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FINAL REPORT PR 81-27-330

Research on Management for Simulation Programs in the U.S. Navy

Thomas R. Rhees
Kenneth P. Kuskey
Robert N. Kraft

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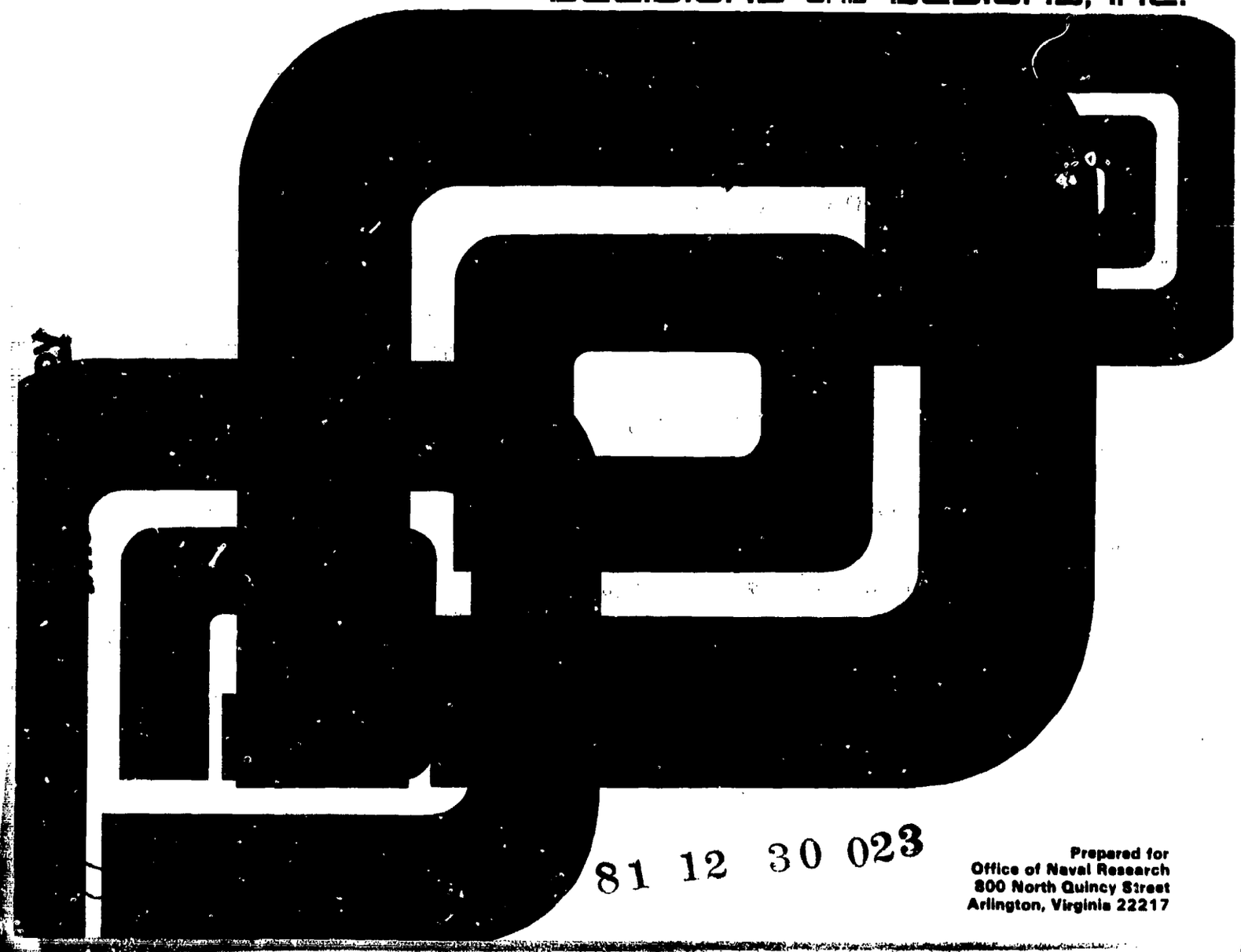

Prepared for
Office of Naval Research
800 North Quincy Street
Arlington, Virginia 22217

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RESEARCH ON MANAGEMENT FOR SIMULATION PROGRAMS IN THE U.S. NAVY

by

Thomas R. Rhees, Kenneth P. Kuskey, and Robert N. Kraft

Prepared for

Office of Naval Research
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800 North Quincy Street
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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

New computer simulation technology makes it possible to simulate naval warfare more effectively and on a more widespread basis. This technology is a very useful and economic way to enhance naval warfare training and to develop and evaluate tactics. This report addresses the management of simulation programs, based upon research into the applications of computer-assisted simulations and relevant directives on management. It is also based upon a unique conference with representatives of Navy activities involved in simulation matters to investigate management options.

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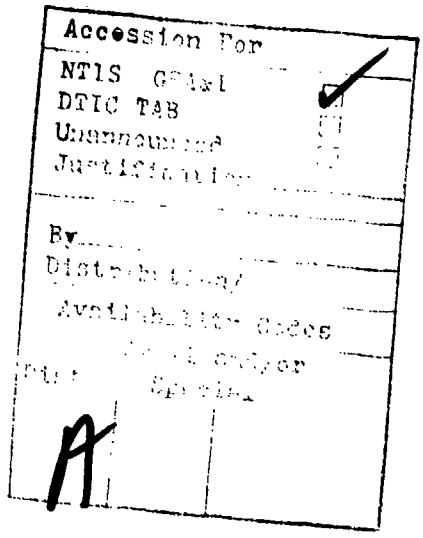
The Navy has long recognized the benefits of simulators in training. Advances in computer and simulation technology now promise to increase the sophistication and widen the use of simulations throughout the Navy. In addition, there is an emerging requirement for tactical simulation capabilities. The investment in these emerging uses of simulation is expected to be a large one; however, the possibility of technical, programmatic, and logistics problems exists. This report discusses representative problem areas and identifies the directions in which the Navy must move to establish and carry out simulation programs which can achieve maximum benefit and avoid possible problems.



SUMMARY

New computer simulation technology makes possible widespread and effective use of naval warfare simulations. These are very useful and economical as a way to enhance warfare training, and to develop and evaluate naval tactics. This report addresses the management of simulation programs, based upon research into the applications of computer-assisted simulations, management directives, and upon a unique conference of Navy representatives which investigated management options.

The Navy's long-standing commitment to superior training devices is being met by using system simulations where advantageous. Well-established management processes are used. Simulation capabilities also exist in the Navy Department for programmatic and operational studies and analyses; however, there is subtantial diversity in their representations of naval warfare and in results. Acquisition of these simulations is frequently managed on an ad hoc basis. In addition, there is an emerging requirement for large-scale interactive simulations of naval warfare to support tactical training requirements, fleet requirements, programmatic requirements, research and development, and the acquisition of systems that transcend service roles. For these, management responsibilities and procedures need to be clarified.

Wholly new policies and procedures for managing computer-assisted simulation programs are not needed; however, ongoing improvements in planning, programming, budgeting, and acquisition procedures would be of benefit and should be supported. In addition, specific management initiatives are needed. From their

discussion, the conference of Navy representatives who are working in the simulation area, led by decision analysts at Decisions and Designs, Inc. developed fifty-one options for management action. They visualized several needs: for Fleet CINCs to take a more active role in generating requirements and OPNAV to sponsor them more aggressively; for OPNAV and NAVMAT to improve program planning and coordination; for information resources, including a uniform tactical warfare data base; for technical resources to develop, appraise and validate systems; and for configuration management. The Navy representatives at the conference made a unique benefit-cost analysis of the management options which resulted in several alternative management packages, their relative costs ranging from austere to plush.

An important principle became evident in this study. The development and use of Navy simulations which involve tactical warfare cannot proceed independently. Management and technical issues come up which demand Navy-wide uniformity, not only in battle group and amphibious group applications, but also in warfare areas, command and control, and weapon/sensor systems. As a consequence of his mission responsibility "for assessment, integration and coordination of tactical warfare programs at the battle and amphibious force level for general tactical development and training," the Director, Naval Warfare is the logical OPNAV official in a position to address these issues at a Navy Department level.

