

Seapower Through People

NPRDC-AP-92-12

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New Navy Challenges

Ruled by Change

Personnel Issues

Profound changes ongoing in the world -- economic, political, military, social -- are affecting our nation's future. As these powerful forces transform the Navy, people-related issues become increasingly important.

The Navy Personnel Research and Development Center (NPRDC) addresses changes within the Navy, develops methods for analyzing them, and suggests ways to manage increasing amounts of data. NPRDC also studies and validates current trends on women, minority, and family issues that are increasingly influencing personnel profiles.

In a rapidly changing environment, NPRDC continually strives to answer challenging questions. NPRDC is dedicated to providing the information needed by our senior officers and elected officials to make decisions, develop goals, and acknowledge personnel interests. People-related issues involve personnel serving in our Navy communities and on our Navy ships, planes, and submarines throughout the world.

This brief discusses NPRDC research efforts that provide electronic tools for enhancing classroom instruction, projecting accurate enlistment needs, identifying ordnance

during critical render-safe operations, and investigating family issues. Comments and inquiries are invited.

Improving Navy Instructional Materials

Authoring Instructional Materials (AIM)

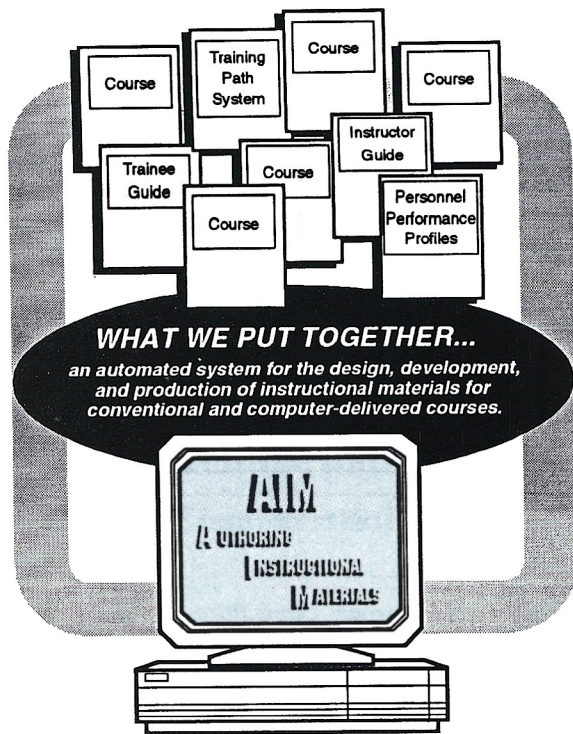
Enhancing Classroom Capabilities

Instructional materials in tune with the latest technology rely on advances made possible through the AIM project.

Feedback from organizations using AIM verify its far-reaching applications. "The Navy finally has a long overdue method for mechanized curriculum development," according to David Rushlow, Director of the Curriculum and Instructional Standards Office at AEGIS Training Center, Dahlgren, VA. Mr. Rushlow emphasizes his department's reliance on AIM, "We now have a tool for acquiring and maintaining the entire spectrum of training materials."

"When implemented, the AIM program will revolutionize the development and maintenance of training materials throughout the Navy," according to Hal Cody, Director of the Naval Sea Combat Systems Engineering Station Instruction Department at Naval Station, Norfolk, VA. He added, "As an AIM





test site since 1989, and after developing over 80 course weeks of formal curricula, we are confident in saying that AIM will eventually cut the cost of developing curricula by at least 50 percent. For once, the Navy will have an automated tool that will effectively eliminate the backlog of training materials presently requiring maintenance.”

Throughout the Navy, instructors teach over 7,000 different courses. Each course requires on-going maintenance and revision to remain efficient and effective. New equipment and advanced technologies increase the need for course development and revisions. AIM, developed by NPRDC, is a state-of-the-art electronic process. Without AIM, materials for 1 hour of instruction require from 100 to 1,000 highly experienced personnel hours to develop. The costs are high. Course development and revision expenses range from \$5,000 to \$50,000. AIM will significantly reduce this cost

by reducing the time required to develop and maintain equipment-based courses.

Jan Dickieson, NPRDC’s AIM project manager, explains, “As personnel costs increase and technological advances require new, increased, and more sophisticated training, the Navy’s ability to meet its instructional materials needs will be seriously affected by continuing budget restrictions. Regardless of funding restrictions, a severe shortage of experienced personnel with the expertise to develop or revise courses for the fleet is reaching critical levels in several training programs.”

