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Trends and Issues in U.S. Navy Manpower

1985

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Robert F. Lockman
Center for Naval Analyses

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**Trends and Issues
in U.S. Navy Manpower**

Trends and Issues in U.S. Navy Manpower

Robert F. Lockman

1985

Center for Naval Analyses
Alexandria, Virginia

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ACKNOWLEDGMENT

I have been closely associated with Navy manpower matters for over two decades. My knowledge and experience have been enriched by associations with many talented manpower analysts, planners, managers, and observers, both in and out of uniform. Without them, this book could not have been written, and they deserve thanks for making it possible.

I also appreciate the work of those at the Center for Naval Analyses who were involved in the book's production. In particular, I would like to thank Linda Garlet, who edited the manuscript and saw it through publication, Sandi Oringer, who prepared the text for printing, and Jane Pearce, who designed the cover and prepared the art.

Robert F. Lockman

1 | INTRODUCTION

Three major events in the past two decades have shaped the course of U.S. Navy manpower: the conflict in Vietnam, the transition from military conscription to the All-Volunteer Force, and the rebuilding of the Navy into a modern 600-ship force.

This book traces the trends and issues in Navy manpower during the tours of the six chiefs of naval operations who guided the uniformed Navy over this historic period. The analyses of these trends and issues by the Center for Naval Analyses are described, from which lessons are drawn that apply when searching for solutions to future manpower problems. Ways to identify and define manpower problems in the future are also presented. A glossary of terms that have special meaning in both naval and broader manpower circles is provided.

A review of the perspectives of Navy manpower planners, managers, educators, and researchers sets the scene for the book. These perspectives are integrated into an illuminating definition of manpower as a multidisciplinary field of study.

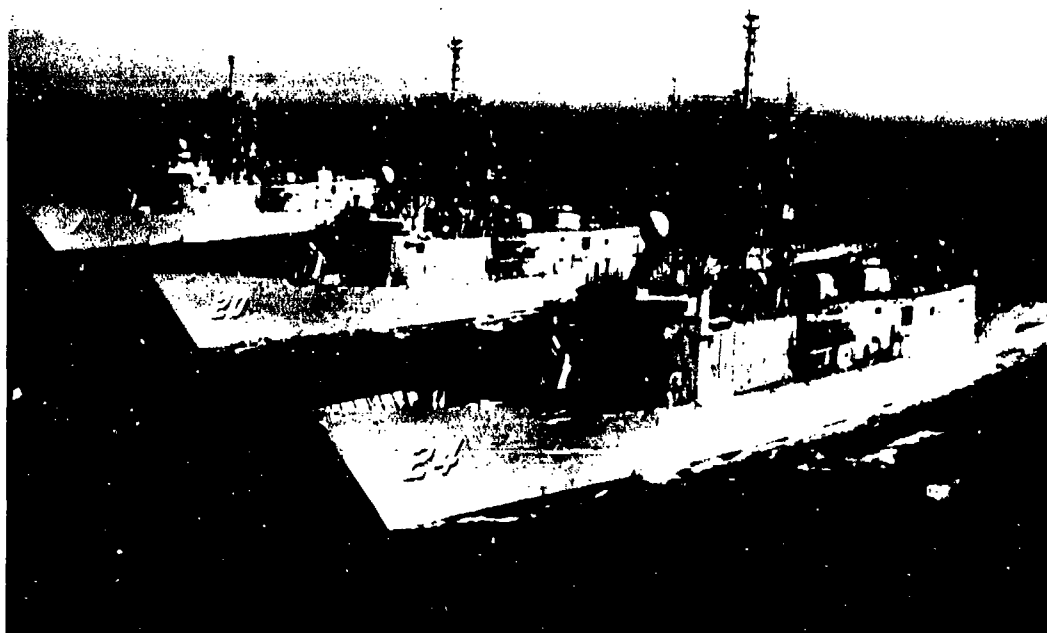
Manpower is a term with many meanings. It is associated with such things as labor-force measurement, matching the supply of people with the jobs available, government training programs, civilian staffing requirements, military manning requirements, personnel management, statistics, labor economics, organizational behavior, and manpower planning.

In the broadest sense, the term *manpower* encompasses the requirements for human resources, the supply of human resources, and ways to reconcile requirements and supply to achieve organizational goals. It subsumes the personnel and training functions necessary to manage human resources. All Navy manpower research, then, really comes down to two questions: (1) How many people of what kind are needed to operate, maintain, and support the Navy? and (2) How can those people be obtained at a reasonable cost?

MANPOWER CHANGES OVER THE LAST TWO DECADES

Many, sometimes dramatic changes in the size and nature of the Navy have occurred as a result of the Vietnam War, the All-Volunteer Force, and the now growing 600-ship Navy, as table 1 shows. Battle forces (ships and submarines) dropped from 973 to 468, and then increased to 542 as the Navy began to build to a 600-ship fleet of 15 battle groups. Total operating aircraft dropped from 7,432 to 4,268 and then grew to 5,032.

The number of officers on active duty declined from 85,000 to 62,000, then increased to 71,000. Active enlisted personnel dropped in number from 686,000 to 455,000 before climbing to 495,000. The number of direct-hire civilians dropped from 424,000 to 298,000 and has grown again to 329,000.



Official U.S. Navy Photo

Table 1. Navy Manpower and Force History, 1966-1985

FY	Forces		Manpower				Direct-Hire Civilians
			Active Navy	Naval Reserve (Drill Pay)			
	Battle Forces	Aircraft		Officers	Enlisted	Officers	
1966	947	7,432	80,000	660,000	21,000	102,000	354,000
1967	973	7,161	82,000	665,000	22,000	103,000	402,000
1968	976	7,038	85,000	675,000	21,000	103,000	416,000
1969	926	6,775	85,000	686,000	20,000	113,000	424,000
1970	769	6,157	81,000	607,000	21,000	107,000	376,000
1971	702	5,844	75,000	544,000	21,000	110,000	350,000
1972	654	5,750	73,000	512,000	21,000	104,000	341,000
1973	584	5,434	70,000	491,000	18,000	108,000	322,000
1974	511	5,332	68,000	479,000	19,000	98,000	326,000
1975	508	5,418	66,000	470,000	19,000	89,000	324,000
1976	484	4,899	64,000	458,000	19,000	78,000	311,000
1977	484	4,707	63,000	462,000	18,000	72,000	307,000
1978	468	4,546	62,000	463,000	17,000	66,000	306,000
1979	472	4,517	62,000	455,000	17,000	71,000	299,000
1980	479	4,449	63,000	460,000	17,000	70,000	298,000
1981	491	4,361	65,000	470,000	17,000	71,000	323,000
1982	513	4,305	67,000	485,000	19,000	75,000	308,000
1983	513	4,268	68,000	485,000	19,000	78,000	328,000
1984	523	4,408	68,000	492,000	21,000	81,000	332,000
1985	542	5,032	71,000	495,000	21,000	89,000	329,000

SOURCE: Department of the Navy, Office of the Controller, Historical Budget Data, NAVSO P-3614, February 1985, and NAVSO P-3523, March 1985.

Appropriations for active and reserve military pay also have shown striking changes. Below are the figures in billions of FY 1986 dollars for selected fiscal years:

	1968	1972	1976	1980	1984	1985
Total obligational authority (TOA)	\$14.7	\$14.1	\$12.2	\$10.9	\$13.2	\$18.0

CHAPTER 1

Compared with their lowest points in the late 1970s, the numbers of ships, aircraft, and active and reserve officers have increased less than 20 percent. The numbers of active enlisted personnel and direct-hire civilians have increased less than 10 percent, while the number of reserve enlisted personnel has risen 40 percent. Appropriations for active and reserve military pay went up over 60 percent, partly as a result of the addition of military retirement obligations to the budget in FY 1985. Actually, the percentage of the total Navy budget that military pay represents has varied narrowly around the 20-percent mark. When the costs of civilians are taken into account, the figure rises to over 30 percent of the total Navy budget.

In 1985, the Navy total force contained over a million people: 571,000 officers and enlisted personnel on active duty, 110,000 Selected Reservists, and 329,000 direct-hire civilians.

Other changes beyond sheer numbers have occurred in the Navy over the last twenty years. The increase in technological sophistication is obvious—67 percent of enlisted personnel on active duty today are petty officers (pay grades E-4 through E-9) compared with 53 percent twenty years ago, a 26-percent increase. Further, 23 percent of petty officers are in scientific and technical occupations involving electronics and computers, compared with less than 17 percent then, a 35-percent increase. Scientific and technical occupations now pervade the aviation, deck, engineering, and ordnance ratings, and they even show up in the administrative and clerical ratings for cryptologic and data-processing technicians.

The percentage of enlisted personnel on active duty with high school diplomas has fluctuated over the years. It rose from 81 percent in 1966 to 87 percent in 1972. It dropped to 82 percent in 1977, then climbed to over 90 percent in 1985.

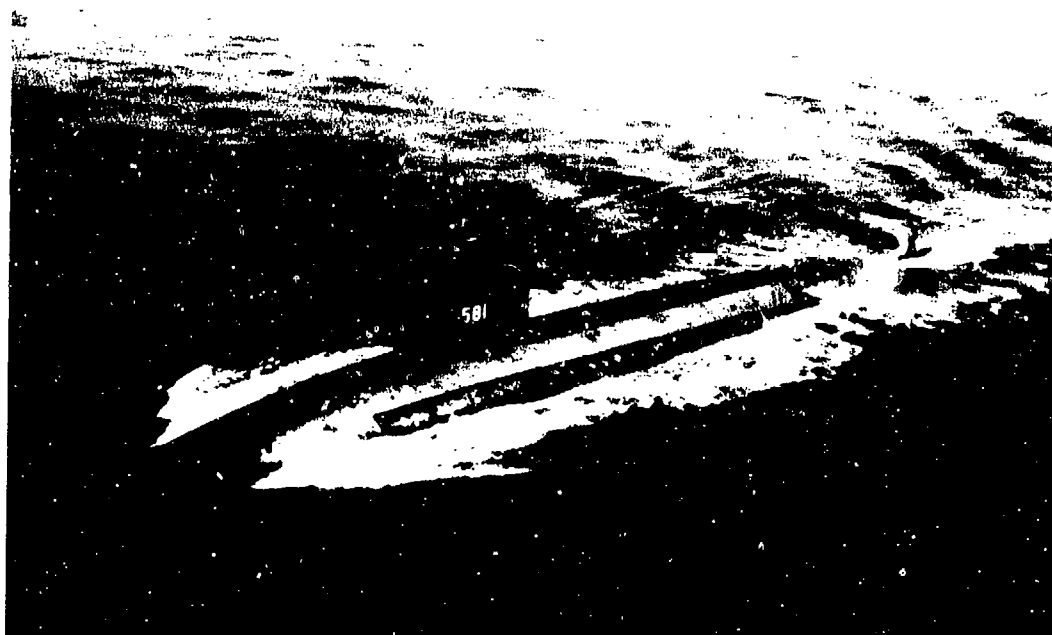
The mental ability of male Navy recruits has varied not so much on average as in distribution. Mental ability is measured by the Armed Forces Qualification Test, part of the Armed Services Vocational Aptitude Battery, which is used by all the military services for enlisted personnel selection. Thirty-five percent of the general population is in the top two mental-ability categories. Over the last two

INTRODUCTION

decades, more than 35 percent of male Navy recruits have been in those categories, except in 1979, when recruiting was a critical problem.

