etc..)

9. Ground Movement and Operations.

9.1. Description. During the operations phase, the phasing player may activates his stacks to conduct movement and attacks. Each stack is activated individually. The phasing player spends one CP from one of his command units to activate an eligible stack. The activated stack may move from one area to an adjacent area. If it enters an area containing an enemy unit, the moving stack must stop. Once a stack stops moving, it may attack enemy units in the space.

9.2. C2 and Movement. Command units affect movement in two ways, First, stacks of ground units must be activated by a ground or joint command unit. This costs one command point. The stack may then move. Second, an activated stack may move a number of areas equal to or less than the current C2 Level of the activating command. For example, an infantry brigade belonging to a Level 3 headquarters may move up to three areas. Stacks containing allied units of different countries may be moved by the appropriate command unit from either country. Airmobile units (indicated by a helicopter icon) may ignore many terrain effects on movement, as specified in the scenario rules.

9.3 Ground Movement and Enemy units. Ground stacks must stop when entering an area containing an enemy ground unit.

9.4 Ground Movement and Terrain. Ground stacks may move into any adjacent land area unless the destination is a terrain type forbidden to a unit of that stack. (For example, no units may enter impassable desert, and heavy armor units may not enter a marsh area.)

9.4. Extended Movement: Ground unit movement is normally limited to a number of areas per turn equal to the owning Command's C2 level. This can be increased in several ways. Some possibilities include the following.

9.4.1 Forced March. Any unit, *including units that are ineligible to move due to C2 limitations* may attempt to Force March one extra area. Roll 1d10 and consult the following table:

Unit Quality	Minimum Roll to Force March
A	8
B	6
C	4
D	2

On a die roll of 1, the unit suffers a step loss.

9.4.2 Rail Movement. The scenario may allow one or both players to use rail movement along railroads printed on the map. The number of units or total strength points that can move by rail, and any limitations (distance, interdiction and destruction of rails) will be specified.

9.4.3 Heavy Equipment Transporters (HETs): The scenario may provide one or both players with a limited number of HETs, which increase the movement of armored or mechanized units. An HET automatically unloads its passenger when it enters an area containing enemy units. An HET transporting a unit may be attacked by strike or CAS as if it were a 1-step, 1 strength, C quality unit. If the HET suffers a step loss the passenger is destroyed.

9.5. Naval and Air Transport Some Ground units may be able to use naval or air transport, in accordance with scenario rules.

10.0 Combat.

Combat takes place when opposing stacks occupy the same area.

10.1 Requirement for Combat. Combat may be mandatory or optional, for one or both players, depending on the scenario. The default is "mandatory" except for submarines.

10.2 Combat breakdown. Combat is broken into individual attacks, which pit a number of friendly units against a single enemy unit. Only units that are stacked together may combine factors for combat. Submarines may never combine their strength with other submarines or surface naval units in a single attack. Air units conducting CAS may add their strength to that of attacking ground units.

10.3 C2 and Combat. The number of units of a particular stack that may combine their strengths to attack a single enemy unit is the C2 level of the activating Command unit.

For example, Red air command has a current C2 level of 2. Up to 2 Red air units in the same area may combine their strengths in a single attack. The number of ground units that may combine their strengths in a single attack is the C2 level of the controlling command unit. For example, Blue has a stack consisting of a 6-A armored division, a 2-B cavalry regiment and a 2-A MEU(SOC). Blue's current land component command level is 3. All 3 units may combine in a single attack. If Blue's command level were degraded to 2, then only two units could combine in a single attack.

10.4 Setting up and resolving combat. An attacking stack must choose one defending stack in the area to attack. Each unit in that defending stack must have at least one attacking unit assigned to attack it before any units in a second stack may be attack. The defending player should take the units in the stack being attacked and arrange them in from left to right in the order he would like them to be attacked (thus you may try to protect high-value units). The attacker must allocate units to attack the defending units in that same order. No unit may be attacked unless all units to its left already have attacking units allocated to them. CAS units supporting an attack must be allocated along with surface units. They may NOT attack a defending unit independently (that's what the strike mission is for). Once the attacker has allocated all his units, any defending CAS are allocated to support defending surface units. After all combat associated with the action of the activated stack is resolved, the phasing player may activate another stack if he has command points remaining to do so.

10.5 Basic Procedure

10.5.1 Compute strength difference. Combat is based on the difference between the attacker's strength and the defender's strength, which may be modified by terrain, fortifications, or other factors. Subtract the defender's modified strength from the attacker's modified strength. The result may be zero, or it may be a positive or negative number.

10.5.2 Roll die and add modifiers. A 1d6 die roll is added to this difference to give a basic combat number (BCN), Again this number will be positive, negative, or zero.

10.5.3 Compute combat ratio and determine results. Divide the value of the BCN by the unmodified (printed) strength of the defending unit (DS). (Do not include any supporting CAS in this strength). Express this result as a ratio, BCN:DS. For example, if the BCN is -3 and the DS is 6, the ratio is -1:2. If the BCN is 6 and the DS is 3, the ratio is +2:1. If the BCN is 4 and the DS is 3, the BCN would be expressed as +1:1 (i.e. the ratio is greater than unity, but not great enough to reach the next step, which is +2:1.) If the BCN is 3 and the DS is 4, the ratio is still positive, but below unity ().75:1) and is expressed as +<1x. Ratios less than -4:1 are treated as -4:1. Ratios greater that 4:1 are treated as 4:1. If the BCN is exactly equal to the DS, then the ratio is "Equal" and the outcome will be "No Effect."

10.5.4 Determine results. Cross-reference the final ratio on the combat results table to find the initial result. This result may be adjusted by the effects of quality and command, as described below.

10.5.5 Effects of Quality Any differential in quality between the defender and the largest attacking unit (in terms of formation size, not strength) causes the combat result to shift up or down a number of rows equal to the differential. When multiple units of the same formation size but different quality are involved then use the highest quality rating.. A quality differential in favor of the attacker shifts the results downward on the table. A quality differential in favor of the defender shifts the result upward. For example, a Red 5-B armor corps and 4-C infantry corps attack a Blue 5-A infantry division. The attacker rolls a 1 on the die, giving a BCN of (9 +1) - 5 = 5. The BCN is thus equal to the defender's printed strength, producing a result of "No Effect." But Blue has a quality superiority of 1 over the Red armor corps, causing the result to shift up one level, to Attacker retreat.

10.5.6 Apply Command shifts. The players may next spend command points to apply further shifts to the results. Each command point a player expends from an eligible HQ shifts the results one level in his favor. The attacking player allocates his shifts first, then the defending player.

Note: The application of command points after the die roll may seem "unfair" to many wargamers. It represents the' use of logistics and other assets to influence the developing battle. Players will need to manage their command points carefully.

10.6. Combat Results. There are eleven possible combat results, as listed in the Combat results table. Explanations of these results are given below.

10.6.1 Retreat. All affected units must retreat out of the area. Units stacked with the affected units that did not participate in the attack are not affected. (Note that this is different from the way retreats typically work in tactical games.) Air units forced to retreat abort their mission and return to base. Special operations ground units forced to retreat may be "extracted" to a

base or Naval unit, depending on the scenario. **Note on retreats**: unlike in many tactical games, a unit is never eliminated if it must retreat into an enemy-occupied area, but it may be subject to another attack in the same phase. Units may only retreat to an enemy occupied area if they are unable to retreat to an area free of enemy units. Retreating units may not stack with any other friendly units in the are to which they retreat.

