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## Set & Drift

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# SET AND DRIFT

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## WAR GAMING: THIRD GENERATION

by

Lieutenant Commander Abe Greenberg, U.S. Navy

During the past year at the Naval War College, the Center for War Gaming has been utilized by the Office of the Chief of Naval Operations in conducting an imaginative series of preliminary tactical games to explore new employment concepts for surface effect ships and patrol hydrofoils. Clearly, this comparatively new role for the center's gaming facilities needs further refinement, but results thus far appear so promising that a brief review of the history of war gaming at the College and its potential for the future seems in order.<sup>1</sup>

The Naval War College has used war games, in one way or another, ever since they were introduced into the curriculum in 1886 by Capt. William McCarty Little, whose name now honors the Chair of Gaming and Research Techniques at the College. Originally, games were conducted on chessboard-type game floors on which units were manually positioned. For more than 70 years,

with evolutionary improvements to permit greater tactical sophistication and a broader range of interactions, this same basic system was employed. The circular dispositions of World War II and the methods of operating several aircraft carriers in the same formation were played in this manner but, by the early 1950's, these manual first-generation gaming techniques were no longer responsive to the needs of students and other users.

The second generation of war gaming styles was unveiled in 1958, preceded by 4 years of planning and reconfiguring Sims Hall to accommodate the Navy Electronic Warfare Simulator (NEWS). The massive analog NEWS system, built around a large-screen display, was the College's first long step into automated gaming. The NEWS could automatically display and maneuver a total of 48 dynamic images, representing individual ships and aircraft or groups of those forces. Aside from displaying the platforms, the NEWS could also simulate weapons employment and assess damage when opposing forces engaged. Gradually, however, NEWS' capabilities were overtaken by swiftly expanding warfare

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<sup>1</sup> For a comprehensive historical description of gaming at the Naval War College, see Francis J. McHugh, "Gaming at the Naval War College," *United States Naval Institute Proceedings*, March 1964, pp. 48-55.

## 72 NAVAL WAR COLLEGE REVIEW

technology and new concepts of tactical coordination. Besides being limited in the number of forces which could be actively displayed, the NEWS inherently lacked the flexibility to deal realistically with the complex sensor and weapons systems which came to dominate naval tactics. Thus the automated gaming which had been envisioned with the NEWS never really materialized, and the system functioned principally as a useful but valuable adjunct to manual gaming. Once NEWS capabilities had fallen behind the curve of tactical development, not even the most innovative war gamers could do much to represent real world conditions.

Accordingly, by 1966, meaningful discussions had begun, pointed toward the future of war gaming at the Naval War College. Several alternatives were available:

- Expand and upgrade the analog NEWS system
- Revert to manual gaming using NEWS as a display system only
- Develop a new gaming system based upon the versatility of general purpose digital computers.

An expansion of the NEWS analog system to double or triple its platform capacity would prove costly and would not overcome the inherent limitations in an analog system. Emerging or futuristic weapon and sensor systems or platforms could not be modeled upon demand. The Navy and industry were shifting away from analog systems, thus making replacement parts and maintenance of such systems both difficult and expensive.

Reverting to manual gaming with the NEWS as a display system had the virtue of being inexpensive, but could not offer realism, timeliness of information, or the depth of detail required. Therefore, the complexities of modern naval warfare with its associated exacting logistic implications could not be effectively gamed.

The introduction of general purpose

digital computers as a system to assist gaming and simulation promised to alleviate most of the NEWS deficiencies. Programs could be specifically structured to game requirements. Real time information and exact logistic accounting became immediately available, and since the ability to change was designed into the system, it should be less susceptible to obsolescence. Thus the basic decision to develop the Warfare Analysis and Research System (WARS) as the third generation follow-on to manual gaming and NEWS gaming was made.