The number of recruits in the top two mental groups reached a high of 62 percent in the mid-1960s due to an influx of recruits who preferred enlisting in the Navy to being drafted into the Army. The figure declined to 36 percent in 1973-74 after the draft ended, rose to 44 percent in 1976, and dropped to its lowest point of 34 percent in 1979. It then climbed to 44 percent in 1984 before slacking off to 39 percent in 1985, as the youth cohort shrank and competition from the other services for quality recruits intensified.

Demographic indices also show significant changes over the past twenty years. Women represented less than 1 percent of the Navy enlisted population in 1966; today they approach 9 percent. The number of women naval officers increased from slightly more than 3 percent to nearly 10 percent. Racial minorities accounted for about 4 percent of officers and 19 percent of enlisted personnel in 1966; today they account for 7 percent and 23 percent, respectively.



Official U.S. Navy Photo

CHAPTER 1

More than numbers and characteristics are at stake here. The knowledge, skills, and motivation of Navy personnel directly affect the operation, maintenance, and support of ships, aircraft, and submarines. Properly equipped and supplied, quality manpower is the key to warfighting ability and the success of the U.S. maritime strategy.

MANPOWER ANALYSES OVER THE LAST TWO DECADES

Since the mid-1960s, the Center for Naval Analyses (CNA)* has been the mainstay in manpower analysis for the Navy, just as the RAND Corporation has been for the Air Force. CNA maintains stable, long-term relationships with Navy sponsors and is granted privileged access to information needed for research. CNA also has a manpower and training program for the Marine Corps, which is the major source of analysis for the Corps. Manpower research has increased in other Navy organizations, but their research has been less policy-oriented and more specialized than CNA's. The distinction is apparent in that their budgeting falls mainly under research and development, whereas CNA's budgeting falls mainly under studies and analyses.

In 1964, CNA completed its first manpower study, *Manning the Future Navy*, which dealt with enlisted manpower requirements and reenlistment incentives.¹ Admiral Horatio Rivero, the vice chief of naval operations at the time, called the study a significant "first cut" in these areas.

Nearly twenty years later, CNA provided the analytic basis for the chief of naval operation's Program Analysis Memorandum on Manpower, Personnel and Training.² The issues dealt with active Navy manpower and the Naval Reserve. The chief of naval operations, James D. Watkins, cited this work for its timeliness and quality. In fact, CNA's work is regularly requested and incorporated in manpower and reserve planning and programming for the annual Program Objective Memorandum, the document that describes and recommends the Navy's total resource and program objectives to the secretary of defense.

* CNA is a Federally Funded Research and Development Center, a nonprofit institution, and may not compete with private contractors.



Courtesy of McDonnell Douglas

Over the last two decades, the Navy has developed a foundation of data, methods, and expertise that should facilitate the solution of future manpower problems. In the process of forming a coherent concept of what manpower encompasses, the perspectives of those concerned with Navy manpower problems—planners and managers, as well as researchers—are described in the next chapter.

REFERENCES

1. Center for Naval Analyses, INS Study 11, *Manning the Future Navy*, by H. Kenneth Gayer et al., October 1964.
2. Office of the Chief of Naval Operations, Memo Ser 91/3C335178, *MPT CPAM—Briefing Material for Program Review Committee*, 19 December 1983, Confidential.

2 | PERSPECTIVES ON NAVY MANPOWER

This chapter describes the perspectives of the major participants in Navy manpower matters: the Office of the Secretary of the Navy, the Office of the Chief of Naval Operations, the Naval Postgraduate School, the Office of Naval Research, the Navy Personnel Research and Development Center, and the Center for Naval Analyses. The management relationships among these participants and their agents are depicted in figure 1. The two organizations in the dashed boxes are not participants as such, but they are in the line of authority for organizations that are.

The views of the participants are later integrated in the framework of the Human Resource Planning Process, which is the subject of growing attention in civilian manpower planning.¹ Appendix A contains a detailed outline of the process. At its broadest level, manpower planning is conceptualized as needs forecasting and program planning.

The purpose of needs forecasting is to improve planning and control of organizational and staffing requirements. It includes the requirements and supply facets of manpower analysis. The purpose of program planning is to improve both organizational and individual performance and career management. It includes the incentives facet of manpower analysis.

Program planning is more important to the Navy and the other military services than it is to organizations in the private sector. The lateral entry of personnel into occupations above the entry level that is characteristic of the civilian economy is rare in the military, which mostly "grows its own."



THE SECRETARY OF THE NAVY

At the top of the Navy manpower hierarchy is the secretary of the Navy (and his assistant secretary for manpower and reserve affairs). He is responsible

for the overall supervision of manpower in the Department of the Navy, for policy and administration of affairs related to military (active and inactive) and civilian personnel.² The general policies under which he operates emanate from the president, the Congress, and the secretary of defense.

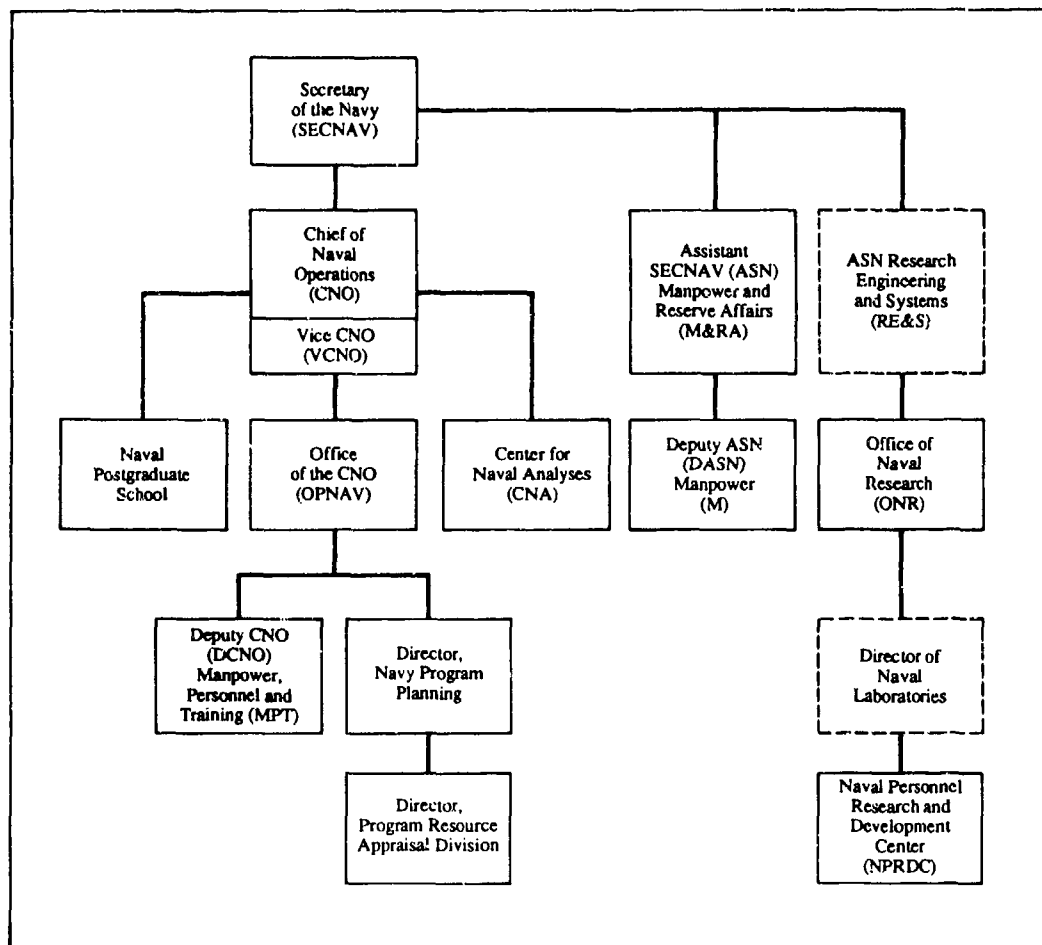


Figure 1. Relationships Among Navy Manpower Proponents, 1985

The secretary's objectives for an integrated Navy manpower planning system³ are to determine manpower requirements, provide staffing (manning) standards, provide and use manpower information, and relate support to operating manpower. These objectives are pursued by the chief of naval operations.



THE CHIEF OF NAVAL OPERATIONS

In response to the secretary's instruction, the chief of naval operations (CNO) developed the Manpower, Training, and Personnel (MANTRAPERS) Plan to deal with the management and administration of the Navy total force—active, reserve, and civilian personnel.⁴ Simply stated, the goals of this plan are to identify manpower requirements, acquire the personnel force to meet them, and sustain that force to achieve the Navy's mission. *Manpower* connotes requirements or billets, whereas *personnel* connotes the individuals who fill them. *Training* means instruction to provide individuals with the knowledge and skills needed to accomplish specific tasks.

The MANTRAPERS Plan also includes human resource management goals: maximum personnel readiness, maximum cost-effectiveness, and maximum career satisfaction for personnel and their dependents.

The steps in pursuing MANTRAPERS's goals cover a "total force life cycle" from determining manpower requirements to recruiting, training, developing, and using personnel and then sustaining and retaining them. Accomplishing these tasks requires long-range planning, including planning for manpower mobilization, as well as the shorter-range planning, programming, and budgeting functions required of all the military services by the Department of Defense.

The CNO's view of manpower is also reflected in the *Manual of Navy Total Force Manpower Policies and Procedures*⁵ and in the Navy Enlisted Personnel Management System.

The *Manual of Navy Total Force Manpower Policies and Procedures* was designed to implement the secretary of the Navy's instruction on manpower planning systems⁶ and to assist all echelons of command that manage total-force manpower resources. Written for manpower managers, the manual describes the

CHAPTER 2

processes of determining, forecasting, and programming manpower requirements for ships, squadrons, shore activities, staff, and new developments. It views manpower management as planning, forecasting, balancing, and approving manpower requirements.

The Navy Enlisted Personnel Management System, also known as the Advancement, Strength, and Training Planning (ADSTAP) system⁷, consists of several subsystems and models for planning and managing enlisted manpower, personnel, and training. It was developed in response to a directive from the secretary of defense⁸ that required all the military services to (1) design an objective or ideal force by pay grade, length of service, and occupational group⁹, (2) develop policies and methods for transition from the current force to the objective force, and (3) establish a methodology for incentive pay to effect the transition.

The ADSTAP system relies on four kinds of models¹⁰:

- Goal development models to provide information for formulating goals and planning the transition from current inventory to established objectives
- Operational planning models to provide information for formulating operating plans to control the size and quality (ratings or skills and pay grades) of the active-duty enlisted inventory
- Interface models between ADSTAP and other automated information systems that support manpower planning, programming, and distribution
- Projection models to provide forecasts of force inventory under planned and alternative policies.