10.6.2 Step Loss. The attacker or defender loses a step from a participating unit. If there are multiple attacking units, the owning player chooses which one suffers the loss. (**Exception**: any participating helicopter units must suffer loss first). If the unit has more than one step remaining, the unit is flipped over (or, if it is already flipped and has a third step, a hit marker is placed on the unit). Steps lost in this way may be Reconstituted on a subsequent turn. If a unit has only one step remaining, it is removed from the board and placed in the "Permanently Eliminated Units" holding box. It may not be reconstituted.

10.6.3 Elimination. If a result is Elimination, all affected units are removed from the board and placed in the "Permanently Eliminated Units" holding box. Steps lost in this way are permanently destroyed and may not be Reconstituted on a subsequent turn.

10.7 Terrain Effects on Combat. Generally, effects of terrain add points to the strength of the defender in combat. Suggested values are: forest or rough: +1, jungle, mountain or swamp: +2, city or fortification: +3, rubble or tunnel complex: +4. Terrain may negate retreat combat results, and have specific benefits or penalties for certain unit types.

Ratio	Result	Meaning
-4x	AE	Attacker Eliminated
-3x	A3R	Attacker lose 3 steps and Retreat (see Terrain exceptions)
-2x	A2R	Attacker lose 2 steps and Retreat (see Terrain exceptions)
-1x	A1R	Attacker lose 1 step and Retreat (see Terrain exceptions)
-<1	AR	Attacker Retreat (see Terrain exceptions)
Equal	NEff	No Effect
+<1x	DR	Defender Retreat (see Terrain exceptions)
+1x	D1R	Defender lose 1 step and Retreat (see Terrain exceptions)
+2x	D2R	Defender loses 2 steps and Retreat (see Terrain exceptions)
+3x	D3R	Defender loses 3 steps and Retreat (see Terrain exceptions)
+4x	DE	Defender Eliminated

For example, attacking mountain units may ignore the +1 defender's bonus in rough, and may treat mountain terrain as if it were rough. Armored units attacked in forest areas by infantry gain no terrain benefit. CAS strength is halved in jungle.

10.8. Combat Examples

10.8.1 Simple Ground Combat Example: Blue 6-A attacks Red 4-C in clear terrain. The attacker rolls a 3. The BCN is 9 - 4 = 5. The ratio is +1:1. The result is D1R, defender lose one step and retreat. .The quality differential is two, so the result is shifted two levels to D3R. The Red unit is only a two-step unit so it is removed from play and may not be reconstituted.

10.8.2 Complex Ground Combat Example: Blue (command level 3) 5-B Inf Div, along with 3-A Avn Bde supported by a4-B CAS wing attack Red (command Level 2) 6-B Mech Corps in Mountain terrain (+2 to Defender). Strength difference is (5+3+4)-(6+2) = +4. The die roll is 2, for a basic combat number of 6. This equals the Defender's strength exactly, for a result of No Effect. The largest participating Blue units has a Quality advantage over Red, shifting the No Effect one level to DR. Blue decides to spend two CPs to shift the result to D2R. Red has only one CP available to commit to this combat, and he shifts the result back to D1R. The Red unit must suffer a step loss, but Red can ignore the retreat because mountain terrain **negates** retreat results.

10.8.3. Naval Combat Example: Blue 5-A CruDesGru and 5-A CV air group attack Red 4-C surface TF. Red's quality of C prevents the Red TF from firing its intrinsic SAM at the air group. Strength difference is +6, Blue's die roll is 5, for a combat number of 11. This is more than twice 4, but not quite three times as much, for a result of D2R. But Blue's quality advantage shifts the result two levels, to DE. Neither side has Command points to spend to alter this result, so the Red unit is permanently eliminated.

10.8.4. Air-to-Air Combat Example: Red spends one CP to launch a b3-B [Su-24] on Strike mission. Blue spends a command point to send an f4-A [F-15] on a CA mission to intercept. Red spends a second CP to send an i3-A [Mirage V] on a CA mission to protect the bomber from the Blue fighters. The Red interceptor engages the Blue fighter. Because Red launched the original mission, Red is the attacker. The die roll is 4, for a basic combat number of 3. This produces a ratio of +<1x, for a defender retreat. The Blue fighter returns to base (as does the Red interceptor) and the Red CAS may carry out its mission.

10.9. Suicidal/*In extremis* Attacks. [Optional] Scenario rules may permit one or both players to make "kamikaze" ground, naval or air attacks. The effect is to boost the quality rating of the attacking unit(s) by one or two levels. No unit can be boosted above "A." Regardless of the result, the attacking unit is permanently destroyed and no POWs are created.

10.10.Missile Attacks

10.10.1 SAM Combat and SAM Suppression. Fixed surface-to-air missile (SAM) sites are represented by double-sided counters (See below). Ground and naval units of A or B quality also have an "intrinsic" SAM capability. SAMs fire at enemy air units that enter their area (that's one of the reasons they are a high quality unit!). Each SAM-capable unit may only fire at one air unit.

SAMs make their attacks after all air units of both sides are committed to the fight in the target space., SAM attacks are resolved on the SAM table. Cross-index the Quality of the SAM to the Quality of the targeted Air Unit and roll 1d10 The die roll must be equal or less than the indicated number to hit. SAMs of higher quality inflict a step loss for each hit. SAMs of lower or equal quality force the air unit to abort its mission if they hit. Air units that suffer a step loss to SAMs have the option of aborting their mission or pressing on, possibly at the risk of further loss if there are additional SAMs that have not fired in the area. SAMs cannot attack undetected "Stealth" air units. Fixed SAMs are suppressed by air strikes, offensive EW, or TBM or cruise missile strikes on their area. Fixed SAMs may retreat with a friendly ground unit, but are permanently eliminated if they are alone in an enemy-occupied area. Suppressed SAMs cannot fire. Intrinsic SAMs are never suppressed.

A table entry of "no" means that the SAM cannot engage the target aircraft. "A"-quality SAMs (only) may engage cruise missile or TBM salvos as if they were targets of "A" or "B" quality.

	Target	Aircraft		
SAM	A	B	C	D
A	2	3	5	8
B	1	2	3	5
C	no	1	1	2
D	no	no	1	1

10.10.2 Cruise Missile, Tactical Ballistic Missile and Coast-Defense Missile Salvoes. Some missiles are represented by expendable counters "assigned" to specific units or fixed sites. A missile salvo has a range and a hit probability. Once a missile salvo is fired it is permanently lost, whether it hits or misses its target (unless the scenario specifically allows missile

Design Note:

"A" SAMs are Patriot, SA-10/20, Standard SM-3, etc. "B" SAMs represent I-Hawk, Crotale, SA-6, etc. "C" SAMs are mod SA-2/3, "D" SAMs are older, less capable SA-2/3 or equivalent. Scenario designers should feel free to use more detailed and accurate SAM probability and IADS effectiveness models where appropriate.

Design Notes: Combat

In some wargame designs, combat takes place at the edges of an area, when units attempt to move into an area from an adjacent area. In other designs, units move into an area and then engage in combat within the area. Both designs are equally valid — here's some things to keep in mind when deciding which to use:

- Which design you use affects your map. As a practical matter, the areas used must be physically large enough to contain all the units which might be in it. Most hex based games, as a result, use the "combat against adjacent areas" method, to keep hexsize small.

- This design decision ties into the placement of terrain features such as rivers. If attacking across a river incurs some sort of penalty to the attacking units, then it is often easiest and clearest for the players if such terrain features are put on the hexsides and attacks come from adjacent areas.

- The scale of the map affects which method "seems" better. (We say "seems" because either can probably be justified, but this is an issue of player psychology issue as much as anything.) If areas are small, then attacking from adjacent areas is probably more intuitive. If the areas are big (e.g., "the state of Iowa,"), then moving into the area before attacking is probably warranted. The question to ask is whether it makes more sense to think of the unit as being in a position to defend the entire area, or whether the unit is simply emplaced or roaming somewhere within the area.