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RESEARCH ON MANAGEMENT FOR SIMULATION PROGRAMS IN THE U.S. NAVY

1.0 BACKGROUND

The Navy has long recognized the benefits of simulators in training. Advances in computer and simulation technology now promise to increase the sophistication and widen the use of simulations throughout the Navy. The training command will continue to rely heavily on simulation equipment so that sailors will spend many classroom hours learning how to operate and maintain naval systems in lieu of extensive "at-sea" time. In addition, there is an emerging requirement for tactical simulation capabilities. Three conditions lend impetus to the growth of tactical simulation uses in the Navy: First, computer technology permits acquisition of large, relatively inexpensive interactive warfare simulations; second, there are a shrinking number of operating areas and ranges suitable for exercising modern combat units; and third, vastly improved simulation capabilities will become available for training in tactical decision making. These conditions should also lead to more simulators in the hands of the fleet. Some of the potential benefits which are available from Navy investment in simulation are listed below:

- NEW OPPORTUNITIES FOR TRAINING IN TACTICAL DECISION MAKING
- A SUPPLEMENT FOR CRITICAL RANGES AND OPAREAS
- BETTER FLEET OPERATING AND EXERCISE PLANS
- WEAPON SYSTEM STUDIES KEYED TO MISSION NEEDS
- IMPROVED PROGRAMMATIC ASSESSMENTS

The investment in emerging simulation applications is expected to be a large one The Navy faces the possibility of severe technical, programmatic, and logistics problems. Some typical problems with simulations, representative of those already beginning to be felt, are listed below:

- o LACK OF REALISM (MODEL ACCURACY-GRANULARITY)
- o UNIFORMITY (CONFIGURATION CONTROL)
- o AFFORDABILITY (HOW MUCH IS ENOUGH)
- o ACQUISITION DECISIONS (COST-BENEFIT)
- o LOGISTIC SUPPORT

The Director, Naval Warfare (OP-095) has recognized that ways must be identified to manage the Navy's emerging requirements in simulation particularly with respect to large-scale simulations of naval warfare. Accordingly, the Office of Naval Warfare has been working to identify the directions in which the Navy must move to establish and carry out simulation programs will achieve maximum benefit and avoid possible problems. The principal directions are listed below:

- o PROVIDE APPROPRIATE POLICIES
- o USE WORKABLE PROCESSES
- o EFFECTIVE MANAGEMENT

The research discussed in this report is one segment of the OP-095 effort to identify the directions in which the Department of the Navy should move. Specifically, the objective was to quickly identify the options for management action.

2.0 RESEARCH APPROACH

There were three basic phases to the research effort. The first phase objective was to develop information about simulations being used by the Navy and the management roles, responsibilities, and processes used in programs of this type. With this knowledge, the second phase could be planned more intelligently. The second phase objective was to develop and analyze Navy management options from which a management action plan could be derived. This phase included the assessment of benefit, assignment of relative cost, and discussion of preferences for the management options by Navy specialists. The third phase objective was to evaluate all of the information developed, and select the directions in which Navy management should proceed.

2.1 Information Planning

This phase began with a review of Department of Defense (DoD) and Department of the Navy directives and instructions to determine how automated systems acquisition and support programs are managed. At the same time, work was undertaken to identify and classify the various kinds of gaming and simulation activities and to identify potential management organizations and the functions they might perform. Also, a list of definitions was assembled to provide a uniform understanding of the terminology used in the gaming and simulation activities.

It was realized in the beginning that computers are widely used throughout the Navy; that interfaces are bound to exist; that management concepts, processes, and procedures used in one area may have applicability in the gaming and simulation area and that the corporate knowledge which exists in a representative

group of knowledgeable Navy personnel is the best source of information to assist in developing a management plan for OP-095. Assistance was provided to Decisions and Designs, Incorporated (DDI) by representatives of the Chief of Naval Operations (OP-094, OP-095, OP-096), the Chief of Naval Material (CHNAVMAT), the Chief of Naval Research (CHNAVRESEARCH), the Naval Data Automation Command (NAVDAC), Naval Education and Training Command (NAVEDTRACOM), and Naval Training Equipment Center (NTEC). An annotated bibliography, an interim categorization of systems/models, a set of definitions, possible options for a management strategy, and an outline management plan were the work products[1].

2.2 Specialists Working Session

The next phase in the research effort involved the interaction of selected representative Navy specialists (those involved in simulation related matters) with DDI decision analysts using decision-analytic methods to develop and analyze Navy management actions. This work was accomplished 11-13 August 1981 in an intensive 2½ day working session at DDI. CINCPACFLT, OP-39, OP-59, OP-094, OP-095, OP-096, CHNAVMAT, CHNAVEDTRA, CHNAVRESEARCH, NTEC, and Naval Ocean Systems Center (NCSC) were represented at this working session.

The specialists working session began with the group listing the functional areas where simulations might be useful for the Navy. Subsequent discussion of management responsibility, problems, and options was organized around this structure which is shown in Figure 2-1.

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[1] Thomas R. Rhees, Robert N. Kraft, and Kenneth P. Kuskey, Research on Management Concepts for Large-Scale Simulations of Naval Warfare, Interim Report PR 81-20-330 (McLean, Virginia: Decisions and Designs, Incorporated, July, 1981).