The ultimate goal of the deputy chief of naval operations (DCNO) for manpower, personnel and training is to provide skilled and trained personnel in sufficient numbers to sustain the Navy's readiness in support of the nation's maritime strategy. He does this by planning, managing, and assessing manpower, personnel, and training functions and participating in programming for support of those functions.

In practice, Navy manpower is controlled by two vice admirals¹¹ on the CNO's staff. The director of Navy Program Planning allocates manpower resources to Navy sponsors and appraises the costs and benefits of current and proposed programs for meeting Navy manpower objectives. The DCNO for manpower, personnel and training manages the manpower resources and plans and establishes military and civilian personnel policies to meet manpower objectives. By law, he also serves as the chief of naval personnel and oversees the implementation of personnel policies.*

The director of Navy Program Planning also serves as scientific officer for CNA. His responsibility for conducting scientific, analytical, and technical studies through the medium of CNA is implemented by the director of the Program Resource Appraisal Division under the CNO Studies and Analyses Program.

The Navy manpower decision-makers, resource allocators, and managers since 1966 are juxtaposed in table 2 to depict the relationships of their varying tenures over the history of CNA's studies of Navy manpower.

From 1966 to 1986, there were eight secretaries of the Navy (SECNAV), six chiefs of naval operations, nine deputy chiefs of naval operations for manpower, personnel and training/chiefs of naval personnel (DCNO(MPT)/CNP), twelve directors of Navy Program Planning (DNPP), and twelve directors of the Program Resource Appraisal Division (DPRAD), formerly the Systems Analysis Division.

* At one time, the chief of naval personnel both established and executed policy in the Bureau of Naval Personnel. In 1978, the bureau was restructured and became the Navy Military Personnel Command, and policy-making responsibilities were shifted into the Office of the Chief of Naval Operations. The chief of naval personnel was combined with the DCNO for manpower, personnel and training. The assistant DCNO for manpower, personnel and training was made responsible for policy-making, and the Navy Military Personnel Command was charged with carrying it out.

CHAPTER 2

Table 2. Navy Manpower Officials, 1966-1985

FY	SECNAV	CNO	DCNO (MPT)/CNP	DNPP	DPRAD
1966	Paul Nitze	David McDonald	Benedict Semmes	Ephraim Holmes	n/a
1967	Paul Ignatius	Thomas Moorer		Bernard Clarey	Elmo Zumwalt, Jr.
1968			Charles Duncan	Fred Bennett	John Davis, Jr.
1969	John Chafee		Dick Guinn	C. Edwin Bell	
1970		Elmo Zumwalt, Jr.			Herbert Anderson
1971				Ralph Weymouth/Wirth Bagley	Stansfield Turner
1972	John Warner		David Bagley		Robert Monroe
1973				Thomas Hayward	Harry Train II
1974	J. William Middendorf II	James Holloway III			M. Staser Holcomb
1975			James Watkins	Donald Davis	
1976					Carlisle Trost
1977	W. Graham Claytor, Jr.				
1978		Thomas Hayward	Robert Baldwin	William Small	Leland Koilmorgan
1979				M. Staser Holcomb	
1980	Edward Hidaigo		Lando Zech, Jr.		
1981	John Lehman, Jr.				John Baldwin, Jr.
1982		James Watkins		Carlisle Trost	William McCauley
1983			William Lawrence		
1984					Grant Sharp
1985			Dudley Carlson	Daniel Cooper	



THE NAVAL POSTGRADUATE SCHOOL

The Naval Postgraduate School offers programs in science, engineering, operations, and administration. Its student body includes officers from all U.S. military services, approximately twenty-five allied military services, and civilian employees of the U.S. government.

The Department of Administrative Sciences, one of eleven academic departments, awards a master of science degree in management in manpower, personnel and training (MPT) analysis. The objective of this curriculum is to produce graduates who are able to:

- Identify the need for MPT analyses
- Conduct MPT analyses and effectively communicate results
- Evaluate MPT analyses done by others
- Maintain and increase their analytical skills.

The curriculum for MPT analysis as of mid-1985 prescribed courses in management fundamentals and a graduate program, including a thesis.¹² Courses in management fundamentals include economics, communication skills, accounting, computer basics, mathematics and statistics, operations research, and organizational systems. Courses in the graduate program include labor economics, personnel processes (human behavior), managerial accounting, probability and statistics, productivity analysis, manpower and personnel models, multivariate data analysis, computer applications, policy analysis, public policy processes, and management policy. A curriculum option toward the end of the program can be taken in personnel testing and selection, personnel

performance evaluation, managing planned change, human factors in systems design, or econometrics.

This curriculum evolved in response to the manpower challenges faced by the Navy. Rooted in economics, management, statistics, and psychology, it makes extensive use of quantitative techniques and models.¹³ The goal of the curriculum is to prepare graduates to serve on the staff of the DCNO for manpower, personnel and training.



THE OFFICE OF NAVAL RESEARCH

The Office of Naval Research (ONR), through its Psychological Sciences Division, has long sponsored research programs relevant to manpower, personnel, and training problems. Most of these programs are conducted under contract with civilian scientists. The division works closely with the Navy Personnel Research and Development Center, the chief of naval education and training, the Naval Medical Research and Development Command, the Marine Corps, and the naval systems commands to promote the diffusion, extension, and utilization of knowledge obtained through the contract research programs in personnel and training, organizational effectiveness, and engineering psychology.

In 1971, in anticipation of the shift from the draft to the All-Volunteer Force, the assistant secretary of the Navy for research and development provided funding and assigned to ONR the responsibility for an applied research program in manpower.¹⁴ The goals of the program were to:

- Identify near-term problems in manning the Navy
- Generate research support to ameliorate or eliminate those problems

- Emphasize the development of techniques and tools for Navy and Marine Corps manpower managers.

The resulting Manpower Research and Development Program is managed by an ONR project manager and administered by a planning committee whose members include ONR scientific officers from the Psychological Sciences Division and Mathematics Program and representatives of the naval systems commands, Navy Military Personnel Command, Navy Recruiting Command, Navy Personnel Research and Development Center, several directorates in the Office of the Chief of Naval Operations, and the Navy secretariat. A full-time secretariat provided by the Manpower Research and Advisory Services of the Smithsonian Institution ensures program support.



THE NAVY PERSONNEL RESEARCH AND DEVELOPMENT CENTER

The Navy Personnel Research and Development Center (NPRDC) is "the principal Navy activity for conducting and coordinating human resources research, development, testing, and evaluation in the areas of manpower, personnel, education, training, and human factors."¹⁵ As of 1986, NPRDC pursued its mission in three major program areas dealing with training, manpower and personnel, and human factors and organizational systems.

The Training Laboratory conducts research, development, test, and evaluation of training technology and applies that technology in schools and in the fleet to ensure the readiness of Navy and Marine Corps personnel. The Training Technology Department assesses new instructional technologies, and develops and evaluates techniques for course design, instructional delivery, and training management for both individuals and teams. It also designs, evaluates, and validates training systems to ensure that they are compatible with operational and personnel subsystems in the Navy. The Training Systems Department adapts existing and emerging training and simulation technologies to shipboard, shore-based, air,

Marine Corps, and Navy civilian workforce training requirements. The Future Technology Office focuses research on human-computer interaction and intelligence systems.¹⁶

The Manpower and Personnel Laboratory is concerned with developing technology and procedures that will enable the Navy to obtain and deploy the most effective mix of personnel (in terms of quality and quantity) to meet fleet performance and readiness requirements. The laboratory's Manpower Systems Department develops techniques and systems for determining manpower requirements, allocating manpower resources, and controlling personnel inventories. It also develops comprehensive manpower planning techniques for rapid, effective response to fluctuations in personnel resources and commitments. The Personnel Systems Department develops methods and procedures to improve recruiting, assessment, selection, classification, satisfaction, and retirement of personnel. The Computerized Testing Systems Department develops adaptive assessment systems to replace existing instruments, and evaluates new computer-based procedures to improve measurement of Navy personnel.¹⁷

The Human Factors and Organizational Systems Laboratory is concerned with developing and conducting a research and development (R&D) program to advance the behavioral technologies supporting an improved understanding of man's interaction with other individuals and with complex hardware systems. The program addresses social, technical, and physical environmental factors for enhancing performance and improving the quality of working life. The Human Factors Department conceptualizes and conducts R&D to extend knowledge of human processes underlying human-machine functions to optimize the design, development, operation, and maintenance of Navy human-machine systems. The Organizational Systems Department conducts R&D into organizational effectiveness and performance of military and civilian personnel. Individual and organizational processes are assessed to enhance motivation and performance. Techniques and strategies are developed and applied to facilitate improved quality and productivity and to design and evaluate command organizations.¹⁸



THE CENTER FOR NAVAL ANALYSES

The Center for Naval Analyses (CNA) is a not-for-profit Federally Funded Research and Development Center sponsored by the Department of the Navy and administered by the Hudson Institute. Its mission is to conduct a continuing program of research, studies, and investigations that help the Department of the Navy make decisions about the application and development of naval capabilities and that help improve current operational capabilities.

The Navy sponsors and clients of CNA's manpower program are shown in figure 2. The chief sponsors are the DCNO for manpower, personnel and training, the director of Navy Program Planning and his director of the Program Resource Appraisal Division, the director of the Office of Naval Reserve, and the director of the Strategy, Plans and Policy Division, who is the Navy's total force advocate.

Other clients include the deputy assistant secretary for manpower, the director of naval medicine, the manpower and training divisions of the DCNOs for submarine, surface, and air warfare, the commander of the Naval Military Personnel Command, and the commander of the Navy Recruiting Command.

CNA also assigns senior manpower researchers as scientific analysts to the DCNO for manpower, personnel and training and to the director of the Office of Naval Reserve. These researchers may spend up to one-quarter of their time maintaining contacts and providing short-term assistance to these clients.

The first formal CNA manpower document was published in 1964. Since then, CNA has published over 400 formal documents related to manpower, personnel, and training. In 1980, a classification scheme for these publications was developed from the *Bibliography of Manpower Research*.¹⁹ The scheme was subsequently refined, and in 1984, it was incorporated into a computerized document catalog to permit ready access to the document base.