- Optional combat may be a way for the scenario designer to implement alternative doctrines or rules of engagement. For example, guerrilla units and special forces may have the option of initiating or refusing combat in certain kinds of terrain.

If using a hex grid, the "grain" of the grid can affect strategy and tactics tremendously, because, combined with rules making an attack against an adjacent unit mandatory, it limits the directions from which an attack may take place.

11. Reconstitution.

11.1 Description. Ground and Air Units that have suffered step losses can be rebuilt during the Reconstitution phase. Naval units may not be rebuilt, except as specified in scenario instructions.

11.2 Cost of Reconstitution. It costs one Command Point to rebuild one step. The Command unit must be either of the same type or a Joint Command unit.

11.3 Limitations on Reconstitution

11.3.1 One Step Per Turn. Only one step loss per unit per turn can be rebuilt; a unit cannot remove two steps of damage in a single Reconstitution phase.

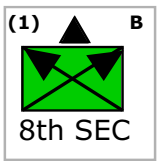
11.3.2 Eligible Units. Units that have been eliminated in combat are permanently destroyed; they cannot be rebuilt.

11.3.3 Enemy occupied areas. Ground units may not be rebuilt in an area containing enemy units. Scenario instructions may specify "base" areas where rebuilt Ground units enter the map.

12.0 Special Operations

Special Operations ("SpecOps") units represent small, elite formations trained and equipped for infiltration, evasion, reconnaissance, raids, sabotage and many other specialized missions.

12.1 Identification SpecOps units are identified by the Stealth symbol and parenthesized combat strengths. SpecOps units only use their combat strength to fight other SpecOps units. SpecOps units may begin on the board (in accordance with the scenario setup) or in an off-board "pool" of units available for missions. Note: SpecOps unit counters may have various symbols (airborne, naval, etc.). These have no effect on movement or combat and are provided only for reference.



12.2 SpecOps and Stacking: SpecOps units have no effect on stacking. Any number of SpecOps units may be present in a stack or in an area.

12.3 SpecOps Movement: SpecOps units on the board move like other ground units. SpecOps units in the off-board pool move by insertion and extraction. They may be inserted into any area except enemy-occupied cities or tunnel complexes. If they are inserted into an area that contains enemy SpecOps they must engage in special combat. To extract a SpecOps unit from an area roll 1d10 The extraction is successful if the die roll is less than or equal to the strength of the unit. The unit remains in the area if the extraction fails. On a die roll of 10 the unit is destroyed.

12.4 SpecOps and Ground Combat: SpecOps units participate in ground combat as part of a friendly stack, by using their quality rating to shift combat results, offensively or defensively. Only one SpecOps unit in each stack may provide this shift in a single combat, and regardless of the result, the SpecOps unit is permanently destroyed.

12.5 Special Combat: SpecOps units fight enemy SpecOps units using their parenthesized combat strengths. Special combat is resolved like ground Combat but terrain effects are ignored. Air support may not be used to affect the results of special combat.

12.6 SpecOps Missions. SpecOps units in the off-board pool may be used to attack enemy command, air, and other off-board assets (as specified by the scenario). Before his air allocation phase, the player targeted by a SpecOps attack lines up his command and air units as "targets" and the opponent may assign SpecOps units to any selected targets (one unit per target). Each SpecOp unit rolls 1d6 for detection. If the die roll is less than or equal to the strength of the SpecOps unit, then the unit is detected and eliminated before it can reach its assigned target. Subtract 1 from the detection die roll after the first turn. This represents the defender's mobilization of security forces.

12.6.1 Command Mission Effects. SpecOps units that avoid detection and successfully execute a mission against a Command target will decrease that Command's number of Command points by an amount equal to the strength of the SpecOps unit. Example: Red (2) SpecOps against Blue 4-point Command. Blue is reduced to 2 Command Points for the rest of the current Turn. The SpecOps unit is destroyed.

12.6.2 Air Mission Effects. SpecOps units that avoid detection and successfully execute a mission against an Air target roll 1d6 again. If the die roll is less than or equal to the strength of the SpecOps unit then a step of the targeted air unit is destroyed. All air units successfully targeted by SpecOps are unable to fly during the current Turn, whether or not they suffer a step loss. In all cases, the SpecOps unit is destroyed.

13. Weather [optional]

The default option is "good" weather that does not interfere with normal operations. The effect of adverse weather is to slow or prevent operations. Adverse weather influences terrain effects on movement and combat, Detection probabilities, and other game functions, usually to the advantage of the defender. Air operations are particularly sensitive to adverse weather. Higher levels of command may enjoy an advantage in weather forecasting, due to space assets. One way to represent this is a deck of weather cards appropriate to the season and climate zone. A new day's card is turned over at the beginning of each turn. Both sides can "see" two days in advance, but the side with a forecasting advantage may "peek" ahead several days more.

13.1. Seasons and Climate Zones. Weather effects vary according to the season and the climate zone of the theater. Climate zones may include Arctic, Temperate, Tropical, Arid and others. Seasons in Temperate zones are Summer, Autumn, Winter and Spring. Seasons in Tropical zones are Wet and Dry. (Remember that seasons are reversed in the Southern hemisphere). Scenario designers should research climate patterns for the area of operations. (A good introduction to weather effects on military operations is Ch. 5 of Collins, J. *Military Geography* (NDU Press, 1998). Some suggested adverse weather effects for the scenario designer are listed below:

13.2. Heavy Rain. Low-lying clear areas become Mud or Swamp, reducing ground movement or preventing Extended Movement. Detection probabilities are reduced. Close Air Support is reduced or prevented. Effects of artillery are reduced.

13.3. Snow and Ice. Mountains may become impassible, rough areas are treated like Mountain for movement and combat. Detection probabilities are reduced, possibly to zero. Air operations are prevented or curtailed (except for heavy bombers based out of theater). Artillery effects may be increased in clear terrain. Littoral areas may be subject to sea ice.

13.4. Sandstorm. Similar to heavy rain, but affects Desert areas and areas adjacent to Desert.

13.5. Hurricane or Typhoon. Naval units may be obliged to exit or prevented from entering certain sea areas. Surface naval units caught in affected sea areas may be subject to step loss. Storm counters that appear, move and disappear in quasi-random fashion may be useful during the appropriate season. Refugees may be created in affected areas.

13.6. Prevailing Winds. May cause downwind migration of NBC contamination, or smoke effects (as in the Kuwait oil fires of 1991 or the Southeast Asian forest fires of 2000).

14. Sample Scenario-Specific Rules

14.1. Counters and Markers

14.1.1. Dummy Units. Dummy units represent the effects of operational deception and the "fog of war." Dummy units may be placed on the map with the back side (Undetected) face up, as part of the initial game setup, or by playing an information operation (see below). When a Dummy unit is Detected it is removed from the map.

14.1.2. Refugees. Refugee units may be present in an area at the beginning of the game or they may be created as a result of operations (such as an attack on a city). Scenario rules specify how refugees are created, how they move and how they are rescued or destroyed. Destroyed refugees may count as combat step losses against a player, or have other effects on victory conditions.

14.1.3. Prisoners of War. When a ground unit is eliminated in ground combat (by a DE or AE result) replace it with an EPOW counter of the victor's color. (Air strikes unsupported by friendly ground units in the area cannot create EPOWs). EPOWs do not count against stacking and they do not participate in combat. They may be escorted by a ground unit or stacked with a Base. They may move and retreat with the escorting unit. A ground unit of any size may escort any number of EPOW counters. If the escorting unit or base is destroyed the prisoners are liberated. For each liberated prisoner, the original owner receives a free ground step during the next reconstitution phase. Scenario designers are encouraged to craft victory conditions that reward liberating POWs, especially for the Blue side.