NPRDC researchers have worked with over 20 different training sites throughout the country to design and evaluate AIM curriculum development and maintenance software. “AIM software test sites include a wide variety of training groups,” according to Jim Apple, NPRDC AIM project researcher. “We purposely sought this diversity during our development of AIM, so we could apply complex parameters to our evaluations. AIM has evolved by being responsive to users’ demands and has performed better than we envisioned.” Most training sites are using the AIM software developed for Sun 3/4 workstations.

Supporting the need for AIM in automating curriculum development, Dr. Warren A. Swanson, Director of the Curriculum Development and Instructional Standards Office at Naval Submarine School (NSS), Groton, CT, states, “We are building curricula for “A” schools in a pilot program, comparing the time requirements for manual development versus automated development using AIM. So far, the time saving benefits, and therefore the costs, are substantial. However, a subject-matter expert and someone familiar with using AIM are required to realize these time savings.”

MMC Alan B. Bird, Lead Instructor, curriculum development course and subject matter expert at NSS, elaborates on those time savings, "For Stage 1 (deliverable) curriculum development, it takes 6 months to develop a course manually; AIM takes 2 weeks. Similarly, a course developed manually in 2 to 3 months, took 3 days to develop using AIM. The formatting and baseline data creation phases of development provide the largest time savings."

In summary, automating curriculum development, production, and maintenance using AIM:

- Decreases curriculum development time by 30 to 50 percent.
- Decreases lag time by 6 to 12 months from fleet equipment changes to training materials update.
- Provides the basis for future electronic curricula.
- Allows scarce subject matter and instructional design-experts to produce high quality instruction efficiently.

Once AIM is tested and evaluated by the Chief of Naval Technical Training (CNTT), Memphis, it will be implemented Navy-wide. The Navy Training Systems Center (NTSC), Orlando, will support AIM after implementation. Soon, a Navy schoolhouse will be able to call an 800 number at NTSC and request AIM software for training program development and maintenance.

For further information, contact Ms. Jan Dickieson (NPRDC Code 132) DSN 553-9270 or commercial (619) 553-9270.

A Cost of Doing Business

Lost Time of Women and Men

Survey Investigates Impact of Pregnancy and Parenthood

Historically, the Navy force was predominately young, single males. During the last several years, increasing numbers of women, single parents (male and female), and sailors married to working spouses have presented new challenges for Navy leaders.

Family issues causing the most controversy are those associated with pregnant women and single parents. A change in policy allowing pregnant women to remain on active duty has generated strong opinions about discharge and leave policies, time off for prenatal visits and sickness, removal of pregnant women from hazardous and physically demanding environments (such as ships), and restrictions on what pregnant women can and cannot do. Like pregnant women, single parents are sometimes perceived to be an administrative burden to their command. Concern has been expressed that single parents might not be available for worldwide deployment, as is required of all Navy personnel.

Since 1988, a 3-year research project conducted by NPRDC researchers has investigated the impact of pregnancy and single parenthood among Navy enlisted personnel. The "Lost Time of Women and Men," project used a multifaceted approach. Data from two surveys have provided estimates of the Navy pregnancy rate and the number of single parents. Interviews with pregnant women and surveys completed by their supervisors allowed researchers to study the impact of pregnancy on the work center and on co-worker morale. An analysis of medical and disciplinary records compared the recorded lost time of female and male sailors. Work diaries collected at 50

commands (shore stations, ships, and squadrons) worldwide have provided information about the “unrecorded” reasons sailors are away from their jobs. Interviews with commanding officers, executive officers, department heads, and division heads documented how pregnancy and single parenthood affect mission accomplishment.

The “Lost Time of Women and Men” project found:

- The pregnancy rate of Navy women is similar to that of their civilian age cohorts.
- Lost time due solely to pregnancy (excluding convalescent leave) amounts to 1 day per month per pregnant woman in the San Diego and Norfolk areas.
- Until their third trimester, most pregnant sailors continue to work normal shifts and hours in their jobs.
- Co-workers and supervisors tend to respond positively to the news of pregnancy.
- Despite perceptions, single parents, as compared to married parents, do not burden Navy personnel or support systems.
- Women experience somewhat more absenteeism than men because of hospitalization, but men’s disciplinary lost time is much greater than women’s.