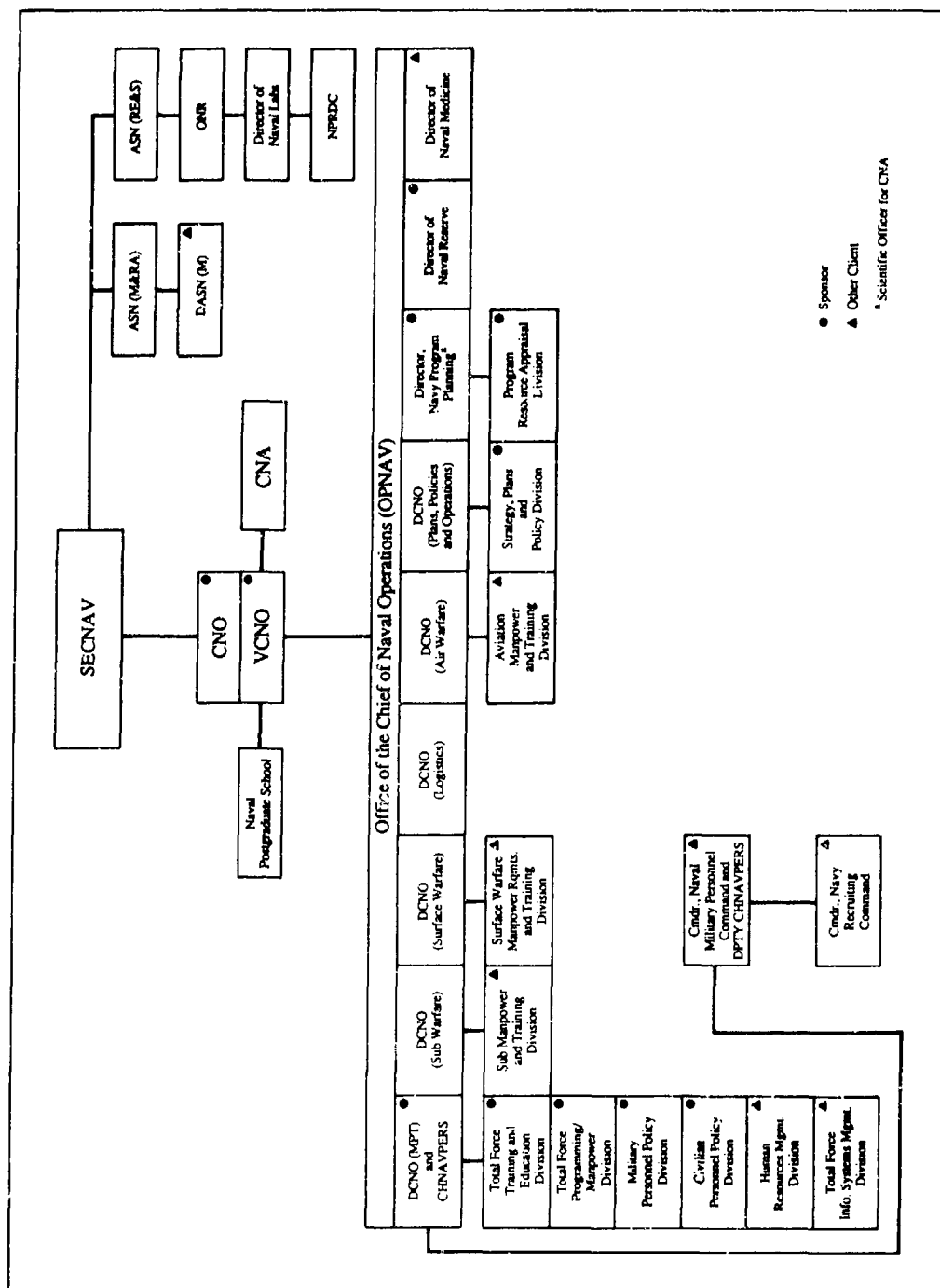


Figure 2. CNA Manpower Program Sponsors and Clients

The major categories in this scheme address manpower supply, requirements, and incentives. They are further defined by eleven subcategories of which four together account for nearly two-thirds of the formal Navy manpower topics on which CNA has published over the last two decades: supply estimation (26 percent), attrition and retention (15 percent), requirements estimation (13 percent), and recruiting and procurement (12 percent).

All but one of these topics deal with human resource availability or manpower supply. The reasons for the heavy emphasis on manpower supply include CNA's extensive role in the early 1970s in the President's Commission on an All-Volunteer Force (AVF), called the Gates Commission, CNA's support for the workability of the AVF when it began in 1973, and the Navy's (and the other services') continual concern about getting and keeping the people it needs. From a total-force perspective, most of the analyses have dealt with the enlisted community; some have dealt with officers, but only a few have been concerned with civilian personnel.

In 1978, an internal CNA review of the issues and content of manpower research urged a change in emphasis. Manpower supply—how to get the right numbers of people of the right quality at the lowest cost through recruiting, training, retention, and retirement policies—had dominated the studies agenda. Manpower requirements issues—how many people of what quality (pay grade, length of service, skills, and knowledge) are needed—though of equal importance, had not figured as prominently. The existing solutions to requirements determination included expert judgment and the development of ship- and squadron-manning documents based on industrial engineering studies and watch-standing demands. What was needed for a better solution was cost and productivity data by classes of manpower as defined by mental group, educational level, pay grade, rating, and so on. Difficulties in measuring personnel productivity, however, had hindered research toward this solution.

Since the late 1970s, advances in research methodology, data bases, and computing capabilities have permitted meaningful research on relating manpower requirements to personnel and unit productivity. At the same time and for the same reasons, more work was initiated on the design and management of incentives for accomplishing specific manning objectives. CNA's manpower work has

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been used in Navy program assessment and planning, to improve existing policies and programs and suggest new ones, in support of Navy positions before the Department of Defense and the Congress, and to enhance the knowledge and tools of the trade. For example:

- Program assessment and planning—Analyses of manpower, personnel, and training issues and options for CNO Program Appraisal Memorandums, Basic Area Assessment Memorandums, and Zone of Executability reviews; analytic support for the President's Commission on an All-Volunteer Force, the President's Commission on Military Compensation, and the Quadrennial Review of Military Compensation conducted by the Department of Defense; cost and executability analyses of active versus reserve manning initiatives; estimation of Navy wartime medical requirements and the personnel supply needed to meet them; estimation of Selected Reserve growth attainability.
- Policy and program improvement—Development of models and computation of parameters for projecting active and reserve enlisted retention as a function of Navy policies and economic variables; calculation of recruiting and training costs; revision of the officer fitness report; design of recruit screening devices; construction of a race-relations diagnostic survey.
- Navy position support—Demonstration of the cost-effectiveness of reenlistment bonuses for technical occupations and pilots; substantiation of the efficacy of recruiting resources for attaining accession goals; establishment of quality standards for recruits; enumeration of the relative costs and achievements of officers from different procurement sources.
- Enhancement of knowledge and expertise—Development of methods, data bases, and parameters for estimating personnel retention; prototype analyses of (1) ship performance in refresher training as a function of personnel, training, and equipment variables, (2) factors associated with the effectiveness of personnel in maintenance occupations aboard ship, (3) the influence of personnel

characteristics and manning on the performance of carrier-based aviation squadrons, and (4) the relative effects of quality of service life versus monetary compensation on first- and second-term reenlistments.

CNA seeks to broaden the concept of manpower studies and analyses by involving fleet representatives, incorporating study data in exercise planning, and participating in exercises to collect study data. These should be useful steps. Manning the future Navy cannot rely exclusively on an analytical or rational framework. Organizational and political processes are also important conceptual frameworks in determining outcomes.

AN INTEGRATED VIEW OF NAVY MANPOWER

The secretary of the Navy is concerned with external and internal conditions and policies that affect requirements for human resources—active, reserve, and civilian—with organizational performance management, and with management succession policy.

In the Office of the Chief of Naval Operations, the director of Navy Program Planning, as the manpower resource allocator and program evaluator, is interested in the costs and effectiveness of policies and programs across the whole human resources planning spectrum. The DCNO for manpower, personnel and training, as the manpower resource manager, also is concerned with the whole spectrum, especially requirements and availabilities and performance and career management policy.

CNA's interests span the spectrum too, but from the standpoint of policy and program analyses for the Office of the Chief of Naval Operations, CNA's main client.

The Naval Postgraduate School trains officers in an MPT analysis curriculum that is concerned with human resource requirements and availabilities, as well as performance and career management.

The Navy Personnel Research and Development Center has MPT interests that parallel those of the Naval Postgraduate School, but from the standpoint of

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conducting R&D on requirements, availabilities, and performance and career management.

The Office of Naval Research Manpower Research and Development Program funds research on human resources availability, near-term manpower needs, and career management policies.

In various ways, Navy manpower proponents draw upon several disciplines and technologies for the substance and methods of the human resources—or manpower—process of planning and management.²⁰ These disciplines and technologies are relevant not only to military manpower but to civilian manpower as well. Their variety explains why manpower seems to encompass disjointed and fractioned views; it is not a unified field, but rather a transdisciplinary one of wide applicability:

- Economics: resource allocation (manpower supply, demand, costs, and productivity measurement)
- Industrial and human factors engineering: task analysis, job design, working environment, and systems design
- Military sociology: hierarchy and authority, role assimilation, group effectiveness, and organizational and control techniques
- Organizational and industrial psychology: selection, placement, motivation, performance measurement, and organizational behavior and development
- Operations research: modeling, optimization, and forecasting techniques
- Personnel management: recruiting, promotion, transfer, termination, retirement, and mobilization
- Statistics: actuarial, demographic, economic, mathematical, and social
- Training administration and technology: design, delivery, evaluation, and management.

The next chapter contains a chronology of Navy manpower problems and solutions since the mid-1960s. It traces the manpower problems faced by the six chiefs of naval operations who led the uniformed Navy over these two decades, and describes the CNA manpower studies and analyses that addressed these problems.

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3 | A CHRONICLE OF MANPOWER CHALLENGES AND RESEARCH

From the early 1960s, when manpower research formally began at the Center for Naval Analyses (CNA), until 1986, six chiefs of naval operations (CNOs) headed the uniformed Navy. The hardware and manpower trends during this time are shown in figures 3 and 4. Each CNO faced challenges in administering the Navy, and the manpower implications of these challenges influenced the course of manpower research. This chapter traces those challenges, the manpower issues, and the CNA work that dealt with them.



**ADMIRAL DAVID L. McDONALD:
AUGUST 1963—AUGUST 1967**

*The Vietnam War Escalates and
the Navy in Washington Reorganizes*

During Admiral McDonald's tour of duty as CNO, the Navy had 947 ships, 7,400 aircraft, 740,000 active military personnel, 123,000 reservists drilling for pay, and 354,000 civilians. The Tonkin Gulf crisis led to the escalation of bombing in Vietnam, and the Navy organization in Washington, D.C., was drastically reorganized. The reorganization was a reaction to demands from the Department of Defense for cost-benefit analyses of defense programs. The Systems Analysis Division* was created in the CNO's office at that time to meet these demands.¹ CNA worked closely with the Systems Analysis Division; the division's head served as the deputy scientific officer of the Navy for CNA and administered the CNO Studies and Analysis Program under which much of CNA's work was accomplished.

* In 1982, the name of this division was changed to the Program Resource Appraisal Division.