14.1.4. Leaders. Leader counters represent the political elite of a regime and its bodyguard. Leaders have no direct command and control function. They may freely use extended movement, are subject to detection like stealth ground units, and do not count against stacking limits. Detected leaders are subject to capture if they are alone in an area with an enemy ground unit. Roll 1d10. The Leader is captured on a die roll of 1-5. Subtract 1 from this die roll for each SpecOps unit in the area. Leaders may be killed if the last friendly ground unit in their area is eliminated. Roll 1d10. The leader is killed on a die roll of 1, otherwise he or she escapes to the nearest friendly unit. Exception: a leader in a tunnel complex may only be killed by nuclear strike. If all of a leader's points the leader commits suicide and the game is over. Heroic leaders (specified in scenario, indicated by "H") increase the quality of "C" and "D" ground units they are stacked with by one level. Scenario designers are encouraged to craft victory conditions that reward the capture or elimination of Enemy leaders.

14.1.5. Bases. Airbases may be represented on the map by counters, face-up when mission-capable and face down when disabled. Disabled bases may not be used as ports of entry, and will reduce the owning player's available air missions and air unit reconstitution capability.

14.1.6. Sea Mines. In some scenarios one or both players may be allowed to place minefields in littoral sea areas, with a number of mine points, which are allocated secretly to minefields before the start of play. It is possible to have dummy minefields with zero mine points. The strength of a minefield is revealed when an enemy naval unit enters its sea area. Scenario rules will specify the exact effects of minefields. As a default, each mine point represents a 10% chance of inflicting a step loss on every enemy naval unit that enters the area. Naval units of "A" quality may reduce this by half (round fractions down) due to their mine avoidance devices. Within the time scale of the game, mine sweeping is not currently a realistic option, but scenario designers are encouraged to experiment with representing future mine countermeasure technologies.

14.1.7. Contamination Markers . The contamination marker represents lethal nuclear, chemical or biological hazards severe enough to inhibit or prevent military operations in the affected area. Scenario rules will specify the duration and effects of contamination. **Example**: A land area is contaminated with persistent chemicals at contamination level "1". The contamination level "attacks" every ground unit that enters or remains in the area with the following probabilities of inflicting a step loss: A: 10%, B: 20%, C: 30%, D: 40%. These hit probabilities are doubled at contamination level "2," tripled at level "3" etc.

14.2. Combat

14.2.1. Nuclear Combat Nuclear weapons are essentially "strategic" in nature. At the **operational** level the use of nuclear weapons stresses a wargame system to the breaking point, and may distort or negate the validity of a scenario. If the designer nevertheless needs to represent these effects, the following guidelines are offered.

14.2.1.1. Nuclear Release Authority: In a multiplayer game, only the top level command may authorize nuclear use.

14.2.1.2. Nuclear Delivery: Nuclear strikes may be made by nuclear-capable aircraft on Strike missions, by ballistic or cruise missiles, torpedo, mine or depth charge, by demolition munitions emplaced secretly before the start of play, or by unconventional means (SpecOps).

14.2.1.3. Effects: Nuclear weapons automatically destroy their selected target, unless the delivery is unsuccessful. A nuclear strike may destroy all or some of the units, bases or facilities in an area, at the discretion of the delivering player. If the player chooses to destroy all enemy assets in an area, then all or some of the friendly units and assets in that area are also subject to destruction (either automatically or on a die roll, as the designer may specify). Nuclear weapons may create contamination effects in the area, or not, at the discretion of the delivering player.

15. Rules for Further Development

15.1 Information Operations. "InfoOps" represent intelligence and surveillance by national technical means, offensive or defensive electronic warfare, deception and dirty tricks.

15.1.1 Playing Info Ops InfoOps are played as "interrupts" at any time in the game, regardless of the turn or phase.

15.1.2 Availability of InfoOps. Scenario instructions give one or both sides a fixed number of InfoOp chits, which are permanently expended when they are used by an eligible command.

15.1.3 Conducting InfoOps. During a turn a command may expend a number of InfoOps equal to its command level. In general, joint and national commands may conduct InfoOps against any target, while subordinate commands may only conduct InfoOps against enemy units or commands of the same type (land, naval or air). The basic InfoOps are listed below. Scenario designers should feel free to define new InfoOps appropriate to the situation.

15.1.3.1 Reconnaissance: a selected enemy stack is detected for the remainder of the turn.

15.1.3.2 Camouflage and Concealment: a detected friendly stack is undetected for the remainder of the turn.

15.1.3.3 Offensive EW: a selected enemy command is reduced by one level for the remainder of the current turn, or enemy SAM's are suppressed for the remainder of the current turn.

15.1.3.4 Defensive EW: an enemy offensive EW strike is cancelled.

15.1.3.5 Deception: A dummy counter is placed with any friendly undetected stack. It may remain in play until detected.

15.1.3.6 PsyOp: One selected enemy unit defects. The unit is permanently eliminated. PsyOps are only allowed against C or D Quality units.

15.1.3.7 Shock & Awe: One selected enemy ground stack is frozen in place for the remainder of the current turn. This InfoOp can only be conducted against a stack that has suffered CAS attack in the current turn.

15.1.4 Placing InfoOps chits. InfoOp chits are placed in the area in which they have an effect, to remind the players that an InfoOp is in effect. The player who played the chit must announce what InfoOp is taking place. The chits are then collected during the reconstitution phase of the next turn and placed in an off-map holding area. (They are not returned to the InfoOps pool.)

15.2. Aerial Tankers One or both players may have the option of deploying "tanker tracks" in areas free of enemy air defense units. Eligible air units (capable of in-flight refueling) can fly their full range to the tanker, refuel and then fly their full range again to complete a mission. If a tanker is ever alone (unescorted by friendly fighters) in an area and attacked by enemy air it aborts its mission, and becomes available again on the next air allocation phase. Tankers are never destroyed.

Sanitized version: remove pages 92-96 and 107

Turn Record Track

1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30					

Combat Results Table

Ratio	Result	Meaning
-4x	AE	Attacker Eliminated
-3x	A3R	Attacker lose 3 steps and Retreat (see Terrain exceptions)
-2x	A2R	Attacker lose 2 steps and Retreat (see Terrain exceptions)
-1x	A1R	Attacker lose 1 step and Retreat (see Terrain exceptions)
-<1	AR	Attacker Retreat (see Terrain exceptions)
Equal	NEff	No Effect
+<1x	DR	Defender Retreat (see Terrain exceptions)
+1x	D1R	Defender lose 1 step and Retreat (see Terrain exceptions)
+2x	D2R	Defender loses 2 steps and Retreat (see Terrain exceptions)
+3x	D3R	Defender loses 3 steps and Retreat (see Terrain exceptions)
+4x	DE	Defender Eliminated

Command Points Remaining in Current Phase

	5	4	3	2	1	0
Allied						
DPRK						

Start the Command units at their current Command level. As Command units Spend CPs, decrement the number of CPs remaining.