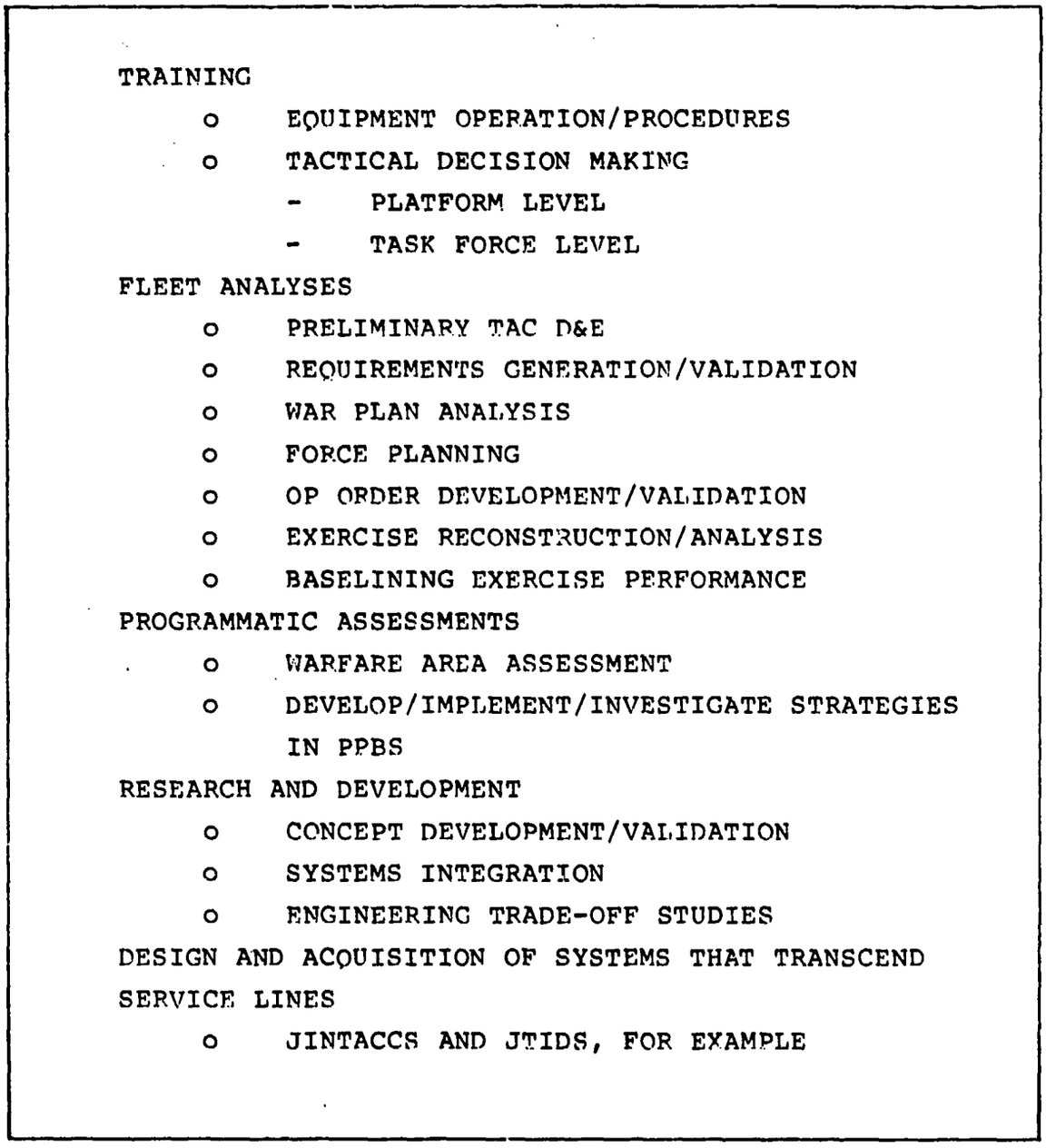

Figure 2-1
FUNCTIONAL APPLICATIONS OF COMPUTER-ASSISTED SIMULATION

The working session discussions resulted in seventeen management alternatives available to the Navy, partitioning each alternative into levels of management action. Thus, fifty-one options were developed within the functional structure, ranging from maintaining the status quo up to the maximum feasible level of management action; i.e. the strongest management option for the alternative. The group then assigned relative cost values and quantified the benefits for all the options. First, the assumption was made that one type of limited resource "cost" was to be allocated across all the options. In this situation, cost was a combination of many factors, primarily manpower and procurement dollars. Costs were assigned to the levels of each management alternative such that the first level was the least expensive and successive levels increasingly more expensive. Second, benefit values were assessed for each alternative via the following direct-scaling procedure. The minimum level was assigned a score of 0 and the highest level a score of 100. Intermediate levels were assigned values by comparing their improvement over the minimum level relative to the total improvement from the minimum to the highest level. Third, the relative benefit of moving from the minimum level to the maximum level on each management alternative was assessed in comparison to all the other management alternatives. This procedure effectively assigned "importance" weights to each of the management alternatives. Then it was possible to construct a plot of relative benefit versus relative cost for all possible combinations of the management actions, or options. Such a plot would appear something like the representation in Figure 2-2.

The useful feature of this type of benefit versus cost plot is that the upper boundary of the plot constitutes the set of optimal values. That is, for any given cost, maximum benefit is obtained at the point on the upper boundary, which is a unique combination of the options available. The upper

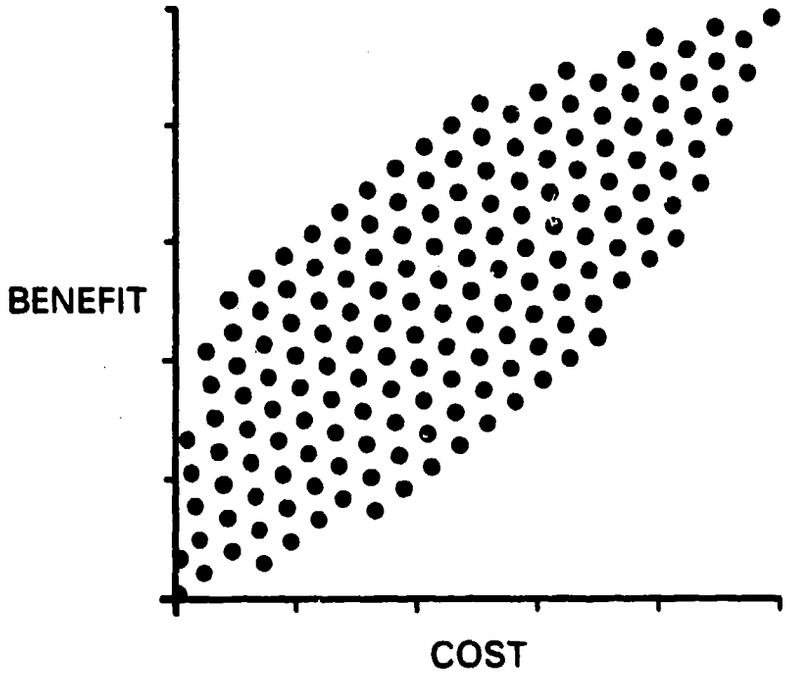

Figure 2-2
PLOT OF BENEFIT VERSUS COST FOR OPTION COMBINATIONS

boundary thus defines the "efficient curve" -- a plot of the options that have the optimal benefit-cost characteristic. Using the "efficient curve" for the values developed in the working session, the group chose seven "packages," starting with a relative cost just below the knee of the curve and increasing relative cost in reasonable increments.

In the final step, the group reviewed the packages and made several adjustments to the values assigned previously, to improve consistency across the management options. A summary of all information developed during the working session was prepared, edited, printed, and bound during the course

of the meeting and distributed to the participants as they left. Copies of this working document were also delivered to the Office of Naval Research and to OP-953[2].

2.3 Preferred Management Directions

Following the working session, a short review and evaluation of the management packages derived in the specialist meeting was planned. It was planned to do this with a select group of higher-level Navy representatives. Scheduling for this meeting was not completed owing to an inability to fix a date when the representatives could be available during the time remaining for the research effort. Therefore, DDI analysts selected tentative directions for Navy management action, which are presented in Section 3.0.

[2] Summary of the Meeting at Decisions and Designs, Incorporated, 11-13 August 1981: Development of a Management Plan for Navy Gaming and Simulation (McLean, Virginia: Decisions and Designs, Incorporated, August 1981).

3.0 RESULTS

3.1 Management Directives

The search of directives showed there was little specific coverage, or indeed mention, of simulation in the Department of Defense (DoD) and Navy directives systems[3]. However, a strong implicit relationship surfaced, with respect to the extensive management direction for planning, programming, acquisition, and support. The precedents in this area cover the handling of computer acquisitions and of defense weapon system acquisitions. Computers are commonly used with information systems, weapon systems, and large simulators, but different procedures can be applied in managing simulation programs when computers are involved.

3.1.1 Computer acquisition and support - Two families of management directives exist. One is a result of Public Law 89-306, commonly known as the Brooks Bill. The other is exemplified by Department of Defense Directive 5000.1, governing the acquisition of major defense systems. P.L. 89-306 is clearly applicable for off-the-shelf commercial computer acquisition when used in management information systems or automated information systems (MIS/AIS). The General Services Administration and Naval Data Automation Command play key roles. DODD 5000.1 is clearly applicable for weapon systems acquisition; however, difficulty arose in determining which family of directives apply when "commercial" computers are involved in weapon systems. This difficulty has been partially resolved by the establishment of criteria under which defense systems can be exempted from the

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[3] ibid, see Interim Report.

provisions of P.L. 89-306. DODD 5000.29 fits computers into the normal defense systems acquisition process under certain conditions. Further efforts by the Defense Department to clarify this "gray area" were reported to be underway at the time of this study.

The application of P.L. 89-306 in naval warfare simulation programs which use "commercial" computers would not relieve the Navy from responsibility for following the DoD process, because they are defense systems. Yet they are not business or accounting systems, where the Brooks Bill definitely applies. No advantage was found for applying P.L. 89-306. If it was applied, however, the management process would require both increased time and administrative resources. Figure 3-1 portrays the direction Navy programs should take.

3.1.2 Defense system acquisition and support - The review of these directives did not reveal any reasons that problems in managing simulation programs would arise, if they were applied. Coverage is extensive and explicit; in Defense Acquisition Regulations, DOD 5000.1, DODI 5000.2, DODD 5000.29, SECNAVINST 5000.1, SECNAVINST 5200.32, and other acquisition directives. The defense processes, then, can be used for simulator acquisition.

3.1.3 Planning and programming - The review of directives and information obtained during the study did not reveal any reasons for exceptions to the DoD and Navy planning, programming, and budgeting systems. In view of the increasing importance of naval warfare simulations, it appeared that specific reference to these defense systems in the directives system would be appropriate, possibly in a single, exclusive high-level document for Navy guidance and compliance.