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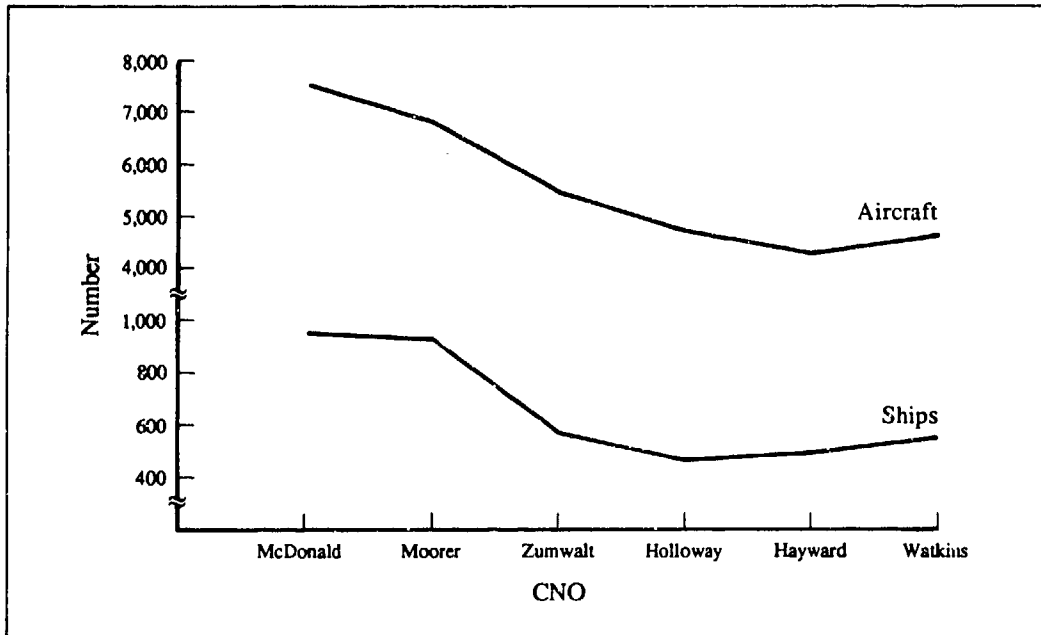


Figure 3. Navy Hardware Trends

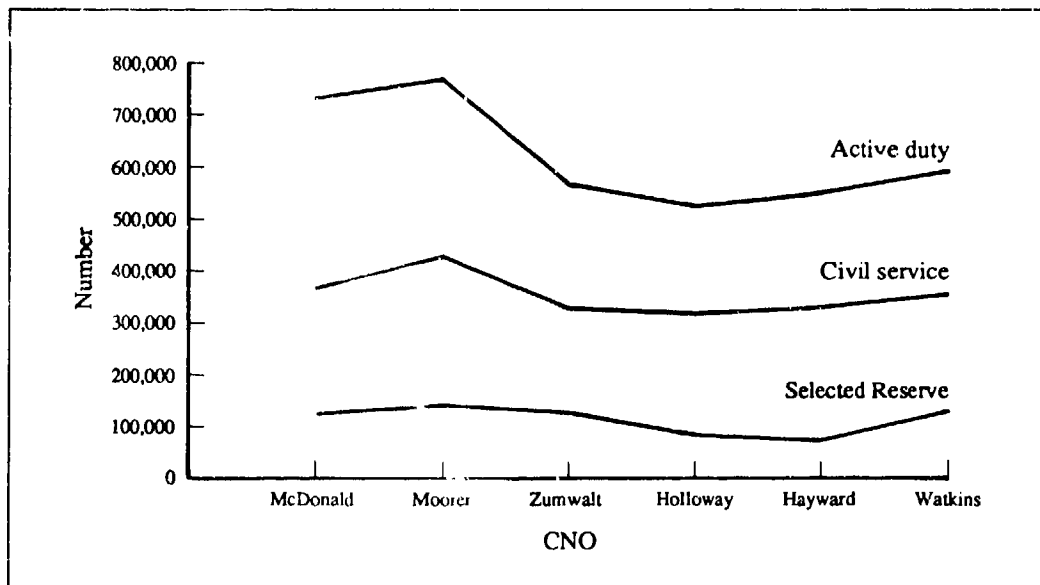


Figure 4. Navy Manpower Trends

Manpower Supply and Utilization

CNA's earliest manpower studies tried to help the Navy better understand its long-term manpower needs as the conflict in Vietnam intensified in the mid-1960s. In this context, the factors related to both officer and enlisted retention, the appeal of various enlistment incentives, and the cost and effectiveness of proposed programs for alleviating Navy manpower shortages were studied. Factors that would affect requirements for enlisted manpower, such as advances in electronics technology, were examined as well.²

Military and civilian manpower requirements were rising as U.S. involvement in Vietnam deepened. Determining manpower requirements and justifying them to the Congress frequently present problems to military manpower planners. The main reason for this is that concrete measures of personnel and unit effectiveness or readiness are difficult to obtain as a basis for establishing the validity of requirements.

Consequently, the ways in which manpower requirements were determined in selected industries, government agencies, and other military services were surveyed for potential application to the Navy.³ Military studies of manpower utilization, which affects requirements, were also reviewed for information useful to Navy manpower managers.



ADMIRAL THOMAS H. MOORER:
AUGUST 1967—JULY 1970

*The Vietnam War Peaks, the U.S. Fleet Ages,
and the Soviet Navy's Potential Grows*

When Admiral Moorer's duty as CNO began, the Navy had 973 ships, 7,200 aircraft, nearly 750,000 active military personnel, 125,000 drill-pay reservists, and over 400,000 civilians. His tenure was marked by the Navy's participation in the peak of the Vietnam War when the fleet was both aging and shrinking.

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One-third of the sea-going Navy was committed to the conflict, and nearly 60 percent of the fleet was over twenty years old. The number of ships dropped to about 770 before the U.S. began turning more combat responsibilities over to the South Vietnamese.

Moorer was concerned about the readiness of the Navy to respond to crises elsewhere in the face of a growing Soviet naval threat. But the cost of the war and the primacy of the U.S. Army in the conflict frustrated his attempts to modernize the fleet. The Navy also began to have problems with attrition of draft-induced personnel and with racial tensions that in large part stemmed from the civil rights movement, but neither became critical until the early 1970s.⁴

Manpower Readiness and the All-Volunteer Force

CNA manpower research in the Moorer era examined for the first time the relationship between manpower factors and unit performance or readiness. It also provided extensive support to the President's Commission on an All-Volunteer Force (AVF) as the nation moved toward the end of the draft and the institution of a voluntary military.

In the area of readiness, destroyer performance at the end of refresher training was demonstrated to be related to personnel, training, and equipment levels.⁵ Predictable relationships were also found between aggregate support manpower requirements (for command, training, base-operating support, and supply, maintenance, and logistics) and operating manpower requirements in the Navy's Five-Year Defense Program.⁶ These results, though just a beginning, showed that more objective measures of manpower requirements could be obtained.

Meanwhile, the President's Commission on an AVF (the "Gates Commission") was appointed in March 1969 to prepare a comprehensive plan for eliminating conscription and moving toward an all-volunteer military force. The commission's report was submitted to the president in February 1970. It expressed a unanimous belief "that the nation's interest will be better served by an all-volunteer force supported by an effective stand-by draft, than by a mixed

force of volunteers and conscripts, . . . and that the first indispensable step is to remove the present inequity in the pay of men serving their first term in the armed forces."⁷

The studies listed below show the scope of the commission's work and clearly underscore the many considerations involved in moving from conscription to voluntarism:

- Manpower and Budgetary Implications of Ending Conscription
- Qualitative Requirements
- Education Attainment of Military and Civilian Labor Forces
- Determinants of Labor Turnover in the Military
- Supply of Volunteers to the Military Services
- Supply of First-Term Enlistees
- Navy Reenlistments: The Role of Pay and Draft Pressure
- U.S. Experience With Volunteer and Conscript Forces
- European Experience With Volunteer and Conscript Forces
- Military Recruitment and Militarism in Latin America
- Military Experience as a Determinant of Veterans' Attitudes
- Military Experience as a Determinant of Veterans' Earnings
- Health Services in the All-Volunteer Force.

The economic studies of AVF manpower requirements and supply focused on cost issues. The sociopolitical perspectives lent support to the philosophy of

voluntarism and individual choice underlying the commission's recommendations. The main implication of the commission's report for the Navy and its sister services was that the days of cheap manpower were over. More efficient use of manpower resources would become a necessity if the nation were to maintain military preparedness.



ADMIRAL ELMO R. ZUMWALT, JR.:
JULY 1970—JULY 1974

*The U.S. Fleet Shrinks, the Draft Ends,
and the Soviet Navy Expands*

When Admiral Zumwalt took office, the Navy had shrunk to 769 ships, 6,200 aircraft, 547,000 active military personnel, 117,000 drill-pay reservists, and 128,000 civilians. He campaigned persistently for U.S. naval expansion to regain the initiative at sea that he believed the Navy had lost due to continued Soviet naval expansion.⁸ But the fleet and its air arm continued to shrink during his tour and those of his next two successors.

Admiral Zumwalt's operational problem was to execute the Navy's part in the "Vietnamization" of the war under the "guns and butter" policy of President Lyndon B. Johnson's administration. This meant sacrificing general-purpose naval forces to limited-war forces, particularly the riverine force. The net result was that older ships wore out before replacements were available. The fleet was rapidly decreasing to 600 ships.

A serious consequence of this aging and shrinking was a decline in morale caused by overwork, long deployments, and rigid adherence to regulations in fleet operations that was unusual under combat conditions. Further, the Navy lagged far behind the other services in reforms involving minorities and women.⁹

All of these problems came to the fore as the AVF began in 1973. To alleviate some of them, Zumwalt instituted "Z-Grams" to announce personnel

policy reforms to the Navy. They were welcomed by the junior enlisted personnel, but not by the more conservative senior ranks. Three race riots that occurred in the fleet only added to the arguments of those against reform.

Manpower Supply and Human Relations

A major effort in Navy manpower research at this time was the exploration of the problems associated with accession, retention, and human relations; these matters had become critical to the Navy. Results were summarized in a single document for Navy manpower managers.¹⁰ The topics covered in this wide-ranging effort are described below.