North Korean Special Forces and Air Mission Holding Boxes

Unassigned Aircraft

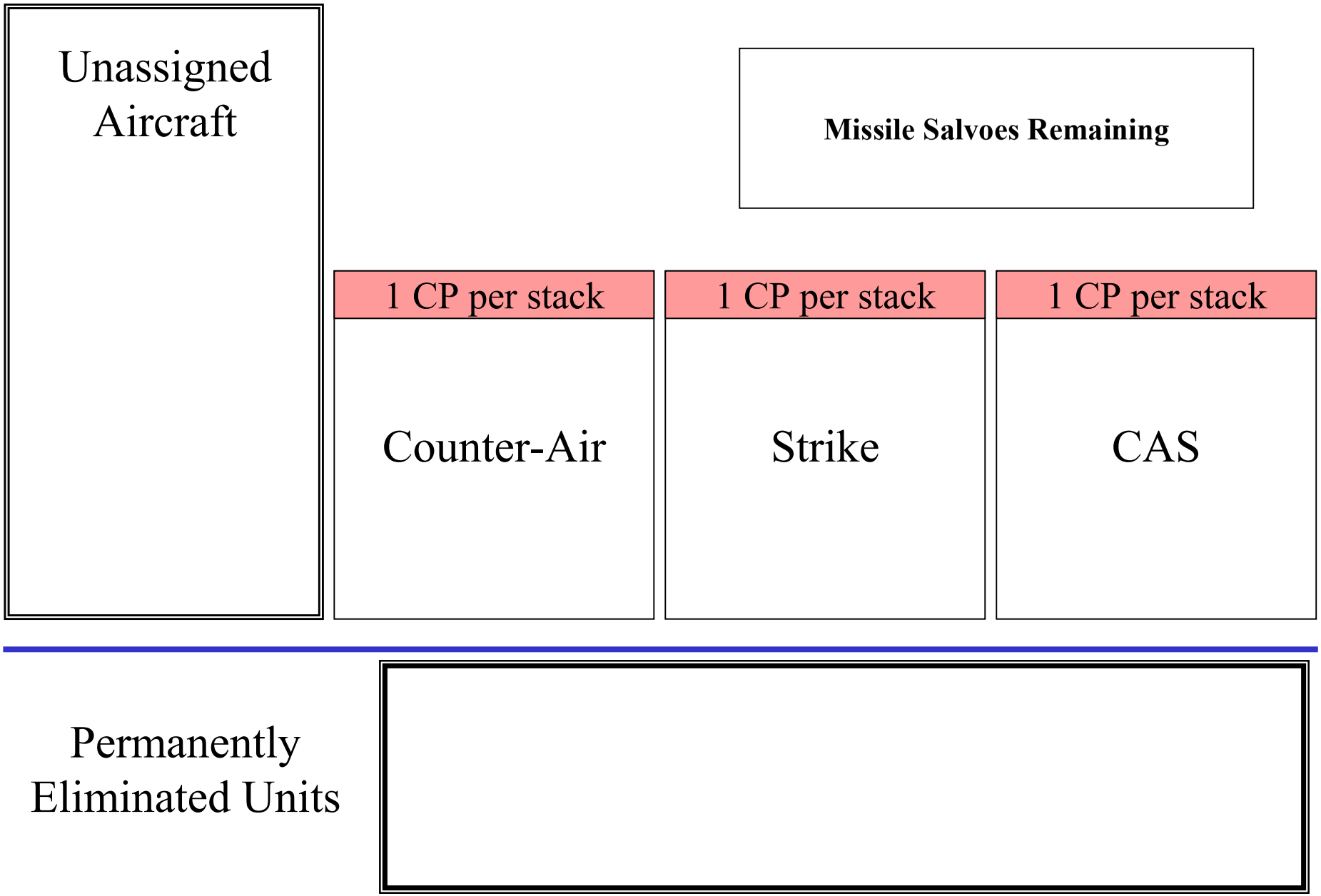
Missile Salvoes Remaining

Special Forces Remaining

1 CP per stack	1 CP per stack	1 CP per stack
Counter-Air	Strike	CAS

Permanently Eliminated Units

US and ROK Air Mission Holding Boxes



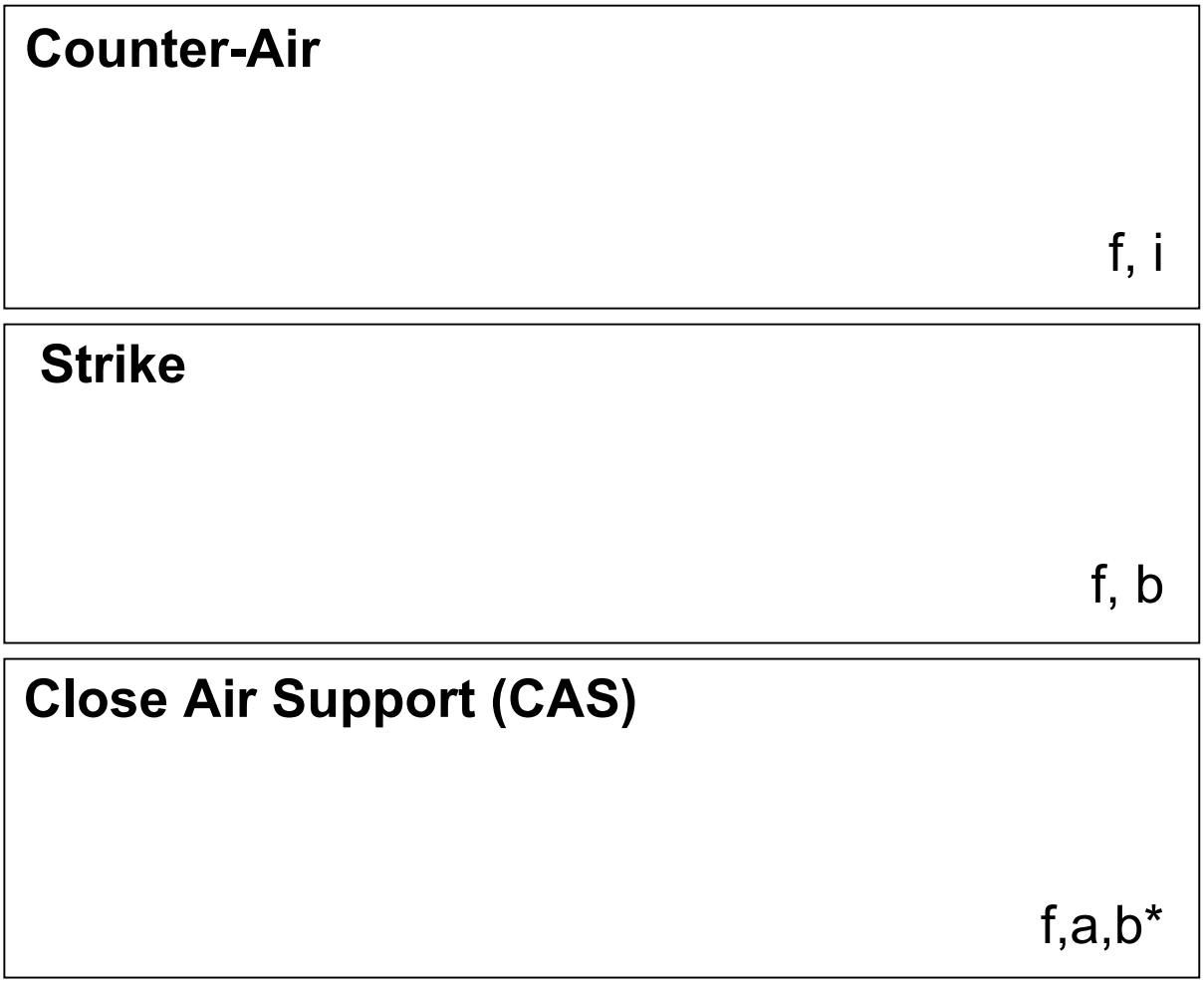
Air to Air Combat Display

After all SAM combat is resolved, resolve Air to Air combat in three steps using the boxes on the Display below. Aircraft may only fight opposing aircraft in the same box, except for Counter-Air.