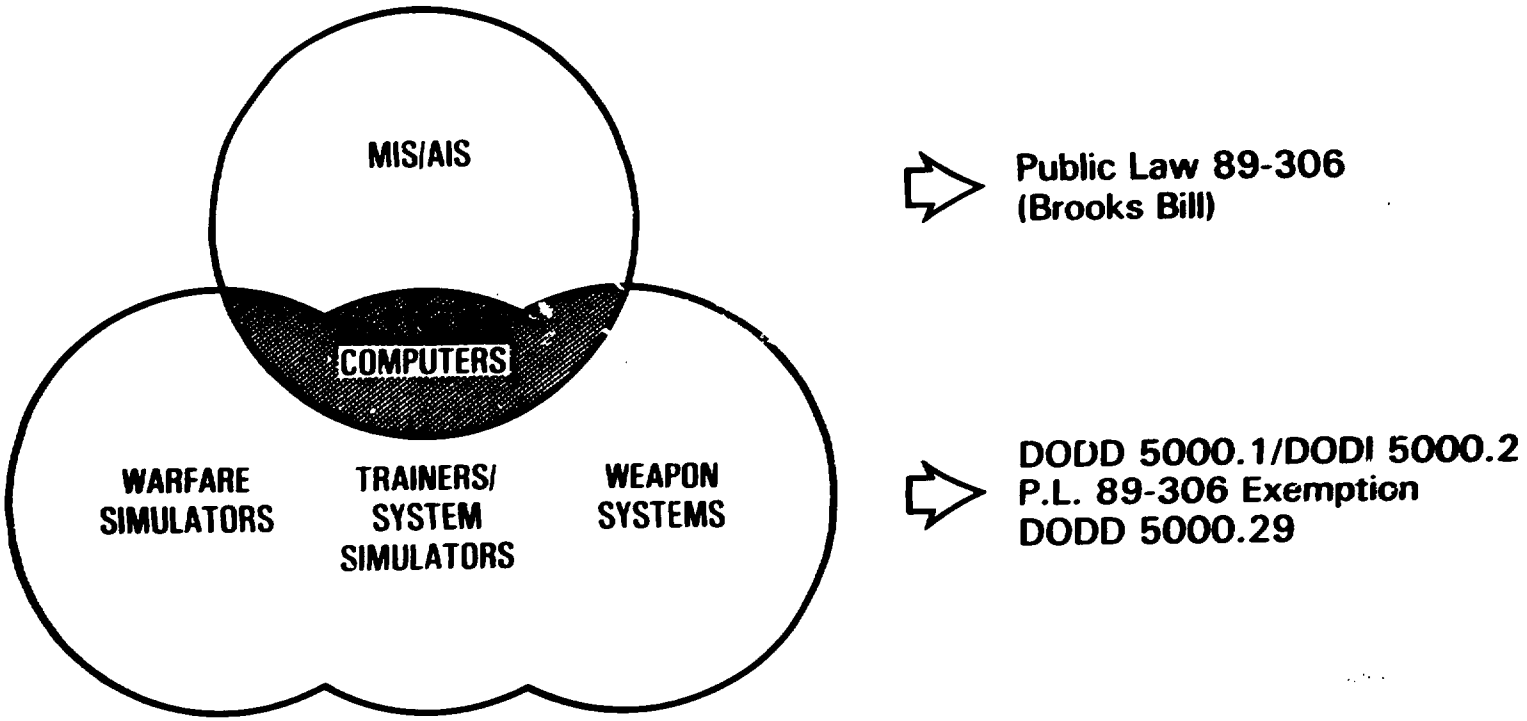

Figure 3-1

COMPUTER ACQUISITION

3.2 Management Actions

The specialists working session and independent discussions developed a number of problems and actions which would alleviate or resolve them. Appendix A provides a summary outline of the information elicited from the specialists, organized by simulation functional use, with comments on responsibilities, problems, and possible management actions. Appendix A is an overview from the perspective of the specialists but it does not include the analytical results. These are presented in this section, organized by function, as follows:

1. Simulation supporting training.
2. Simulations for tactical development and evaluation.
3. Simulations for fleet planning and operations.
4. Simulations for research, development, test, and evaluation.
5. Other simulation management topics.

3.2.1 Simulations supporting training - Significant amounts of the Navy's operating time and money is spent on training. The first step is to educate and train individuals, under the auspices of the Chief of Naval Education and Training. The second step is to continue the training of individual teams, and crews, coming under fleet responsibility, culminating in an operationally capable platform. The third step is the training of tactical elements, as well as the battle, amphibious and support groups, in the numbered fleets and theatre commands. Simulation has a growing place in the second and third steps of this process, owing largely to its usefulness and economy for training in tactical decision making. Figure 3-2 places the process in perspective in terms of "when, where, and with what." The lower three lines of the heavily outlined area in the figure are of special interest because they indicate where simulation can be a powerful adjunct

HOW TO OPERATE EQUIPMENT	TACTICAL DECISION MAKING			
CNET - FOR TRAINEES & STUDENTS	TYCOMS - FOR PLATFORM CREWS	2ND/3RD FLEET -FOR TACTICAL ELEMENTS	6TH/7TH FLEET -BATTLE, AMPHIB, & SUPPORT GROUPS	THEATRE COMMAND -FOR THEATRE FORCE
TRAINING CURRICULA	INDEPENDENT EXERCISES	FLEET EXERCISES		COMBINED EXERCISES
SCHOOLS AND TRAINING UNITS	RANGES AND OP AREAS	OPERATING AREAS		
SOME FLEET EQUIPMENT	COMBAT PLATFORMS AND EQUIPMENT			
TRAINING DEVICES	PLATFORM WARFARE SIMULATIONS	LARGE-SCALE NAVAL WARFARE SIMULATIONS		LARGE-SCALE SPECIAL SIMULATIONS (STRATEGIC)

Figure 3-2

GENERALIZED TRAINING PERSPECTIVE

to underway training in the training process. This is a major emerging requirement. The study found no noteworthy problems in simulation management for the purposes of individual education and training. The analysis for higher level training is shown in the next two sections.

Tactical Action Officers (TAO) and staff tactical decision makers:

- o Function - Warfare simulation for training Tactical Action Officers and staffs in tactical decision making.
- o Problems
  - No central point in OPNAV for management coordination.
  - CHNAVMAT not exercising adequate role in simulator development.
  - No uniform data base. Inadequate validation of data being used in different simulations.
  - Level at which simulation should be used is unknown.
- o Management Actions
  - OP-29, OP-39, and OP-59 forward program requirements to OP-095 for coordination and concurrence.
  - OP-095 establish capability to coordinate in OP-095 organization.

- OP-095 publish catalog of warfare training simulations.

- OP-095 place priority on naval warfare tactical data base program.

- CHNAVMAT establish capability to coordinate simulator development.

o Management Responsibility

- OP-02 Program Sponsor, Submarine Warfare Requirements.

- OP-03 Program Sponsor, Surface Warfare Requirements.

- OP-05 Program Sponsor, Air Warfare Requirements.

- OP-095, coordination of program requirements.

- CHNAVMAT, coordination and review of development programs.

- CHNAVEDTRA, prepare program documentation and manage schools.

Fleet CINC, Numbered Fleet Commanders, Type Commanders, and Major Afloat Staffs:

o Function - Warfare simulation for training Warfare Commanders, Fleet Commanders, Major Afloat Commanders, and their staffs in decision making.

- Problems

  - The system for establishing training requirements, and deciding whether simulation will satisfy the requirements, is not being used effectively.

  - No authoritative point in OPNAV for management coordination.

  - Lack of definitized requirements for curricula and devices.

  - Inadequate data base availability.

  - Diversion of programmed funds.

- Management Actions

  - Fleet CINCs send requirements to OP-095.

  - OP-095 coordinate requirements with mission/ platform sponsors.

  - CHNAVEDTRA prepare program documentation for OP-095.

  - CHNAVMAT coordinate and prepare development plan.

  - OP-095 publish catalog of warfare training simulations.

- Management Responsibility

  - OP-095 Program Sponsor, promulgate requirements.

  - CINCs develop requirements.

  - CHNAVEDTRA, prepare program documentation and manage schools.

  - CHNAVMAT, coordinate and review development programs.

Note that program sponsorship shifts to OP-095 as the size of the warfare simulation increases and the scope combines simulation of submarine, surface, and air elements.

Management options - The options are shown in Table 3-1 for increasing levels of cost. A set of options which the analysis indicated were reasonable is included in the heavily outlined portion of the table.