War gaming or decision gaming should not be confused with tactical simulation training so widely used elsewhere in the Navy. Decision gaming is a unique educational or analytical process with the primary emphasis upon human choices. This consideration makes the modeling of automated decision gaming far more complex than the reproduction of a single dimensional warfare capability such as anti-air warfare. The modeling complexities of war gaming stem primarily from the intricacies involved in constructing the Master Simulation Program (MSP) to provide a realistic framework for tactical or strategic decisions. The MSP utilizes a data base comprising platforms and their characteristics such as sensor configuration, weapon systems, motion, logistic, and environmental parameters. All of these factors are then combined and interrelated to develop units which can be operated individually or in various sized groupings employing a variety of current or futuristic tactics. Thus, the MSP is designed to simulate crisis or combat situations whose representation presents the player with a realistic confrontation. The MSP also provides a three-dimensional representation of the real world and allows the gaming area to be specified at anyplace on the earth. Game elements may be defined anywhere from a depth of 10,000 feet below or to an altitude of 200,000 feet

above mean sea level. In addition, physical environmental factors such as atmospheric effects on radar, ambient noise on sonar, and various sea states are included. The game rate can also be controlled as a one-to-one linear or a time base variable up to 40 times real time, and key decision points can be replayed. Combining the salient characteristics of command or force organization, platforms with their capability, vulnerability, sensor suits, weapons characteristics, and a range of damage/kill probabilities, a realistic decision base presentation is provided to the players. Opposing force capabilities can be altered to reflect environmental factors, damage degradation, and mission or doctrinal constraints. So, in the most basic of decision gaming, a one-on-one engagement analysis, such as a submarine vs. a submarine, applicable parameters such as depth, sensor performance, weapon capabilities, and environmental features are injected to influence gaming decisions by the players. Complexity escalates rapidly as scenarios become more sophisticated and forces are scaled upward or mixed.

WARS gaming offers three unique and significant user advantages which are not found in other U.S. gaming systems. First, and most significant, is the integrated nature of the system. Unlike analytic gaming models which are designed for a specific purpose, WARS has the potential to simulate the entire gamut of naval operations. Each individual model is designed to interact with all others, modifying a common game data base. Thus, events flow naturally, in a timely fashion, with no requirement to set up conditions at various stages.

The second major advantage stems from the ability to interject human decisions into the game as it is running. Most gaming models require the introduction of initial conditions, followed by a start-to-finish uninterrupted run. WARS permits the course of events to

be changed at any stage by human interaction without stopping or resetting the game and promptly reflects such interactions. Beyond the obvious value this offers in the area of decision-making experience, this capability permits each model to operate as an entire family of models, each modifiable as the game progresses in order to mesh with specific requirements or permit comparison of the effect of differing actions.

Finally, WARS interactive modeling permits a level of flexibility unavailable in other simulations. As a function of game objectives and activities, the user may select the level of participation he deems appropriate. Predefined (and on-line changeable) doctrine is used to guide the functioning of the system in areas in which the user does not desire to take direct control. For example, the system itself, left undirected, will determine the proper actions to take to counter an impending airstrike, including detection activities, threat assignment, fighter mission allocation, SAM assignments, and use of basic point defense weapons. Alternatively, however, the user can assume complete or partial control of any or all of these functions, and the system will respond to his directions rather than to its own doctrine guided decisions.

Thus, this type of computer assisted gaming offers the realism which forces a commander into decisionmaking situations he would otherwise encounter only in actual operations. Gaming also provides an exceptionally convenient vehicle for testing various operational plans and tactical concepts. It is particularly cost effective in exercise plan gaming prior to the essential but expensive live fleet exercises at sea.

At the moment, however, WARS is far from complete. The system design and installation schedule were deliberately developed for phasing over a period of years to permit incremental evaluation before proceeding to the

## 74 NAVAL WAR COLLEGE REVIEW

next step. As each package of the new WARS hardware and software components is validated, the corresponding elements of the obsolete NEWS are eliminated. Accordingly, the partially installed WARS and partially dismantled NEWS are now functioning as a frequently frustrating but remarkably improved hybrid, and a wide range of users are enthusiastic about the future potential of the ultimate full-digital system.

In addition to supporting the resident curriculum at the Naval War College, the Center for War Gaming provides services for game sponsors outside the Newport area, including:

- The Office of the Chief of Naval Operations, currently conducting a series of exploratory advanced tactical war games, with the Center for Naval Analyses providing game direction.

- NATO and U.S. Fleet commands, who conduct on a regular basis various kinds of war games to test operational plans and force employment concepts. The respective staffs provide the players.

- The Naval Material Command which sponsors several games each year, generally oriented to new developments in sensors and weapons and utilizing Navy laboratory engineers/scientists associated with those systems as players.