The player with more units in the Counter-Air box may remove any or all of his excess units from that box and use them to attack opposing units in either or both of the other boxes. In this case the Counter-Air aircraft are considered the Attacker in any combat they initiate in the Strike and CAS boxes. Resolve all of these combats and return surviving Counter-Air units to their respective Unassigned boxes. (Note that, as usual, the maximum number of aircraft that may attack any one opposing unit is limited by the Command level of the HQ controlling each stack).

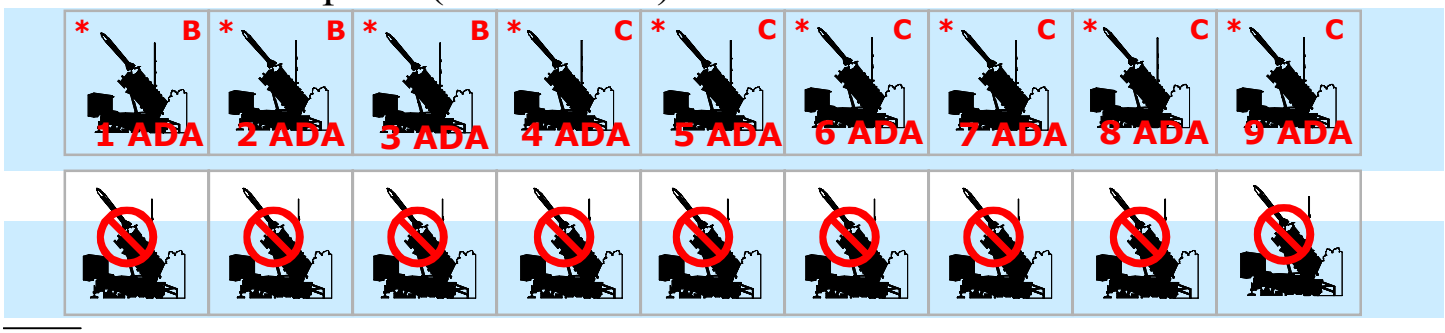
After all Counter-Air combat is resolved, opposing Strike aircraft (of both sides) may carry out their Strike missions and return to their Unassigned boxes.

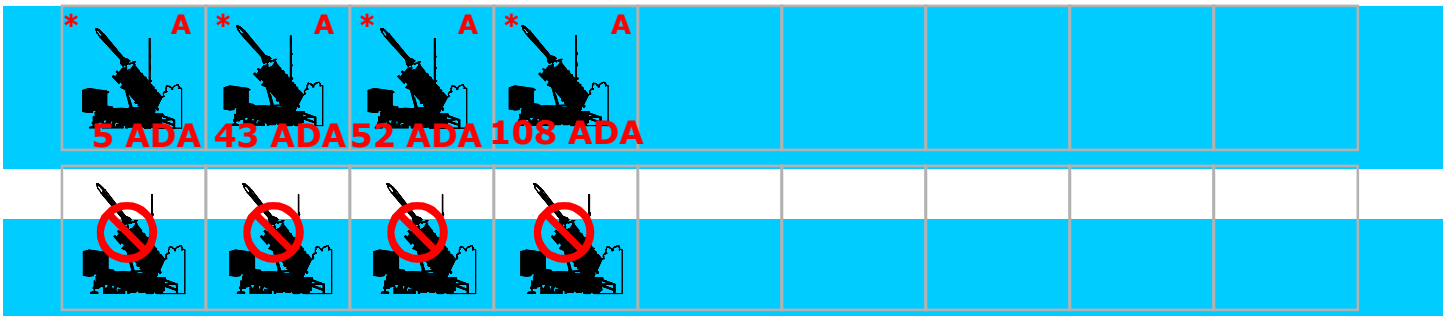
Finally, surviving Close Support aircraft may participate in Ground or surface combat, after which they also return to their Unassigned boxes.

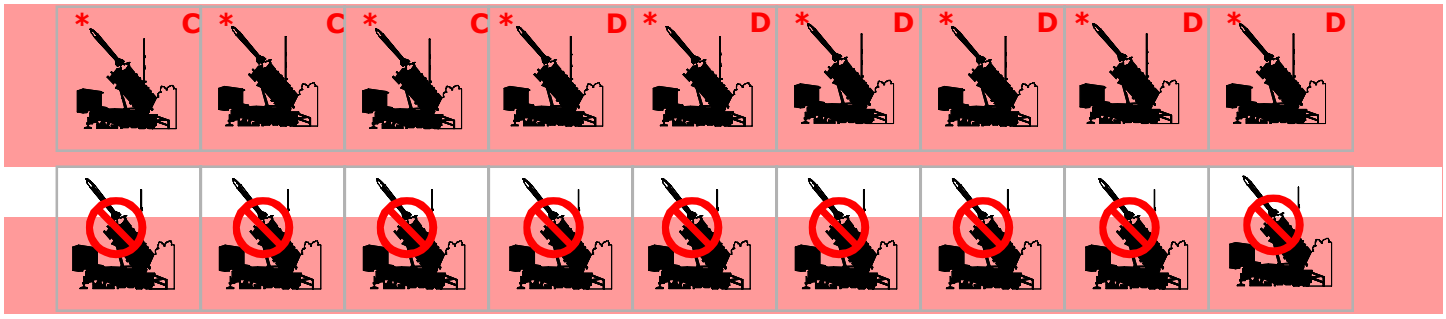


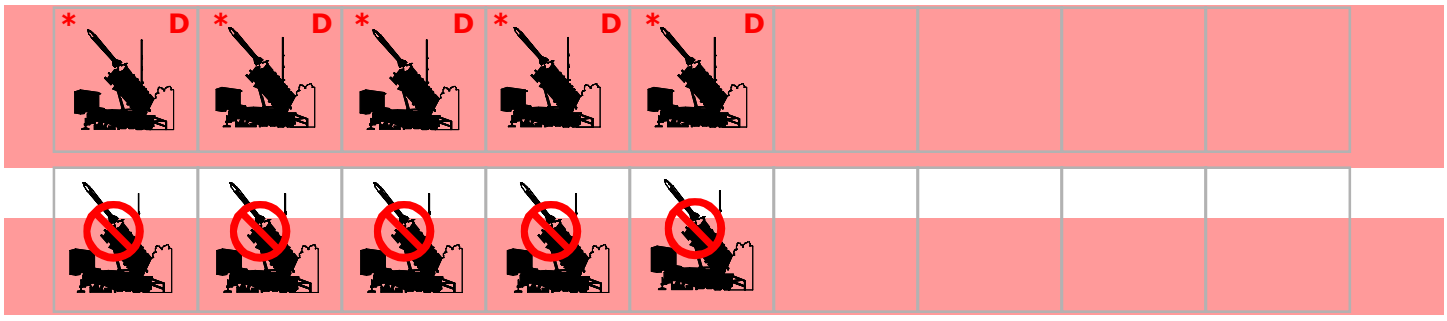
* if friendly SpecOps in area to provide targeting