Benefit-Cost values - The values for option benefit and cost are shown in Table 3-2, normalized to a base of 1,000 points (i.e., a benefit score of 25 indicates that the option is judged to have 2.5% of the total benefit deemed available from implementing all of the options). For example, to develop

	LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4
OP-095 INVOLVEMENT WITH REQUIREMENTS FOR SIMULATORS	STATUS QUO NO COORDI-NATION	COORDINATED WITH OP-095	COORDINATED AND CHOPPED BY OP-095	OP-095 APPROVAL REQUIRED
CHNAVMAT INVOLVEMENT WITH DEVELOPMENT	NO RESPONSI-BILITY	COORDINATED WITH NAVMAT	COORDINATED, REVIEWED, COMMENTS MADE	DEVELOPMENT PLAN PROVIDED
NAVAL TACTICAL WARFARE DATA BASE	NO	YES		
OP-095 INVOLVEMENT WITH MANAGEMENT OF WARFARE TRAINING MODELS	STATUS QUO NO OP-095 MANAGEMENT	PUBLISH CATALOG OF MODELS	APPRAISE MODELS	

Table 3-1

MANAGEMENT OPTIONS FOR TRAINING

OPTION \ LEVEL	BENEFIT 1	2	3	4	5	COST 1	2	3	4	5
OP-095 SIMULATION REQUIREMENTS	0	8	14	11		0	0	0	0	
CHNAVMAT SIMULATION DEVELOPMENT	0	3	7	8		0	0	0	1	
DATA BASE	0	203				0	16			
WARFARE TRAINING	0	25	101			0	2	134		

Table 3-2

NORMALIZED BENEFIT AND COST - TRAINING OPTIONS

and use the naval tactical warfare data base was judged to obtain 20.3% of the total benefit which was attainable, at 1.6% of the total cost of the most expensive options. The analysis also showed that OP-095 should become a part of the formal process for establishing requirements and the management of simulation models for warfare training.

3.2.2 Simulation for tactical development and evaluation - The analysis classified the application of simulation for tactical development and evaluation (TAC D&E) into two categories: one where ranges were not involved (pure simulation using computers); and the other, where ranges are involved.

TAC D&E (no range involved):

- Function - Warfare simulation for use in developing tactics; using complete computer simulation of engagements.

- Problems

  - A number of similar tactical models exist, some of these are outgrowths or adaptations of RDT&E models; however, significant differences lead to poor suitability for TAC D&E. For example:

    . Data base inconsistency
    . Models too specialized
    . Models inflexible
    . Assumptions invalid

- Management Actions

  - Fleet CINCs develop statement of requirements for OP-095.

  - OP-095 identify, assess and certify computer models which, with stated limitations, can be used for TAC D&E.

  - OP-095 place priority on naval tactical warfare data base.

  - OP-095/CHNAVMAT provide capabilities for function.

- Management Responsibility

  - Fleet CINCs establish requirements.

  - OP-095 Program Sponsor.

  - CHNAVMAT Acquisition.

TAC D&E (range involved)

- o Functions - Use of tactical simulation in conjunction with major test ranges to provide more realistic tactical development and evaluation capabilities.

- o Problems

  - The close relationship between range requirements for RDT&E work, training, and TACD&E is not managed to overall Navy advantage.

  - No coordinated development planning, long- or short-range. Insufficient exploitation of Navy and DoD ranges for TAC D&E.

- o Management Actions

  - OP-095 coordinate requirements from TAC D&E viewpoint.

  - OP-095 identify capabilities and limitations of major ranges for TAC D&E, and publish catalog.

  - OP-095 provide organizational capabilities for the management function.

- o Management Responsibility

  - Fleet CINCs, develop requirements.
  - OP-02 Program Sponsor, Submarine Ranges.
  - OP-03 Program Sponsor, Surface Ranges.
  - OP-05 Program Sponsor, Air Ranges.

- OP-095 coordination of requirements.
- CHNAVMAT Acquisition.

Management options - The options are shown on the next page, in Table 3-3, for increasing levels of cost. A set of options which the analysis indicated were reasonable is included in the heavily outlined portion of the table.

Benefit-Cost values - The values for option benefit and cost are shown in Table 3-4, normalized again to a base of 1,000 points. The analysis indicated that 1.4% of the total benefit was attainable for 0.1% of the maximum cost for OP-095 to identify the capabilities and limitations of TAC D&E simulation models and publish the results. Also, 2.5% of the total benefit was attainable for 2.9% of the maximum cost for OP-095 to publish a listing of ranges suitable for TAC D&E.

OPTION \ LEVEL	BENEFIT 1	2	3	4	5	COST 1	2	3	4	5
TAC D&E COMPUTER MODELS	0	14	54	68		0	1	100	101	
TAC D&E RANGE USAGE	0	7	17	25	34	0	1	27	29	62

Table 3-4

NORMALIZED BENEFIT AND COST - TAC D&E OPTIONS

3.2.3 Simulations for fleet planning and operations - The analysis considered management of applications to meet fleet requirements in planning and operations.

	LEVEL 1	LEVEL 2	LEVEL 3	LEVEL4	LEVEL 5
OP-095 INVOLVEMENT WITH COMPUTER SIMULATION MODELS	STATUS QUO	INDENTIFY CAPABILITIES & LIMITATIONS & PUBLISH	EVALUATE & CERTIFY MODELS	DETERMINE REQUIREMENTS AND DEFICIENCIES	
OP-095 INVOLVEMENT WITH RANGE CAPABILITIES AND USE	STATUS QUO	IDENTIFY CAPABILITIES & LIMITATIONS	ASSESS SUITABILITY	PUBLISH RANGE LIST SUITABLE FOR TACD&E	DEVELOP 5-YEAR PLAN

Table 3-3

MANAGEMENT OPTIONS FOR TAC D&E

- Function - Warfare simulation for use in war plan analysis, force planning, operation/exercise planning, and in operational decision aids.

- Problems

  - No effective OPNAV sponsor to handle requirements and fund them.

  - Coherent Navy plan for development and use of simulations is lacking.

  - Need more realism and consistent results.

- Management Actions

  - OP-095 replace OP-96 as sponsor for simulation associated with the development of tactics, doctrine, procedures, and warplans.

  - Fleet CINCs generate coordinated set of requirements and increase their management activities in use of simulations, appraisal of suitability, and configuration control.

  - CHNAVMAT develop capabilities for program planning and acquisition.

  - OP-095 place priority on naval tactical warfare data base program.

- Management Responsibility

  - Fleet CINCs develop requirements.

  - OP-095 Program Sponsor. Coordinate with platform/ mission sponsors.

  - OP-094 Command and Control Program Sponsor.

  - CHNAVMAT Acquisition.

Management options - The options are shown in Table 3-5 for increasing levels of cost. A set of options which the analysis indicated were reasonable is included in the heavily outlined portion of the table.

Benefit-Cost values - The values for option benefit and cost are shown in Table 3-6, normalized, again to a base of 1,000 points. For OP-095 to be assigned as Program Sponsor and develop 5-year plan, 6.8% of the total benefit was attainable for 3.3% of the maximum cost. Also, 10.1% of the total benefit was attainable for 1.0% of the maximum cost if the fleet CINCs generated requirements, appraised models for suitability, and controlled configuration.

	LEVEL 1	LEVEL 2	LEVEL 3
OP-095 ASSIGNED AS PROGRAM SPONSOR AND DEVELOP 5-YEAR PLAN FOR POM PURPOSES	NO	YES	
CINCs GENERATE REQUIREMENTS AND INCREASE MANAGEMENT	STATUS QUO	APPRAISE MODELS FOR SUITABILITY	CONTROL CONFIGURATION

Table 3-5

MANAGEMENT OPTIONS FOR FLEET PLANNINGS OPERATIONS

OPTION \ LEVEL	BENEFIT 1	2	3	4	5	COST 1	2	3	4	5
OP-095 PROGRAM SPONSOR/ 5-YR PLAN	0	68				0	33			
CINCs REQUIREMENTS & MANAGEMENT	0	91	101			0	7	10		

Table 3-6

NORMALIZED BENEFIT AND COST-FLEET PLANNING AND OPERATIONS OPTIONS

3.2.4 Simulation for research, development, test and evaluation (RDT&E) - The analysis considered both management actions with respect to technology for simulation progress and for warfare simulation as a tool for RDT&E work.