Because recruits who were motivated to join the Navy to avoid being drafted into the Army did not stay in the service as long as did volunteers, draft lottery data were used to estimate the chances that prospective Navy recruits were volunteers. This information helped recruiters in screening applicants for naval service.¹¹

Recommendations for increasing reenlistments were made as a result of a study that related certain characteristics and attitudes of enlisted personnel to their first-term reenlistments.¹² The influence on reenlistments of sea/shore rotation, overseas homeporting, and ship habitability were studied,¹³ and the effectiveness of reenlistment bonus and sea-pay policies were reviewed. To combat premature personnel attrition, the causes of increasing administrative and disciplinary discharges were identified, and ways to reduce them were indicated.¹⁴

During the draft, a Variable Reenlistment Bonus (VRB) had been used by the Navy to increase reenlistments. It proved to be a powerful tool for retaining enlisted personnel and influencing their allocation across ratings.¹⁵ The VRB had a significant, positive effect on first-term reenlistment rates and length of commitment, but not on second-term reenlistment rates. This information was used in the design of a new Selective Reenlistment Bonus to improve upon the VRB in the AVF.¹⁶

A special retention questionnaire was designed that drew on the best of the Navy's earlier survey work. It was administered to 3,000 men approaching the

end of their first enlistments. The reenlistment intentions of these men were related to their socioeconomic backgrounds, reasons for enlisting, opinions of the shipboard organizational climate, job satisfaction, and wives' opinions of Navy life. As a result, recommendations for changes in both retention and recruitment policies were made.¹⁷

When reenlistments decline, Navy training programs for technical personnel become more expensive because more personnel must be trained to make up for attrition. As an alternative to Navy training, contracting-out training for technical personnel—in this case electronics technicians—was studied, and its cost-effectiveness demonstrated.¹⁸

Computer models were developed for estimating the effects of different retention rates on enlisted manpower costs and man-years, and for simulating the flow of officer cohorts through the ranks as a function of attrition and promotion policies.¹⁹

In the area of human relations, a Personal Response Program developed by the Navy to facilitate understanding and cooperation between Navy personnel and host nationals was reviewed. In the process, elements that might be useful in improving relations among Navy personnel of different racial and ethnic origins were identified. At the same time, data on a lengthy human-relations questionnaire that had been developed by a Navy contractor became available. Analysis of these two sources of information culminated in the design of a short, valid human-relations questionnaire that was used to identify discrepant racial attitudes in Navy commands and to assess attitudes before and after Navy human-relations training.²⁰

To provide a behaviorally oriented evaluation of human-relations skills as well as of traditional task-oriented performance, the officer fitness report—the evaluation form routinely used by senior officers to rate their subordinates' performance—was revised. An experimental version was tested on a representative sample of over 1,000 surface, air, and submarine officers throughout the Navy. It achieved its purpose by measuring three underlying performance factors for each rank: human-relations performance, task-oriented performance, and formal communications ability. The new form was adopted by the Navy on January 31, 1974, for use with all officers on active duty.²¹

The efficiency and fairness of procedures used to select personnel for the Navy and for Navy schools, jobs, and advancement were scrutinized. Relationships among selection test scores, Class "A" school grades, advancement examination scores, and supervisory performance evaluations were analyzed. The conclusion drawn was that real gains in selection efficiency and fairness could best be achieved by basing testing, training, and performance evaluation more directly on the knowledge and skills demanded by Navy jobs.²²

Manpower Resource Analyses

A Navy Resource Study was initiated to develop the tools and expertise needed to calculate the resource implications of the Navy's Five-Year Defense Program (FYDP) under the Department of Defense's newly revised Planning, Programming, and Budgeting System.²³ The study spanned a seven-year period.²⁴

The principal programming tool the study produced was the Navy Resource Model (NARM). With its extensive data base and report generator, the NARM was widely used by the Navy for calculating the resource implications of Navy programs and alternative force structures.

Analyses of manpower programming and budgeting issues were later consolidated in a study of policies affecting officer and enlisted end-strengths.²⁵ An Officer Projection Model was developed for evaluating officer strength, promotion, and accession plans.²⁶ Also, a model called QUIKPAY was constructed to estimate the money required over the FYDP for the thirty-six entitlements contained at that time in the multi-billion dollar Military Pay account in the Navy's budget.²⁷ Ship and aircraft levels, as well as major manpower policies and inventories, were inputs to the model.

The Navy Resource Study provided short-term analyses for the annual CNO Program Analysis Memorandum on manpower, and for a variety of other manpower resource issues of interest to various Navy offices.²⁸ These issues dealt with a variety of topics:

- Permanent Change of Station funding

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- Medical services
- Officer and enlisted end-strength reductions
- Flight-training simulators
- Student and trainee billet needs
- Recruit-training-center capacities
- Specialized-training plans
- Pilot-training rates
- Recruiting shortfalls
- Enlisted retirement projections
- Mobilization manpower planning
- Management of transients, patients, and prisoners.

The studies of manpower and personnel planning and specialized training that grew out of the Navy Resource Study's efforts are mentioned later.

Peacetime Manpower Requirements

In addition to general concerns about requirements for officers and enlisted personnel in the AVF, specific concerns arose about requirements for the nuclear power program, the Naval Reserve, and Navy physicians.

The nuclear power program requires highly qualified personnel, who are in limited supply in the recruitable-male-youth population and are also sought after by the other services and civilian employers. Future requirements for these personnel—and the effects these requirements might have on the quality manning of

conventionally powered ships—were estimated so that appropriate incentive policies could be modified or initiated, if necessary, to ensure the supply of qualified personnel.²⁹

Alternative active and reserve force structures, that is, different mixes of numbers, ratings, pay grades, and experience, were analyzed in the context of the total naval forces needed to support national objectives. Different sources of Naval Reserve manpower for these structures were then examined, both with and without draft-motivated volunteers.³⁰ This was the first reserve study undertaken by CNA, but it would be ten years before the use of reserves became a pressing issue for the Navy.

With the end of the doctor draft, concern arose over the number of physicians needed by the Navy in the AVF and how to get them. Physician staffing in the Navy was compared with that of a civilian group having a similar patient population. Beneficiary populations in both health care systems were estimated, taking into account differences between them. Then the number of physicians needed to provide services comparable to the civilian plan was estimated for the expected number of Navy patients in FY 1969-74.³¹

Given an estimate of the number of physicians the Navy needed in the AVF, the next question was how to obtain them. The attractiveness to physicians and the payoff to the Navy of various financial incentives were assessed. Incentives were identified that would attract and retain enough physicians to maintain authorized staffing levels, produce a better distribution of experience than was possible under conscription, and enable the Navy to make the transition to an all-volunteer medical corps.³²



ADMIRAL JAMES L. HOLLOWAY III:
JULY 1974—JULY 1978

*U.S. Fleet Readiness Declines, While Soviet Fleet
Capabilities Increase*

By Admiral Holloway's watch as CNO, the Navy had shrunk to 511 ships, 5,300 aircraft, 547,000 active military personnel, 117,000 drill-pay reservists, and

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326,000 civilians. The Soviet navy had developed capabilities in all warfare areas and was able to conduct multidimensional operations remote from the Soviet Union.

Although the number of Soviet ships was expected to decline gradually over the next decade, the introduction of larger and more capable ships and aircraft was increasing the Soviet navy's fighting and distant-deployment capabilities. The U.S. fleet was capable of carrying out its mission and tasks within the national strategy, but with only a slim margin of superiority in those scenarios involving the most vital interests of the country.³³

To improve personnel readiness, more personnel were required than recruiting, training, and retention programs were providing. A Fleet Readiness Improvement Program was instituted in 1976 as an expedient way to achieve sea manning levels at 100 percent, but shortages persisted of mid-grade petty officers at sea.

Recruiting fell 5,000 short of goal in FY 1977, the year with the largest recruiting goal (116,000) in the All-Volunteer Force. Career reenlistments were down. Procurement of physicians and nuclear-trained officers also fell short of goals, and pilots were leaving the Navy for careers with commercial airlines.³⁴

Premature first-term attrition was approaching crisis proportions: Only 42 percent of recruits were completing their first terms of service, partly due to a sharp upswing in desertions. To bring this problem under control, the chief of naval personnel initiated an attrition-reduction program.

As a result, personnel readiness problems were vigorously attacked in the CNA Navy manpower research program. Work was done on recruiting and retention problems, inventory projection models, and personnel productivity and requirements.

Recruiting

A way was found to predict early losses of recruits. Level of education, mental group, and age explained most of the differences between recruits who survived and those who were prematurely discharged from the Navy. A table of

Success Chances of Recruits Entering the Navy (SCREEN) based on these characteristics was devised, and the Navy adopted it in October 1976 to help control recruit attrition.³⁵

Premature attrition was found to be due in part to inflated test scores and hence mental-group standings derived from the Armed Services Vocational Aptitude Battery (ASVAB). The problem was caused by irregularities in both the administration and the norming of the battery. To compensate for this problem and for inconsistencies and shifting standards in mental-group measurement since the ASVAB was introduced for all services in 1973, a conversion table that adjusted and correlated scores from the various versions of the ASVAB was provided to the Navy. This table permitted more accurate selection of recruits for Navy schooling and better prediction of their retention.³⁶

Later, a new statistical model was used to refine the SCREEN table used in recruit selection. Also, SCREEN scores were shown to relate to losses from Class "A" schools for academic failure, although not for non-academic reasons. Non-academic losses occurred earlier in training than losses due to academic failure³⁷.

Because the majority of recruits receive specialized or skill training in Class "A" schools, the planning and programming process for this training was examined to gain a better understanding of how it worked.³⁸ Then the funding required as a function of student loads was estimated to provide better information for allocating training resources.³⁹

To improve recruiting productivity, a model was developed to help the Navy Recruiting Command allocate recruit quotas and recruiters to the more than forty recruiting districts. The model related enlistments to the demographic characteristics of the districts and the command's policies.⁴⁰ Easily developed measures of district population characteristics, together with measures of quota and recruiters per district, accounted for most of the variation in enlistments across districts.

Navy concern about officer accession and retention led to an evaluation of nine programs for procuring unrestricted line officers.⁴¹ The optimal mix of these programs was determined using a model that minimized the cost of procuring and

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maintaining officers by rank and designator, while meeting unrestricted line officer requirements. Costs included pre-commissioning training costs and base, severance, and retirement pay. The programs in the optimal mix were the Naval Academy, Naval Reserve Officer Training Corps scholarship program, Naval Enlisted Scientific Education Program, Officer Candidate School, Aviation Officer Candidate School, and Naval Flight Officer Candidate School.

Retention

An enlisted supply model called PROPHET was developed to project the flow of enlisted personnel over time.⁴² This model used historical data on length of service and time until expiration of active obligated service for specified populations and groups of enlisted personnel. PROPHET reflected the effects of Navy and economic policies on enlisted retention, but did not explicitly take them into account.

Subsequent work for a Department of Defense compensation study, the Third Quadrennial Review of Military Compensation, and for the President's Commission on Military Compensation led to the development of the Annualized Cost of Leaving (ACOL) model. The ACOL model projects the effects of both Navy policies and economic conditions on enlisted retention.⁴³ It has been widely used by the Navy, the Department of Defense, and other government agencies to evaluate alternative military retirement plans and compensation programs.

Productivity and Manpower Requirements

The condition of engineering, weapons, and antisubmarine warfare equipment aboard 91 cruisers, frigates, and destroyers was shown to relate to the characteristics of shipboard maintenance personnel in six ratings.⁴⁴ These characteristics included education, mental ability, training, experience, pay grade, marital status, and race. The amount of time that equipment was down, as recorded in Casualty Reports, was used as a proxy for material condition. The effects of ship age, overhauls, and equipment complexity on material condition were taken into account. These results provided additional evidence on the objective justification of manpower requirements.

In an attempt to project enlisted requirements by rating and skill level as a function of changes in ship and aircraft forces, an Enlisted Requirements Planner (ENREP) was designed.⁴⁵ ENREP proved to have difficulty in empirically modeling the relationships between operating manpower and support manpower. Nevertheless, projections did reveal relative changes implied by different force configurations that had implications for manpower planning.