Double-sided Square (0.75x0.75”) Units

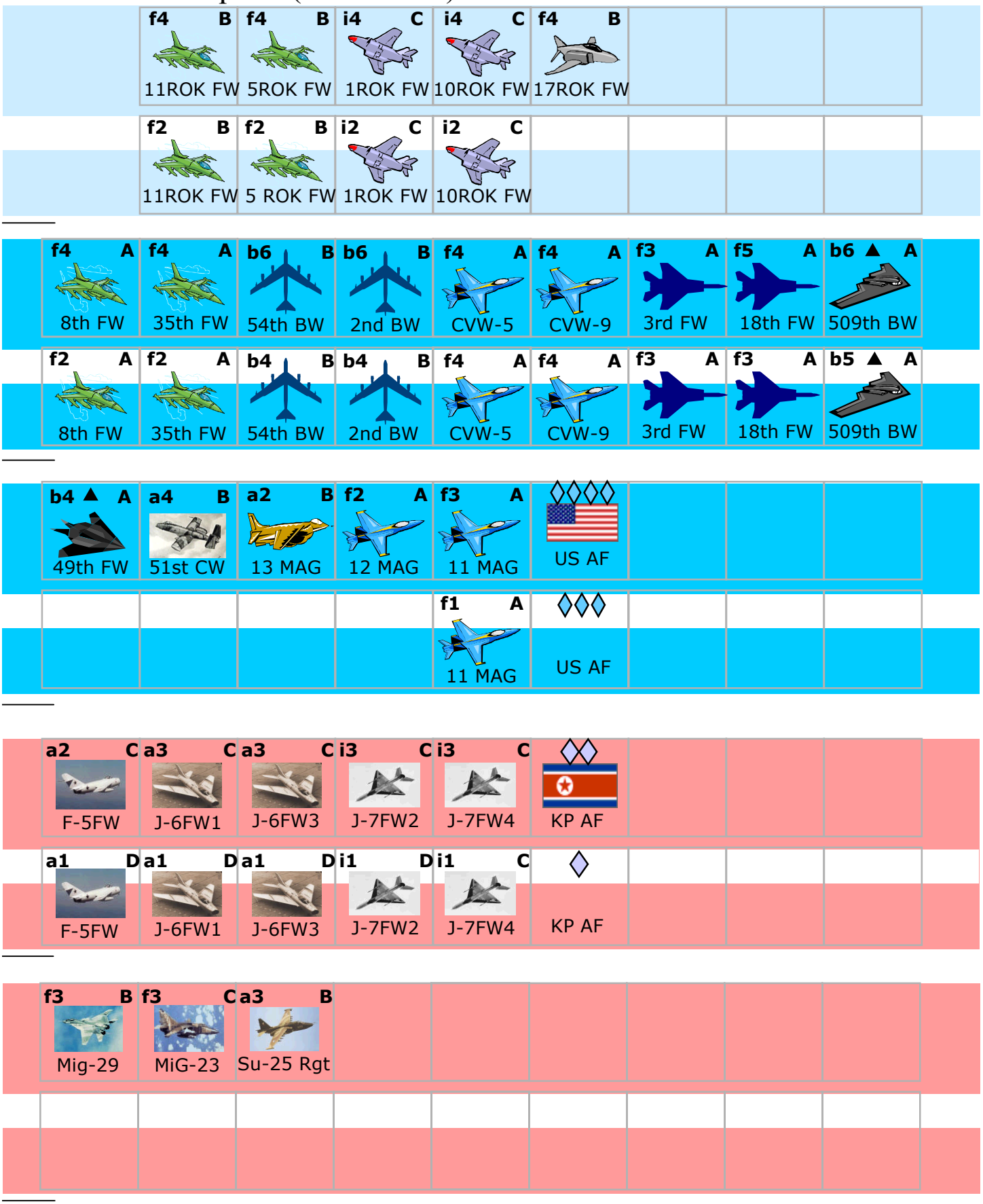








Double-sided Square (0.75x0.75") Units



KOREA--Doublesided Square (0.6”x0.6”) Units

4 xx B 1 Mech | 4 xx B 2 Mech | 4 xx B 3 Mech | 6 xxx B I Corps | 6 xxx B II Corps | 6 xxx B IIICorps | 6 xxx B IV Corps | 6 xxx B V Corps | 6 xxx B VI Corps | 4 xx A 1 Mar | 4 xx A 2 Mar | 3 B AVN Bde

2 xx B 1 Mech | 2 xx B 2 Mech | 2 xx B 3 Mech | 3 xxx B I Corps | 3 xxx B II Corps | 3 xxx B IIICorps | 3 xxx B IV Corps | 3 xxx B V Corps | 3 xxx B VI Corps | 2 xx A 1 Mar | 2 xx A 2 Mar

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7 xx A 1MarDiv | 5 xx A 3MarDiv | 2 A 11MEU | 2 A 26MEU | 4 xx A 10th Mtn | 5 xx A 82nd | 6 xx A 101st | 5 xx A 2nd Inf | 4 xx A 25th Inf

5 xx A 1MarDiv | 3 xx A 3MarDiv | 1 A 11MEU | 1 A 26MEU | 2 xx A 10th Mtn | 3 xx A 82nd | 4 xx A 101st | 3 xx A 2nd Inf | 2 xx B 25th Inf

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3 A 18 Avn+ | 3 A 6th Cav | 3 A 17th Avn | 2 B 36 Mag- | 2 x A 172nd | 2 x B MP 8th Prov | 3 x B MP 16th | 2 x A 2nd ACR | (2)▲ A JSOTF | (2)▲ A 75th Reg | (2)▲ A 1st SFG

1 x A 172nd

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6 xxx B 820th | 4 xxx B 9th | 4 xxx B 10th | 4 xxx B 815 | 4 xxx B 425 | 4 xxx C I Corps | 4 xxx C II Corps | 4 xxx C III Corps | 4 xxx C IV Corps | 4 xxx C V Corps

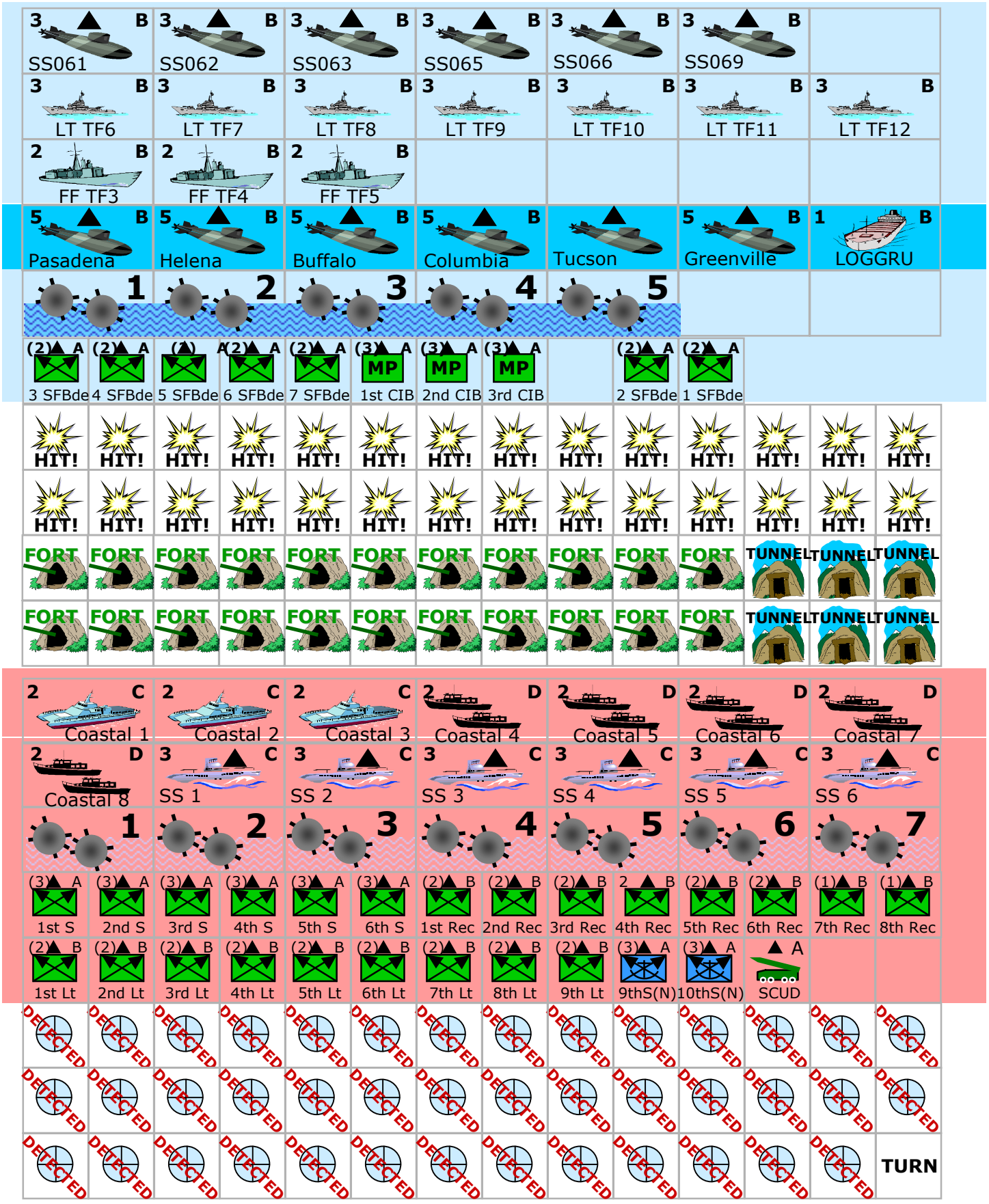
4 xxx B 820th | 3 xxx B 9th | 3 xxx B 10th | 3 xxx B 815 | 3 xxx B 425 | 2 xxx D I Corps | 2 xxx D II Corps | 2 xxx D III Corps | 2 xxx D IV Corps | 2 xxx D V Corps