- o Function - Warfare simulation to aid decision making for technology objectives, system concepts, and system design; i.e., simulation as an RDT&E tool.

- o Problems

  - Many models, but no uniform logic or data base.

  - No validation of models, low confidence in results.

  - Difficulty in keeping up with technology in simulation.

  - Too little coordinated use of models in RDT&E work and in other areas.

- Lack of coordination in overall planning.

o Management Actions

- OP-095 place priority on naval tactical warfare data base program.

- OP-095 initiate action to establish a single field activity with technical cognizance over warfare simulation, similar to NTEC cognizance over trainers.

- CHNAVMAT/ONR publish directory of simulation researchers.

- ONR publish recent simulation research abstracts.

- CHNAVMAT establish controls to avoid duplication and ensure validity of RDT&E warfare simulation.

o Management Responsibility

- OP-02 Program Sponsor, Submarine Weapon Systems.

- OP-03 Program Sponsor, Surface Weapon Systems.

- OP-05 Program Sponsor, Air Weapon Systems.

- OP-094 Program Sponsor, C^2 Systems.

- OP-095 Coordinator, naval warfare aspects of programs.

- OP-098 Appropriation Sponsor.

- ONR Research and Technology Manager.

- CHNAVMAT Systems Acquisition and Support Manager.

Management options - The options are shown in Table 3-7 for increasing levels of cost. A set of options which the analysis indicated were reasonable is included in the heavily outlined portion of the table.

Benefit-Cost values - The values for option benefit and cost are shown in Table 3-8, normalized again to a base of 1,000 points. Assignment of functions to a single technical activity to manage the data base for warfare simulations and to review development plans was judged to attain 4.6% of the total benefit for 0.2% of the maximum cost. A single technical resource point for these matters was considered very beneficial. Action by ONR to increase the information resources available to technical personnel was deemed effective. Also, a five-year plan for the acquisition and operation of R&D simulators and a wider review of new development projects appeared to be desirable in accordance with the analysis.

LEVEL / OPTION	BENEFIT 1	2	3	4	5	COST 1	2	3	4	5
SINGLE TECHNICAL ACTIVITY	0	41	46	96	101	0	2	2	136	137
ONR PUBLISH RESEARCH RESULTS	0	5				0	1			
ONR PUBLISH DIRECTORY RESEARCHERS	0	20				0	10			
CHNAVMAT 5-YEAR PLAN	0	34				0	33			
OP-095, CNM, CNET, ONR REVIEW	0	7				0	1			

Table 3-8

NORMALIZED BENEFIT-COST VALUES-RDT&E

	LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4	LEVEL 5
NAVAL WARFARE SIMULATION TECHNICAL ACTIVITY (NEW)	STATUS QUO	DATA BASE MANAGEMENT	REVIEW DEVELOPMENT PLANS	APPRAISE & VALIDATE MODELS	EVALUATE DEVELOPMENT PLANS
ONR PUBLISH RESEARCH RESULTS/ ABSTRACTS	NO	YES			
ONR PUBLISH DIRECTORY OF RESEARCHERS IN SIMULATION	NO	YES			
CHNVAMAT 5-YR PLAN FOR ACQUISITION & OPERATION OF R&D SIMULATORS	NO	YES			
OP-095, CNM, CNET & ONR REVIEW ALL NEW SIMULATOR DEVELOPMENT	NO	YES			

Table 3-7

MANAGEMENT OPTIONS FOR RDT&E

3.2.5 Other management topics - Four management options were developed. One called for a simulation "czar", two concerned configuration management, and the fourth concerned review of the PPBS structure regarding simulation line items. Problems related to these topics, as well as possible action and assessment results, appear below.

- o Problems
  - No standard methodologies nor technical controls for models.
  - No suitable simulations for assessing programmatic requirements.
  - No evidence of aggressive OPNAV activity in CPPG, POM, and FYDP.
  - Insufficient Fleet input to OPNAV.
  - Lack of promotion and scheduling for potential users of existing simulators.
- o Management Action
  - Clarify roles and responsibilities in OPNAV.
  - Provide sufficent staffing to ensure requirements are developed, programs are initiated, and technical/fiscal management is accomplished.
  - Review PPBS structure for possible establishment of new simulation line items.

Management options - The options are shown in Table 3-9 for increasing levels of cost. A set of options which the analysis indicated were reasonable is included in the heavily outlined portion of the table.

Benefit-Cost values - The values for option benefit and cost are shown in Table 3-10, normalized again to a base of 1,000 points. The analysis indicated that strong coordination of all areas of Navy simulation by establishing a simulation "czar" would provide 8.1% of the total benefit attainable from all options considered; however, at 16.3% of the total cost this could not be supported. Similarly, strong management by a simulation "czar" would have even greater benefit, but at 32.7% of the total cost it was not considered supportable. On the other hand, the configuration aspect of the technical management of simulation programs was considered marginally supportable for the two options discussed. The final option, a review of the PPBS structure for adequacy of simulation line items was expected to provide less than 0.1% benefit; cost was less than 0.1% of total cost. Implementation of this option was not suggested.

OPTION \ LEVEL	BENEFIT 1	2	3	4	5	COST 1	2	3	4	5
ESTABLISH SIMULATION CZAR	0	81	162			0	163	327		
CNM CONFIGURATION MGMNT-RDT&E MODELS	0	30	34			0	65	67		
OP-095 CONFIG MGMT-LRGE FLT/TAC D&E	0	36	41			0	65	67		
REVIEW PPBS FOR SIMULATION LINE ITEMS	0	0				0	0			

Table 3-10

NORMALIZED BENEFIT-COST VALUES - OTHER TOPICS

	LEVEL 1	LEVEL 2	LEVEL 3
ESTABLISH SIMULATION CZAR	STATUS QUO	CENTRAL COORDI-NATION	CENTRAL MANAGE-MENT
CHNAVMAT CONFIGURATION MANAGE-MENT OF RDT&E MODELS	STATUS QUO	ENSURE CHANGES ARE PUBLISHED & DOCUMENTED	AUTHORIZE CHANGES AND CONTROL PROGRAM
OP-095 CONFIGURATION MANAGE-MENT OF LARGE-SCALE FLEET/TAC D&E MODELS	STATUS QUO	ENSURE CHANGES ARE PUBLISHED & DOCUMENTED	AUTHORIZE CHANGES AND CONTROL PROGRAM
REVIEW PPBS STRUCTURE FOR ADEQUATE SIMULATION LINE ITEMS	NO	YES	

Table 3-9

MANAGEMENT OPTIONS - OTHER TOPICS

3.2.6 Summation of Benefit-Cost Analysis - The preceding sections discussed the benefits and costs associated with the management options, in the context of a reasonable selection of those options; i.e., those which seemed reasonable to implement based on the analysis and other factors discussed with Navy representatives during the study. To provide an overview of the reasonable management package, all options are shown in Table 3-11 and the benefit and cost values associated with the selected package are circled.

The management package which was selected provides 71.8% of the total attainable benefit for 40.5% of the total cost.