At the beginning of the AVF in 1973, future requirements for scarce high-quality personnel in the nuclear power program and the effect they might have on manning the rest of the Navy had been estimated. These estimates now were updated so that recruiting and retention policies could be modified, if necessary, to ensure quality manning of both nuclear-powered and conventionally powered ships.⁴⁶



ADMIRAL THOMAS B. HAYWARD:
JULY 1978—JULY 1982

Manpower Falls Short as the U.S. Rebuilds Its Fleet

At the beginning of Admiral Hayward's tour as CNO, the Navy reached a low point in size: 468 ships, 4,500 aircraft, 525,000 active military personnel, 83,000 drill-pay reservists, and 306,000 civilians. The fundamental problem in Hayward's eyes was the appropriate allocation of available money, material, and manpower in the Navy. Although U.S. combat capabilities were improving, so was Soviet naval power.

The Navy continued to be plagued by shortfalls in both quantity and quality of manpower. Recruiting goals were not being reached, although premature attrition was declining. Career reenlistments dropped further, resulting in a shortage of 22,000 petty officers, mostly in the sea-going and technical ratings. Retention goals for nuclear officers, physicians, and especially pilots were not being achieved. The Naval Reserve needed to be revitalized if it was to fulfill its role in the total force.

In early 1981, the new secretary of the Navy, John F. Lehman, Jr., listed three priorities for the Navy in hearings on military posture before the House Armed Services Committee: restoration of the prestige, compensation, and quality of life of Navy and Marine Corps personnel; establishment and management of a shipbuilding and ship modernization program to achieve a fleet of about 600 ships and 15 battle groups; and reform of the research, development, and procurement cycle.⁴⁷

At similar hearings a year later, Admiral Hayward noted some welcome improvements in the Navy: the fleet had grown to 490 ships with 76 more abuilding and personnel readiness had improved significantly. He attributed these improvements to "growing awareness on the part of the American public in favor of personnel serving their nation in uniform," the combined effect of two military-pay bills, and the Navy leadership's "pride and professionalism" program.⁴⁸

Manpower research during this period dealt with a wide range of topics: personnel productivity, enlisted recruiting and retention, specialized training, pilot attrition, wartime health care, and Naval Reserve issues.

Productivity and Manpower Requirements

In a search for ways to improve the determination of manpower requirements, a promising method was identified. It required quantifying tradeoffs between costs and personnel with different backgrounds and service characteristics. Measures of productivity can be unit (ship or aircraft) performance data, individual performance data, or supervisors' assessments of subordinates' performance.⁴⁹ This method would be used later in a study of the performance of carrier-based attack aircraft in relation to differences in their squadron manning.

Another approach to productivity measurement and requirements determination evaluated the advantages and disadvantages of consolidating co-located, like-aircraft squadrons.⁵⁰ Squadron consolidation would reduce officer and enlisted billets; however, it might result in decreased readiness due to management problems associated with command of larger units, reduced job-satisfaction, loss of onboard competition and deployment flexibility, and lower pilot-retention due to fewer opportunities to command. The concept was sufficiently promising that an operational test of it was recommended to the Navy.

Contingency (wartime) requirements for health care were studied for approved Navy and Marine Corps scenarios.⁵¹ A time-phased deployment list was inspected to verify troop strengths needing medical support, alternative evacuation policies were compared, and key assumptions and inputs to the Navy's medical contingency model were evaluated. The model was run to determine the sensitivity of personnel requirement output to alternative policies and other input.

Manpower Availability Analyses

Given contingency health care requirements, methods for meeting them were investigated. Personnel costs, training duration and costs, and expected response times were taken into account. Each method's compatibility with overall system planning was assessed, and special problems posed by certain medical personnel categories and specialties were identified.⁵²

The supply of male high-school-graduate enlistments to the Navy and the other military services was examined using annual data from 1975 to 1980 on enlistment contracts in forty-three Navy recruiting districts.⁵³ The effects on enlistments of military pay, GI Bill benefits, recruiters, advertising (for the Navy only), population, unemployment, Department of Labor training programs, and Department of Education student-aid programs were estimated. All but the last of these factors had significant effects on enlistment contracts, which helped explain the serious recruiting problems encountered during FYs 1978 and 1979.

To achieve enlisted manpower goals, the relative costs of enlistments and reenlistments were compared.⁵⁴ Recruiting, training, and reenlistment-bonus costs were calculated for recruits with four-year enlistments in twenty-eight groups of Navy ratings. A computer simulation model was designed to minimize the sum of these costs while meeting manpower requirements at the point of career entry, the fifth year of service. As a result, continued strong support of the Selective Reenlistment Bonus (SRB) program, additional funding, and relief from the bonus ceiling was recommended to the Navy, particularly for technical ratings with high replacement costs. On average, each SRB dollar saved two and a half dollars in recruiting and training costs to achieve the then-current inventory of reenlistees at the point of career entry. The study's conclusions were

confirmed by subsequent work that used cost data together with personnel effectiveness estimates of first-term enlisted men in twenty ratings that were derived from a survey of Navy petty officers.⁵⁵

To balance the competing considerations of retention, morale, and sea/shore distribution of enlisted personnel, two pioneering models were designed.⁵⁶ These models captured the interrelationships of rotation, billet structure, continuation behavior, and personnel inventory. The aggregate model predicted steady-state first-term and career forces for evaluating rotation policy issues in Navy program planning.⁵⁷ The expanded model dynamically simulated personnel flows for managing specific rating and detailing communities.⁵⁸

A prototype model was built to project inventories of Navy Enlisted Classification codes that are awarded to graduates of Navy Class "C" schools. These schools teach more than a thousand short courses on how to operate or maintain specific pieces of equipment.⁵⁹

The effects of advertising and of delayed-entry recruiting on Navy manpower supply were tested.⁶⁰ Advertising expenditures were incorporated into a recruit supply model of high school graduates, which also included numbers of recruiters, market conditions, and enlistment goals.⁶¹

The Delayed Entry Program (DEP) allows recruits to begin active duty up to a year after enlisting. It enables recruits to complete their civilian schooling or obtain Navy school seats that are not immediately available. It allows the Navy to smooth somewhat the pattern of seasonal accessions and reduce the variation in Navy school enrollments from month to month. The effects of recruit participation in DEP on retention during the first enlistment term were examined.⁶² The effects of mental ability and assignment to Class "A" school immediately following recruit training on first-term retention were also studied.

Other research on Navy manpower supply led to a number of products:⁶³

- A SCREEN table with an optimum qualifying score developed on a new cohort of recruits and extended for use with reservists.⁶⁴

- Predictors of first-term survival that could easily be incorporated in the recruit classification process to reduce further premature attrition for sixty ratings.⁶⁵
- Survival curves over the first eight years of service for recruits who went to Class "A" school and for those who took apprenticeship training instead,⁶⁶ derived from a new statistical model that used inexpensive cross-sectional data instead of expensive longitudinal data.⁶⁷
- Estimated responses to first- and second-term reenlistment bonuses for white-collar ratings, electronics and electrical equipment-repair ratings, and ratings with arduous working conditions, such as boiler and hull technicians.⁶⁸
- Comparison of the Navy Job-Oriented Basic Skills (JOBS) program with normal Class "A" school training.⁶⁹ Designed to compensate for the skill deficiencies of lower-aptitude personnel through job-specific remedial training, JOBS was viewed as a way of filling technical billets when Class "A" school-qualified recruits were in short supply.

Ways to expand the Navy manpower pool by qualifying more applicants for enlistment and retaining them longer were explored.⁷⁰ Among them were enlistment waivers, separate screening tables for recruits who attend Class "A" schools and those who go to apprenticeship training, and an additional rating assignment guide for recruit classification.

A step toward quantifying quality-of-life factors was taken when measures of Navy job satisfaction and dissatisfaction were shown to relate to first- and second-term reenlistments.⁷¹

The effect of compensation on pilot retention during the five years after the initial service obligation was examined by source.⁷² (Pilot training is one of the most expensive Navy training programs. The cost of fully training a pilot is estimated to be over a million dollars.) The pilot sources examined were the Naval Academy, Naval Reserve Officer Training Corps scholarship program, and Aviation

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Officer Candidate School. As a result, an efficient bonus plan was suggested for improving pilot retention.

Other important manpower and personnel issues of the 1980s were also studied.⁷³ The compensation needed to counteract the shrinkage of the pool of prospective male recruits and the increased civilian competition for Navy-trained technicians was estimated.⁷⁴ The productivity of first-term enlistees trained in Class "A" schools was compared to that of those trained on the job.⁷⁵

The readiness of carrier-based aviation squadrons as a function of squadron manning was analyzed⁷⁶ using the new technique mentioned previously.⁷⁷ After estimating the effects of experience, education, mental ability, and skill factors of enlisted personnel on aircraft-squadron performance, the degree of substitutability among these factors was examined and combined with cost data on different types of personnel to determine a minimum-cost manpower mix. This work became the basis for a planned large-scale test of differential squadron manning in the fleet.

A CNA conference on Navy manpower/personnel research in the 1980s concluded that productivity was the central issue in military manpower, and that productivity research was needed to determine best whom to enlist, reenlist, and retire.⁷⁸ Available data bases on the use of enlisted personnel, patrol aircraft performance, and recruit performance and retention were identified for analysis.

The conferees, from the military and civilian defense manpower and academic communities, also singled out two other manpower issues: the effect of Navy competition with the civilian sector for trained manpower, and the relative costs and effects of sea pay and reenlistment bonuses on retention.

Growing congressional interest in the Naval Reserve led to a study of Selected Reserve supply and skill depreciation. Recommendations for recruitment, training, and retention policies to meet reserve requirements in the 1980s were offered.⁷⁹

Work on civilian manpower problems was also initiated. Because the career development of senior civilian scientists and engineers in the naval systems commands requires technical expertise at Washington headquarters and corporate

breadth among managers, the kinds and numbers of personnel needed were compared with the backgrounds of incumbents. A simple flow model of career progression led to recommendations for resolving discrepancies in experience.⁸⁰

Retention

To measure the effects on retention of several proposals for military retirement systems, the Annualized Cost of Leaving (ACOL) model described previously was used.⁸¹ Additional analyses for other military services were made for the Department of Defense, and other kinds of retention models were described and compared with ACOL.⁸²

The effects of Regular Military Compensation (the value of all military pay and tax benefits) and reenlistment bonuses on extensions as well as reenlistments of first- and second-term enlisted personnel were estimated using the ACOL model.⁸³ For the first time, pay responses were estimated for groups of similar ratings, rather than for all ratings combined.

The retention value of the opportunity for aviation squadron command was estimated by means of a questionnaire mailed to a random sample of pilots and naval flight officers in the grades of lieutenant (junior grade) through commander. This work was done in connection with the broader study of aircraft squadron consolidation mentioned earlier.⁸⁴



ADMIRAL JAMES D. WATKINS:
JULY 1982—JULY 1986

The U.S. Navy Grows and Personnel Readiness Improves

Admiral Watkins assumed the helm of the uniformed Navy as President Ronald Reagan reaffirmed his intention to build a highly capable, 600-ship fleet to achieve U.S. maritime superiority. By early 1984, U.S. naval forces were growing.