---

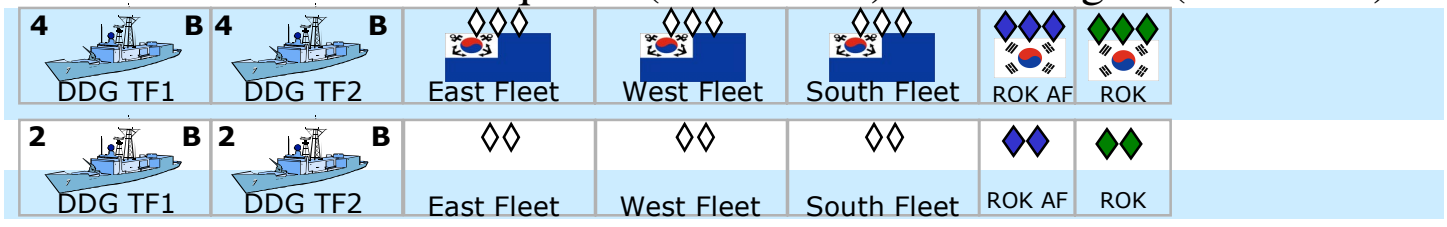
4 xxx C VI Corps | 4 xxx C VIICorps | 4 xxx C VIIICorp | 4 xxx C IX Corps | 4 xxx C X Corps | 4 xxx C XI Corps | 4 xxx C XIICorps | 3 xxx B CAPDEF | ▲  Dear Leader

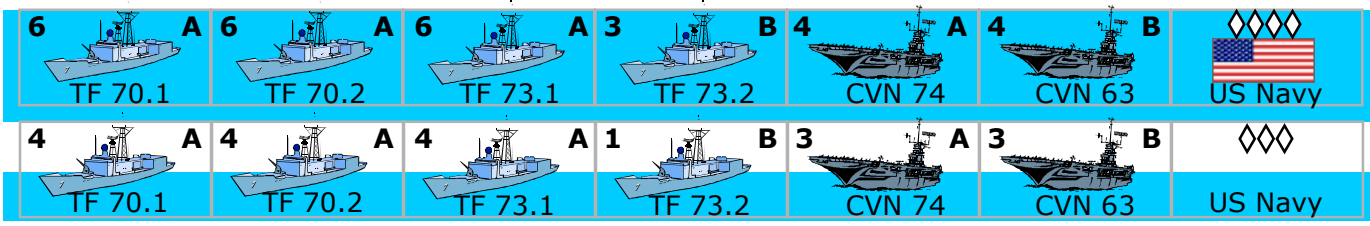
2 xxx D VI Corps | 2 xxx D VIICorps | 2 xxx D VIIICorp | 2 xxx D IX Corps | 2 xxx D X Corps | 2 xxx D XI Corps | 2 xxx D XIICorps | 2 xxx B CAPDEF

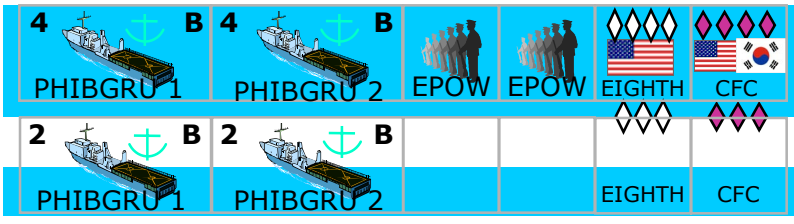
KOREA--Single-sided Squares (0.5”x10.5”) & Rectangles (1.0”x0.5”)

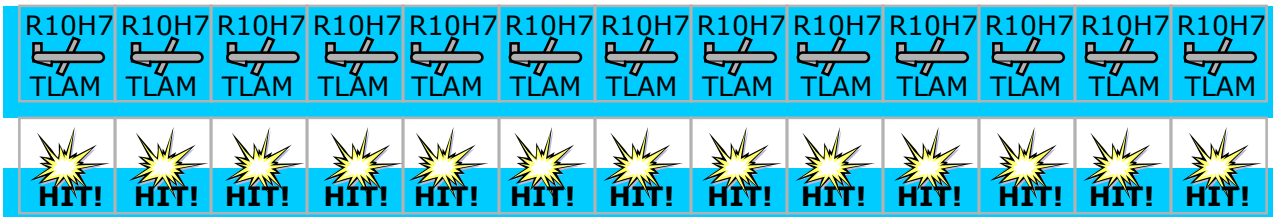


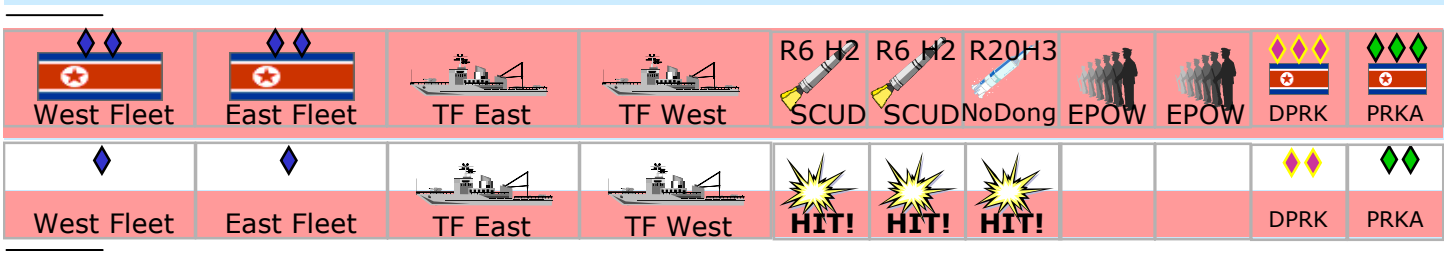
KOREA--Double-sided Squares (0.5”x10.5”) & Rectangles (1.0”x0.5”)











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Sanitized version: remove pages 92-96 and 107

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