OPTION \ LEVEL	BENEFIT 1	2	3	4	5	COST 1	2	3	4	5
OP-95 SIMULATION REQUIREMENTS	0	8	14	(11)		0	0	0	(0)	
CHNAVMAT SIMULATION DEVELOPMENT	0	3	7	(8)		0	0	0	(1)	
DATA BASE	0	(203)				0	(16)			
WARFARE TRAINING MODELS	0	25	(101)			0	2	(134)		
TAC D&E COMPUTER MODELS	0	(14)	54	68		0	(1)	100	101	
TAC D&E RANGE USAGE	0	7	17	(25)	34	0	1	27	(29)	62
OP-095 PROGRAM SPONSOR/ 5-YR PLAN	0	(68)				0	(33)			
CINCs REQUIREMENTS & MANAGEMENT	0	91	(101)			0	7	(10)		
SINGLE TECHNICAL ACTIVITY	0	41	(46)	96	101	0	2	(2)	136	137
ONR PUBLISH RESEARCH RESULTS	0	(5)				0	(1)			
ONR PUBLISH DIRECTORY RESEARCHERS	0	(20)				0	(10)			
CHNAVMAT 5-YEAR PLAN	0	(34)				0	(33)			
OP-095, CNM, CNET, ONR REVIEW	0	(7)				0	(1)			
ESTABLISH SIMULATION CZAR	(0)	81	162			(0)	163	327		
CNM CONFIGURATION MGMNT-RDT&E MODELS	0	30	(34)			0	65	(67)		
OP-095 CONFIG MGMT-LRGE FLT/TAC D&E	0	36	(41)			0	65	(67)		
REVIEW PPBS FOR SIMULATION LINE ITEMS	(0)	0				(0)	0			

Table 3-11

SELECTED MANAGEMENT PACKAGE

4.0 CONCLUSIONS

The research, discussion, and intensive specialists working session provided a firm foundation for decision on management actions designed to enhance the handling of naval warfare simulation efforts. In view of the problems which surfaced and the consensus that improvement was feasible, the conclusion was that action is necessary if the Navy is to improve the management of the emerging requirements in the field of warfare simulation.

In particular, the existing management structure and processes are useful and explicit direction can be accomplished through them. The Director, Naval Warfare can play a more significant role in simulation matters, which will benefit the Navy. Those engaged in simulation work would benefit from augmentation of simulation information and technical resources. In addition, configuration controls are needed and logistic support should be handled more uniformly. Finally, a center of technical excellence in simulation matters is needed. A single field activity with this role, in an appropriate command structure, is a practical step toward implementing management actions which it can be anticipated will occur.

5.0 RECOMMENDATIONS

It is recommended that planning efforts of the Office of the Director, Naval Warfare (OP-095) be broadened to include all naval warfare computer-assisted simulation programs for the following: training in tactical decision making; fleet analyses; programmatic assessment; research, development, test, and evaluation; and systems that transcend service lines. In the foregoing areas, OP-095 should coordinate development and addressal of simulation requirements across warfare tasks; i.e., antisubmarine warfare, anti-air warfare, anti-surface warfare, strike warfare, amphibious warfare, mine warfare, and special warfare -- including command and control and electronic warfare.

It is recommended that the Navy begin efforts to establish and promulgate policies and procedures for managing simulation projects more effectively. OP-095 should lead these efforts. Procedures should be included to ensure that OP-095 can exercise centralized coordination of planning and requirements for naval warfare simulation projects which may appear in major defense system master plans or in master plans for warfare tasks.

It is further recommended that OP-095 develop and promulgate a management plan for large-scale simulations of naval warfare as they apply to training, tactical analysis, and programmatic analysis at the warfare task, battle group, amphibious group, and force level. This plan should be developed using the analytic approach that was effectively used in the research which is reported herein. To assist in formulating the plan, it is recommended that the unique capabilities of Decisions and Designs, Incorporated be considered, for bringing together knowledgeable Navy personnel and professional decision analysts to develop the preferred alternatives. The process would involve a series of

working sessions to establish the management alternatives and resource requirements, and to assess the options. These sessions would be followed by a final session to merge the results (an overall analysis) and select the actions to be included in the plan.

APPENDIX A

CONFERENCE SUMMARY
FUNCTIONAL MANAGEMENT OVERVIEW

CONFERENCE SUMMARY
FUNCTIONAL MANAGEMENT OVERVIEW

Appendix A presents an overview in outline forms based on the material discussed during the meeting of Navy specialists held 11-13 August 1981. The summary report of this meeting was submitted to the Office of Naval Research, with a copy sent to the Office of the Chief of Naval Operations, on 26 August [1].

The outline is structured in sections based on the functional areas or applications where simulation is used by the Navy. The objective decided upon at the specialists meeting was to discuss six functional areas: Training, R&D, Operations/Planning, Evaluation, Program Planning, and Resource Management. Within this framework, the specialists discussed the management aspects of Navy simulation programs ranging from relatively simple training simulators to large-scale simulations of naval warfare.

The outline includes two subsections: Responsibilities and Management Actions Required/Timing, providing a notional plan for management roles and actions. These subsections are drawn from the specialists discussion and earlier research[2]. The timing suggested for the initiation or completion of the actions noted in the subsection on Management Actions Required/Timing is arbitrary and is intended to provide a feel for a possible sequence of events. Although the scope of the study was not sufficient to develop a definite plan, this Appendix does provide an embryo management plan for consideration by the Navy.

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[1] Development of a Management Plan for Navy Gaming and Simulation Summary of the Meeting at Decisions and Designs, Inc., 11-13 August 1981.

[2] Thomas R. Rhees, Robert N. Kraft, and Kenneth P. Kuskey, Research on Management Concepts for Large-Scale Simulations of Naval Warfare, Interim Report PR 81-20-330 (McLean, Virginia: Decisions and Designs, Incorporated, July, 1981).

1.0 TRAINING

1.1 Function

Warfare simulation for training Tactical Action Officers and Staffs in decision making.

1.1.1 Responsibilities -

OP-02 Program Sponsor for Submarine Warfare requirements.

OP-03 Program Sponsor for Surface Warfare requirements.

OP-05 Program Sponsor for Air Warfare requirements.

OP-095; coordination and chop of program requirements.

CHNAVMAT; coordination and review of development programs.

CHNAVEDTRA; provides school to meet requirements.

1.1.2 Problems -

No central point in OPNAV for management coordination which can assure satisfactory use of warfare simulation in TAO training.

NAVMAT not currently exercising an adequate role in simulation development to ensure requirements will be met for TAO training.

Inadequate validation of data being used in different simulations. There is no uniform data base[3].

Undocumented deficiences in TAO training that could be using simulations. Thus the level at which simulations should be used is unknown.

1.1.3 Management Actions Required/Timing -

OP-29, OP-39 and OP-59: Forward program requirements to OP-095 for coordination and chop/Initiate by 1 January 1982. Forward development requirements to CHNAVMAT for coordination and review/ Initiate by 1 October 1982.

OP-095: Establish the capability within the OP-095 organization for coordination of program requirements/Complete by 1 October 1982. Place sufficient priority on naval warfare tactical data base program to ensure usable data base/By FY83.

CHNAVMAT: Establish the capability within NAVMAT for review and coordination of development programs/ Complete by 1 October 1982.

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[3] This problem occurs in all naval warfare simulation programs, irrespective of function, and the solution lies in an effective program to validate simulations and in rapid development and use of a standard naval warfare tactical data base.

OP-095: Publish catalog of warfare training simulations/1 October 1982.

1.2 Function

Warfare simulation for training Warfare Commanders, Fleet Commanders, Major Commanders, and their Staffs, in decision making.

1.2.1 Responsibilities -

OP-095 Program Sponsor; promulgate requirements.

CHNAVMAT; coordination and review of development programs.

CHNAVEDTRA; provide schools to meet requirements.

Fleet CINCs; provide requirements.

1.2.2 Problems -

The existing system is not being used effectively for establishing requirements for training and determining whether warfare simulations satisfy the requirements.

No central authoritative point in OPNAV for management coordination of requirements, vis-a-vis warfare simulation, to satisfy Warfare/Fleet/Major Commanders and Staffs requirements for training.

Lack of requirements definition for curricula and devices.

Inadequate data bases for use in warfare simulations.

Stronger discipline needed in use of programmed funds.

1.2.3 Management Actions Required/Timing -

Fleet CINCs: Provide requirements to OP-095 for training in naval warfare of Warfare Commanders, Fleet Commanders, Major Commanders and their Staffs/ Initial submissions by 1 March 1982, then annually for POM cycle.

OP-095: Coordinate requirements with platform and mission sponsors and promulgate requirements/1 July 1982 and continuing. Implement PPBS process/Continuing.

CHNAVEDTRA: Prepare simulation requirement documentation for OP-095 from fleet and technical inputs/1 July 1982 and continuing. Implement simulation programs to provide training/Continuing.

CHNAVMAT: Coordinate and prepare Development Plan for simulation programs/1 October 1982 and continuing.

OP-095: Publish catalog of warfare training simulation/1 October 1982.

1.3 Function

Simulation for training crew members and equipment operators in procedures.