The findings on “unrecorded” lost time and mission accomplishment are currently being prepared for publication. In general, the project has found that while the Navy has had to make some accommodations (such as increasing the availability of child care) because of shifting demographics, pregnant women and single parents have not been a major drain on Navy resources. Their needs should be seen as simply a “cost of doing business.”

Research will continue to focus on pregnancy and single parenthood. A new effort will investigate how women who are transferred from ships because of pregnancy are utilized ashore. In addition, a third Navy-wide survey will be administered to continue monitoring pregnancy and single parenthood rates and to study attitudes regarding pregnancy in the work center and women in combat.

For further information, contact Dr. Marie Thomas (NPRDC Code O1E) DSN 553-7655 or commercial (619) 553-7655.

Building the Navy’s Future Enlisted Skill Inventories

Skilled Personnel Projection for Enlisted Retention (SKIPPER)

Improving Personnel Planning and Policy Analysis

When CDR Dennis Davidson, the Hospital Corpsman and Dental Technician Community Manager, or any of the other 15 managers in BUPERS’ Enlisted Community Management Branch (PERS-221) need to develop “A” school or reenlistment plans for their ratings, they turn to the SKIPPER (Skilled Personnel Projection for Enlisted Retention) model developed by researchers in NPRDC’s Manpower Systems Department.

SKIPPER is actually a suite of mathematical and statistical models that help community managers structure plans and shape policies to produce sufficient trained personnel in their rates. The system has three components: an inventory projection model (SKIPPER), a reenlistment control model (ENCORE), and an accession planning model.

SKIPPER is used by managers to forecast manning levels under current and prospective

policy scenarios. The three components work together to assess the impact of changes in reenlistment policies; "A" school input, loading and attrition; and selective reenlistment bonuses on future rating inventories.

"With the SKIPPER model, NPRDC has taken Navy Enlisted Community Management from the Stone Age to the 1990's", said CAPT Ronald R. Peterman, Head of the Enlisted Community Management Branch. "Previously, inventory projections were done on the back of an envelope. Now, a validated and consistently applied analytical method is used to produce defensible personnel projections and plans. As a result, career path management plans, recruiting and retention plans, training plans, advancement plans, and so forth, are more executable. Ultimately, it is our sailors that benefit most from NPRDC's development of SKIPPER."

CAPT G. J. O'Donnell, Director of the Enlisted Plans and Career Management Division at BUPERS added: "SKIPPER projections are essential to determine our manpower requirements profile. Knowing where we are headed, in the midst of radical change, is the key factor that allows BUPERS to maintain fleet readiness during force reduction and beyond."

The reenlistment control model in SKIPPER was developed to support the Navy's ENCORE program, which centralized control of first-term reenlistments. The model recommends the number of first-term reenlistments the Navy should accept in each skill community to meet current and out-year strength objectives.

Finally, the accession planning model allows a manager to compute an "optimal"

SKIPPER Model Inventory Screen

SKILLED PERSONNEL PROJECTION FOR ENLISTED RETENTION
Community: MMSW Gender: Aggregate

LOS	ACTUAL END INVENTORY					
	FY90 (info only)		FY91 (proj. base)		June (info only)	
	Male	Total	Male	Total	Male	Total
1-6	8474	8862	8115	8555	7404	7864
7-10	2575	2587	2407	2429	2486	2521
11-14	2254	2256	2189	2192	2147	2150
NoSRB	2402	2403	2722	2723	2874	2875
INV	15705	16108	15433	15899	14911	15410
EPA	17303		16802			
%	0.0	93.1	0.0	94.6	0.0	0.0

PROJECTED END INVENTORY							
FY92	FY93	FY94	FY95	FY96	FY97	FY98	FY99
7244	6135	5287	4777	4726	4797	4957	5096
2610	2579	2686	2652	2218	1986	1684	1467
2145	1998	1867	1763	1881	1855	1934	1925
2944	3193	3278	3337	3382	3368	3280	3188
14943	13895	13118	12529	12207	12006	11855	11676
14461	13687	12926	12548	12120	12120	12120	12120
103.3	101.5	101.5	99.8	100.7	99.1	97.8	96.3

Comments: A School inputs as of 8/23/91 including add 135 genders and 190 nucs

Warnings: Overrides in effect:

school plan. Optimal, in this case, means a plan that comes closest to meeting strength targets without exceeding schoolhouse capacities or causing unacceptable fluctuations in school enrollments.