- The Naval War Colleges of the Americas, who participate annually in a major Western Hemisphere convoy routing and protection game, remotely played from the South American coun-

tries concerned. U.S. Naval Reserve officers whose mobilization billets are in the Navy Control of Shipping Organization plan and play much of this game as the U.S. participants.

Figure 1 depicts the WARS data flow from its inception by the sponsor to postgame analysis. Following review of game results, the sponsor is, of course, free to replay the game at a later date, varying the parameters, players, or both, and again analyzing his results to exploit the "Monday morning quarterbacking" and "what if" capabilities of this kind of gaming.

The present developmental phase of WARS is structured around two major and two minicomputers with their peripheral storage and display equipment. Use of digital computers in gaming permits a faster and more extensive investigation of an engagement, tactic, or scenario than would otherwise be possible. The computer assumes the tedious duties of bookkeeping. Most important, however, players and umpires are relieved of the burden of manual labor involving computations, track update, damage assessment, and detection calculations. Unhindered by the minutia of bookkeeping, the gamer is free to concentrate on his thoughts, his tactics, and his decisions which, after all, is what war gaming at the Naval War College is all about.

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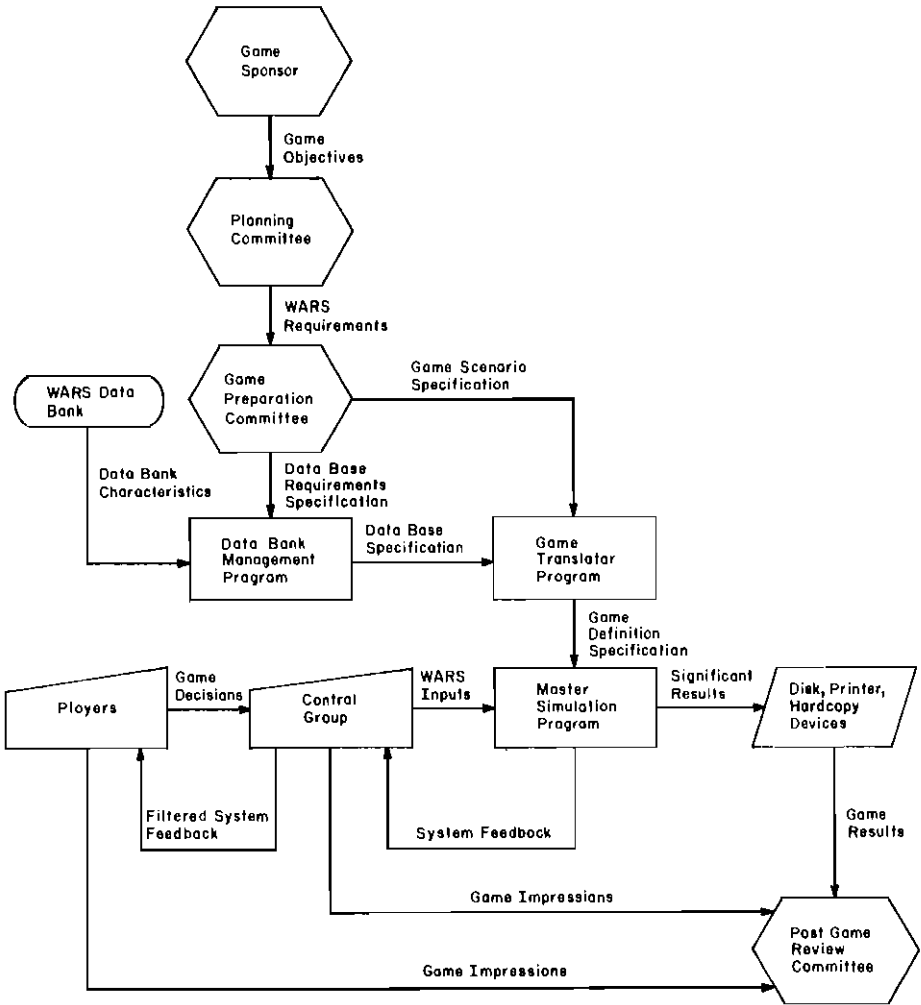


Fig. 1—WARS Game Data Flow