1.3.1 Responsibilities -

The management structure and processes for the acquisition of training devices and procedure trainers, including those using simulations, is well-established and the Navy is experienced with them. Modifications were not considered.

2.0 RDT&E

2.1 Function

Warfare simulation for systems evaluation and aiding decision making with respect to technology objectives, system concepts, and system designs. (Simulation as R&D tool)

2.1.1 Responsibilities -

OP-02 Program Sponsor for Submarine weapon systems.

OP-03 Program Sponsor for Surface weapon systems.

OP-05 Program Sponsor for Air weapon systems.

OP-094 Program Sponsor for C^2 systems.

OP-095; coordination of naval warfare aspects of programs.

CHNAVMAT; systems acquisition and support.

2.1.2 Problems -

Similar or functionally identical simulations exist in RDT&E world.

No catalog of simulation tools for RDT&E work.

Inadequate validation of data; lack of uniform data base.

No appraisal of existing simulations to weed out the bad ones.

Lack of coordination and overall planning for use of simulation in RDT&E work.

RDT&E programs have sometimes developed capabilities useful for simulation in warfare training, planning, or evaluation, but the capabilities have not been managed in a manner which would assure maximum benefit to the Navy outside the R&D community.

2.1.3 Management Actions Required/Timing -

CHNAVMAT: Publish a catalog of Navy systems simulation RDT&E tools/1 October 1982.

CHNAVMAT: Establish the capability within NAVMAT for review and coordination of the acquisition of simulation tools to be used for RDT&E work/1 October 1982.

OP-095: Establish the capability within the OP-095 organization for review and coordination of RDT&E simulations, to ensure other potential Navy uses are considered and managed effectively/1 October 1982.

OP-095: Take steps to ensure the naval tactical warfare data base is used in RDT&E simulations/ FY83.

OP-095: Inititate action to provide charter authority to a single Navy agency with responsibility for technical overview and support of all Navy simulation programs/1 January 1982.

2.2 Function

Simulation technology and R&D for application in simulator development. (R&D to foster simulation)

2.2.1 Responsibilities -

OP-098 Function Sponsor for R&D

OP-095; coordination of naval warfare aspects of programs.

CHNAVRESEARCH Program Sponsor for Research and Technology.

2.2.2 Problems -

Poor coordination with other services and DARPA, and between Navy Systems Commands, ONR, and NTEC.

Poor communication on new research to OPNAV codes and technical activities.

2.2.3 Management Actions Required/Timing

ONR: Publish a directory of activities involved in simulation research and publish abstracts of research results/1 October 1982.

3.0 FLEET OPERATIONS/PLANNING

3.1 Function

Warfare simulation for use as decision aids during fleet operations and as aids in preparing operating plans.

3.1.1 Responsibilities -

Fleet CINCs; provide requirements and support.

OP-095 Program Sponsor.

CHNAVMAT Acquisition.

OP-094 Command and Control Program Sponsor.

3.1.2 Problems -

No effective OPNAV sponsorship for Fleet requirements and funding.

Lack of uniformity in operational and system parameters used in warfare simulations, hence low confidence in planning results.

3.1.3 Management Action Required/Timing -

Assign OP-095 rather than OP-096 as sponsor of naval warfare simulation support for Fleet Warplan development/1 January 1982.

Fleet CINCs: Develop current requirements and forward to OP-095/1 April 1982. Establish inter-Fleet coordination, requirements and support for large-scale operational decision aid development/ 1 July 1982. Joint Fleet catalog/1 October 1982.

OP-095/CHNAVMAT: Establish capability for carrying out responsibilies/By 1 October 1982.

OP-095: Place sufficient priority on naval warfare tactical data base program to ensure usable data base/By FY83.

OP-094: Coordinate Command and Control systems requirements and development programs with OP-095/ 1 January 1982.

4.0 TACTICS DEVELOPMENT

4.1 Function

Warfare engagement simulation for use in developing tactics. (No range involved; pure simulation)

4.1.1 Responsibilities -

Fleet CINCs; provide requirements.

OP-095 Program Sponsor.

CHNAVMAT Acquisition.

4.1.2 Problems -

A number of similar tactical models exist in the RDT&E and TACD&E worlds with no controls over validity of models/data base.

No assessment of models for suitability of use and certification.

Models too specialized and inflexible for TAC D&E.

4.1.3 Management Actions Required/Timing -

Fleet CINCs: Develop current requirements and forward to OP-095/1 April 1982. Establish inter-fleet coordination/1 January 1982.

OP-095: Identify existing computer models, establish capabilities and limitations for TAC D&E use, and publish catalog/1 October 1982.

OP-095/CHNAVMAT: Establish capability for carrying out responsibilities/By 1 October 1982.

OP-095: Place sufficient priority on naval warfare tactical data base program to ensure usable data base/By FY83.

OP-094: Coordinate Command and Control systems requirements and development programs with OP-095/ 1 January 1982.

5.0 TACTICS EVALUATION

5.1 Function

Use of tactical simulation in major test ranges and test facilities, to provide realistic tactical evaluation capabilities.

5.1.1 Responsibilities -

Fleet CINCs; provide requirements.

OP-02 Program Sponsor for Submarine Ranges/ Facilities.

OP-03 Program Sponsor for Surface Ranges/ Facilities.

OP-05 Program Sponsor for Air Ranges/Facilities.

OP-095; coordination of program requirements.

CHNAVMAT Acquisition.

5.1.2 Problems -

Insufficient exploitation of Navy and DoD ranges and facilities for TAC D&E.

No coordinated development planning, long- or short-range.

Close relationship between range/facility needs for RDT&E work, training, and TAC D&E is not being managed to Navy advantage.

5.1.3 Management Actions Required/Timing -

OP-095: Identify existing major test ranges and test facilities, establish capabilities and limitations for TAC D&E use, and publish catalog/ 1 October 1982.

6.0 PLANNING ANALYSIS

6.1 Function

Warfare simulation for analysis and evaluation of CNO plans.

6.1.1 Responsibilities -

OP-96; manage the CNO studies and analysis program.

OP-095 Functional Sponsor for naval warfare simulation.

6.1.2 Problems -

Uses of simulation in studies of planning questions, such as force levels and force mixes, is largely unexplored.

6.1.3 Management Action Required/Timing -

OP-095: Initiate a study of the potential applications of warfare simulation to analysis and evaluation of CNO plans/1 October 1982.

7.0 SIMULATION PROGRAM PLANS

7.1 Function

Acceleration of Navy uses of warfare simulation; primarily by PPBS-related program actions.

7.1.1 Responsibilities -

OP-095 General Navy-wide sponsor and coordinator for naval warfare simulation.

CHNAVMAT General Navy-wide simulator acquisition.

CHNAVRESEARCH Simulation R&T sponsor.

CHNAVEDTRA Simulation for Training sponsor

7.1.2 Problems -

The Navy has not established programs for a warfare simulation effort outside the training and RDT&E communities which are commensurate with the benefits attainable with current simulation technology.

Even the existing simulation programs lack Navy-wide perspective and coordination.

Insufficient push from the potential users of simulation and insufficient pull from the Navy Department level.

No appreciation of the many uses and benefits of warfare simulation.

Inadequate program resources are being applied to simulator technology, development, and procurement.

Poor communication between technologist, developer, and user.

Lack of adequate program review to ensure correct technical approaches and fulfillment of Navy-wide needs with warfare simulations which will consistently provide realistic and comparable outputs.

Diversion of resources through reprogramming and reallocation.

7.1.3 Management Actions Required/Timing -

OP-095: Develop a 5-year simulation plan/Commence with POM-84 cycle.

CHNAVMAT: Develop a 5-year plan for the development and operation of simulators used for R&D/ Commence with POM-84 cycle.

OPNAV/CHNAVMAT/CHNAVEDTRA/CHNAVRESEARCH: Review all new simulator development programs.

8.0 MANAGING IN-SERVICE WARFARE SIMULATIONS

8.1 General Comments

Strengthen NTEC capabilities to capitalize on simulation uses in training.

Establish a field activity to carry out CNO policy and direction for warfare simulations used in Fleet Ops/Planning and TAC D&E, including software support.

Select a lead laboratory/R&D center for simulation R&T, with product area responsibilities associated with naval warfare simulations.