SKIPPER was developed to support the novice computer user, as well as the sophisticated analyst. The system, which operates on a local area network, features an easy-to-learn and use WINDOWS user interface, many formatted graphs and reports, and a built-in "help" system. For the more advanced user, SKIPPER offers customizable display screens, graphical override capabilities, and extensive "what-if" modeling tools.

CDR Davidson feels that "SKIPPER provides great analyses. It is the best mechanism to plan and project outyears and to ensure having the right mix of people on the platform and on-the-job."

"The best part of SKIPPER," continued CDR Davidson, "is its accuracy. Its ability to manipulate data and to compile 'what-if' scenarios is invaluable. With increased information and accuracy, it provides us with the baseline to make better decisions. It quickly provides methods for observing trends, making changes, and performing updates. It's a beautiful tool!"

CAPT O'Donnell added, "This is the most dynamic time for Navy manpower planners since the inception of the All Volunteer Force. SKIPPER allows us to plan confidently for the future."

For further information, contact Mr. Roy Jordan (NPRDC Code 111) DSN 553-0727 or commercial (619) 553-0727.

Building a Superior Support System

Artificial Intelligence-Explosive Ordnance Disposal (AI-EOD)

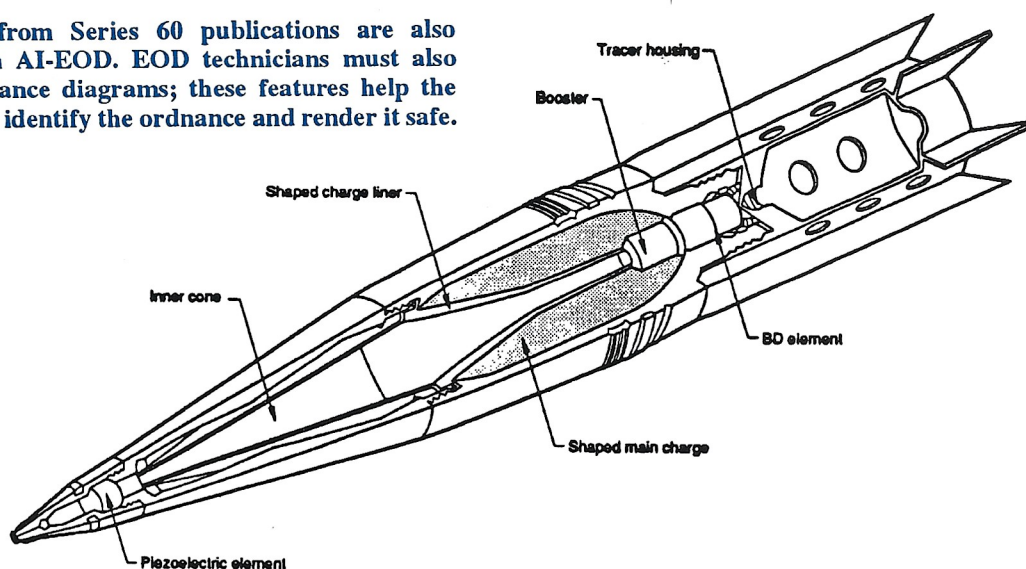
The Best Approach for Ordnance Identification

"Neural networks are going to make a dramatic change in decision-making and troubleshooting capabilities in the future," according to Dr. Harry Conner, former NPRDC principal investigator for the Joint Service Explosive Ordnance Disposal (EOD) project. "We chose artificial intelligence (AI), and the capabilities provided by its neural networking configurations, to build an AI-EOD identification, recording, and tracking system with state-of-the-art image and text management."

Researchers from NPRDC, EOD technicians from 24 operational sites of the three major services, and technicians and researchers from Los Alamos National Laboratory (LANL) and the Naval EOD Technology Center (NAVEDTECHCEN) worked together to develop the AI-EOD package. Group cooperation, teamwork, and skill was instrumental in developing the expert system component for AI-EOD.

Dr. Robert Williams, a member of the Advanced Nuclear Technology Group at LANL supports the view that their task was made easier by the cooperation and expertise exhibited by research group members. He adds that "the crucial modification that made possible electronic schemes for the identification (ID) of ordnance was the addition of ID tables to the NAVEDTECHCEN's publications. The EOD experts helped us create an auxiliary computer program to ease the difficult task of building the ID tables and to standardize the language they contained. This program was used in the

Diagrams from Series 60 publications are also included in AI-EOD. EOD technicians must also know ordnance diagrams; these features help the technicians identify the ordnance and render it safe.



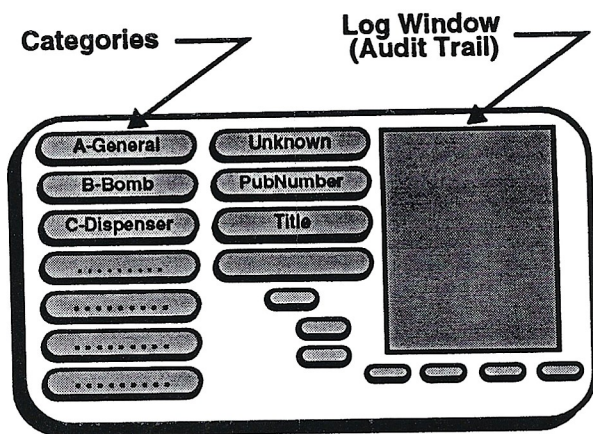
extracting of data from technical drawings and text to create ID tables for over 200 of the Series 60 publications, thus making the information palatable to computer software.”

The “smart” system, developed to identify ordnance, was modeled after neurological processes. An innovative implementation of artificial intelligence, the AI-EOD system provides a search and retrieval capability that uses any combination of available identification criteria to access the Series 60 publications, which provide technical descriptions and render-safe procedures for all known munitions.

The system operates in a Unix-based windows environment, which provides a user-friendly interface to the swift AI/neural network processing. “The system’s speed, ability to conduct ‘fuzzy’ searches, and capabilities in displaying and updating a list of relevant publications in real-time all provide tangible, vital benefits to the EOD technician in the field,” according to Dr. Williams. “Fuzzy searches can operate on

incomplete or inaccurate data,” Dr. Williams explained. “The neural network can use negative data as well; for example, specifying that ‘the fin type is not shrouded’ can limit the list of matching ordnance as can a positive statement like ‘the fin type is fixed.’ When the user requests a search, the observations to date are matched with ordnance ID information and a ranked list of the publications that describe the ordnances is provided, with the best ‘fit’ at the top. In addition, the system provides a log of the identification process which the user can annotate.” Dr. Williams continued, “This is useful for documentation and training purposes as well as to lessen confusion; the system can track up to 10 ordnance identification problems at once.”

To explain the much needed capabilities provided by the AI-EOD project, Mr. James Altier, Head of the Documentation Division, Munitions Countermeasures Department, NAVEDTECHCEN, details the system’s functions. “Instead of sorting through literally



The AI-EOD system allows four ways to search for a publication: (1) by category, (2) using the "unknown category" button, (3) by title or common name, and (4) by publication number.

thousands of pages on explosive ordnance and procedural information and spending many man-hours maintaining publication sets, joint-service EOD technicians will soon be able to interact with an 'intelligent' database that will allow them to rapidly identify ordnance items

and access critical render-safe and disposal information via a computer." Mr. Altier explains why the system's abilities are vital to technicians in the EOD field, "The AI-EOD system will greatly enhance the opportunity for mission success in a highly dangerous line of business. With attrition rates being experienced in the EOD field and the overall emphasis on downsizing throughout the Department of Defense, the potential capabilities afforded by this innovative approach to information management are not only impressive, they are essential."

The AI-EOD prototype was tested during fiscal year 1992 at 24 major operational sites throughout the Western United States and is currently operating at LANL and NAVEDTEHCEN.

In May 1992, Dr. Conner retired. For further information, contact Mr. Joseph McLachlan (NPRDC Code 13) DSN 553-7681 or commercial (619) 553-7681.

Seapower Through People is an official publication of the Navy Personnel Research and Development Center, 271 Catalina Boulevard, San Diego, California 92152-6800. The purpose of this research brief is to communicate new developments and techniques and to promote the exchange of information.

Inquiries concerning the Center can be directed to Dr. Richard C. Sorenson, Technical Director (Acting), DSN 553-7813 or commercial (619) 553-7813.

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