They numbered over 500 ships, 4,300 aircraft, nearly 550,000 active military personnel, 94,000 drill-pay reservists, and almost 310,000 civilians. Personnel readiness had risen by nearly half from its low point three years earlier, and the widely reported petty officer shortage of 22,000 had fallen to 9,300 as retention surpassed goals for the third year in a row.⁸⁵

Despite these improvements, retention problems persisted in the electronics and engineering ratings. The retention of aviators had improved due to increases in aviation-officer continuation pay, but the retention of nuclear-qualified officers, though up, still fell short of goal.

A major factor contributing to improved recruiting and retention was the 11.7-percent military pay raise in FY 1981 followed by another 14.3-percent pay raise in FY 1982. The Selective Reenlistment Bonus also helped, having been adequately funded both years.⁸⁶

The Congress, however, was concerned about the cost of operating a 600-ship navy, which represents a 25-percent increase in the size of the fleet from its low point in 1980. Urged by Congress to shift greater numbers of its active forces into presumably less-costly reserves, the Navy promised to analyze the comparative cost and executability of additional reserve missions.

Meanwhile, the nation's pool of military-age manpower continued to decline toward the low point it will reach in the mid-1990s. Manning the 600-ship Navy in the face of this declining youth cohort, an improving economy, and increasing pressures on the military budget became the major concerns of manpower planners.⁸⁷

Personnel Effectiveness

To identify Navy ratings for possible end-strength changes, a method was devised that reflected rating mission criticality, replacement costs, sea-tour length, and reenlistment-bonus levels. The result was a standardized ranking of ratings from low to high.⁸⁸ Lower-ranked ratings were examined for possible civilianization. The expected increases in personnel readiness with increased Navy-wide manning in high-ranked ratings were calculated.

For measuring the performance of crewmen on Navy patrol aircraft, the usefulness of flight simulators was examined.⁸⁹ The scores made by Selected Reservists on the simulators were compared with those of aircrew members on full-time active duty.

Personnel effectiveness was assessed in another way using survey data from petty officers who supervised first-term enlistees in ten populous ratings.⁹⁰ The productivity of these enlistees was compared with that of men who had completed four-year enlistments.

Active/Reserve Manpower

Congress requires an annual report from the Navy on progress in incorporating reserve manpower into the total force. Analyses of the relative costs and capabilities of active and reserve forces were done for the Navy's total force advocate as a result of the congressional mandate.⁹¹ According to the Navy's FY 1985 Report to Congress, "the focus is on changes . . . to provide the Naval Reserve with new missions, more modern equipment, and greater integration with the active forces in keeping with the Total Force concept."⁹²

Active/reserve force mix issues were examined using a decision logic that allocated activities to the Naval Reserve and the regular Navy by defining mission requirements, developing total force options, determining their capabilities, assessing their executability in terms of geographic manpower supply, and estimating their costs.⁹³

A methodology was established for estimating annual operating and support costs of similarly equipped active and reserve aviation units. It provided a way to estimate the operations and support costs for the assets, activities, and support associated with maintaining an aviation capability.⁹⁴

The methodology for estimating the manpower executability of a proposed transfer of activities to the Naval Reserve contains four major steps: (1) selecting potential sites to evaluate, (2) determining the size and the skill distribution of the available personnel at each site, (3) determining the demand placed upon this

supply by both new and existing activities, and (4) evaluating alternative policies for alleviating shortages.⁹⁵

Extensive work was also done on reserve planning and programming issues for the director of Naval Reserve. Tools were developed for evaluating Selected Reserve (SELRES) accession, training, and retention policies, and efficient strategies were identified for achieving SELRES growth to Navy Manpower Mobilization System goals. The executability of total force initiatives at given costs and billet-substitution levels was examined.⁹⁶

A SELRES Force Projection Model was designed for estimating overall enlisted attainability and for evaluating the effects on personnel supply of alternative accession plans, compensation policies, economic forecasts, and retention behavior.⁹⁷ The costs of meeting SELRES requirements with less junior personnel were calculated.⁹⁸

Ways to improve SELRES retention were studied, and bonus levels that would induce Navy veterans to affiliate with SELRES units were estimated.⁹⁹ Recruiter incentives were revised and the concept of targeted retention management was introduced, including the screening of Navy veterans and the use of SELRES affiliation bonuses.

The number and kind of Sea and Air Mariners (SAMs) were estimated.¹⁰⁰ This enlistment program replaced the existing Ready Mariner program's input of 2,000 recruits per year with 7,000 recruits per year (down from the 10,000 originally planned). These recruits are trained on active duty and then returned to SELRES units.

Related to reserve and mobilization matters, work was completed on a National Manpower Inventory sponsored by the Office of the Assistant Secretary of Defense for Manpower and Reserve Affairs. The goal was to identify military skills in the civilian population and project them under various scenarios. One of the several efforts in the inventory's development was an empirically based model to inventory and locate military-relevant skills in the general population.¹⁰¹

Mobilization as well as peacetime requirements for Navy civilians were analyzed to identify occupational shortages by geographical area. Reservists and

retired military personnel age 60 or older were removed from the mobilization supply because of the unlikelihood of their being recalled to active duty.¹⁰²

Meanwhile, the potential budgetary savings to the Navy provided by a peacetime draft were examined.¹⁰³ A link between the attitudes of youths toward joining the military and subsequent enlistment rates enabled the peacetime recruit supply through the rest of the century to be projected.¹⁰⁴

Within the active Navy at this time, both unauthorized absence and desertion rates had soared. A careful examination revealed errors in the official counts, which, when corrected, resulted in a 16-percent drop in the unauthorized absence rates and a 30-percent drop in desertion rates. The types of personnel with the highest absence and desertion rates in Class "A" schools and at permanent duty stations were identified.¹⁰⁵

The major source of data for Navy manpower research since the late 1960s has been the Navy's Enlisted Master Records of all active-duty enlisted personnel. These records are maintained by the Naval Military Personnel Command and described in the voluminous *Manpower and Personnel Management Information Systems* manuals. A guide was prepared to facilitate the analysis of data from this data base of over 500,000 records.¹⁰⁶ As reserve data bases develop, guides for their use are also being prepared.

Incentives

Many studies of the factors that influence personnel retention have been made. A new approach revealed that increases in pay improve the quality of personnel retained (as defined by mental group derived from scores on the Armed Forces Qualification Test) as well as the number retained, and vice versa.¹⁰⁷

Measures of the quality of service life have been difficult to quantify in dollars so that tradeoffs with monetary incentives can be examined in devising retention policy. A step in this direction was made in an analysis of the effects of Permanent Change of Station (PCS) moves on wives' earnings and on their husbands' retention in the service. About half of all military wives work at least

part time. Over 25 percent of those sampled earned over \$4,200 a year in 1984 dollars.¹⁰⁸ Related to this topic, the length of time that men in sea-intensive ratings stay in one location was calculated to help evaluate policies for reducing PCS moves and increasing geographic stability.¹⁰⁹

Manpower Program Planning

Analyses of Navy manpower, personnel, and training policy options for the annual CNO Program Objectives Memorandum were documented for the FY 1984 cycle, for the first time since the CNA Navy Resource Study¹¹⁰ ended. Constraints in policy evaluation were described, force structures and compensation options evaluated, and the models used to estimate parameters for policy evaluation delineated.¹¹¹

Work for the deputy chief of naval operations for manpower, personnel and training supported the Zones of Executability (ZOE) review for the FY 1983 and 1984 cycles. The ZOE working group defined major manpower issues; reviewed models; developed sets of assumptions regarding pay, end-strength goals, retention, accession quality and quantity, and unemployment; and established the bounds of program attainability.

Help was provided to the deputy chief of naval operations for manpower, personnel and training in response to Senate tasking on recruit quality goals for FY 1985-89. A model to calculate the percentage of upper-mental-group recruits needed to fulfill Class "A" school plans was developed, and the percentage of high school graduates needed to control first-term attrition was estimated.¹¹²

Assistance was provided to the director of Navy Program Planning for the Reserve Program Analysis in FY 1984. Detailed work was done on issues in the Naval Reserve Baseline Area Appraisal in FY 1985. Manpower growth areas were identified and personnel attainability and costs were estimated for the SELRES and its full-time support by Training and Administration of Reserves personnel.

These kinds of analyses provide access to Navy councils and expertise, rapid feedback on results, and knowledge about issues needing further research.



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SUMMARY

This chronicle of Navy manpower issues and research spanned the tours of six chiefs of naval operations over two decades that included the buildup and draw down of forces in Vietnam, the introduction of the AVF, and the buildup of the 600-ship Navy of 15 battle groups. Much of the manpower research generated by these events took the form of work conducted under the CNO Studies and Analysis Program.

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Shorter-term manpower analyses explored new research areas that eventually led to studies. Others attempted to answer Navy questions that could not wait for further study. The latter group included work on CNO Program Assessment Memoranda, Zone of Executability assessments, and demands of flag officers. Many drew upon previous study products and suggested topics for further analysis.

Both the long- and short-term efforts of the manpower program have contributed to manning the Navy effectively, efficiently, and equitably. Next, a broader context of manpower problem-solving is described, and the findings of past analyses are distilled to provide guidelines for manning the future Navy.

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4 | MANNING THE FUTURE NAVY



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Future manpower problems can be anticipated before they become critical, and multiple approaches can be used to solve or alleviate them. Although great strides have been made in developing computerized manpower data bases and rational analytic techniques, other conceptual frameworks can broaden research perspectives and promote problem-solving.

PROBLEM IDENTIFICATION AND DEFINITION

A variety of techniques are available for searching out problems before they become critical.¹ They include:

- Compiling documented problems and screening them for potential seriousness and indications of inadequate and late attention
- Surveying the opinions of decision-makers, managers, and technical experts about anticipated future problems
- Studying other organizations or nations to identify problems overlooked in the resident organization
- Examining discontinuities in key trends that are forced by absurdities that would appear if the trends continue
- Comparing alternative interpretations at different levels of organizational structure for problems viewed as serious and persistent, with the purpose of identifying their future manifestations
- Searching for significant opportunities for technological or social innovations that might be exploited in the current political, social, or organizational climate
- Conducting an overview of futures research.

Problems identified by such techniques can be rated according to their importance by using such criteria as:²

- Intensity, distribution, and duration of potential impact
- Time to potential criticality
- Links to other problems
- Solvability.

By employing these techniques, the interrelationships of various problems can be revealed. These interrelationships may be such that dealing with them in isolation is unwise or impossible. "Interproblem synergy" may lead to the insight that "the larger holistic pattern may . . . be more tractable than its individual component problems. . . . The problems may confront a dispersed and largely uncoordinated set of decision-makers who approach them with varied emphases and objectives . . . , a wide range of quite different perspectives."³ Consequently, problem-solving requires the participation of all interested parties in an exploratory rather than confrontational mode. What is seen as a problem is a matter of perspective, and the Navy, the Department of Defense, and the Congress each have different perspectives.

PROBLEM-SOLVING APPROACHES

Most current problems in manpower, personnel, and training were anticipated or suspected using the techniques cited above. Since the All-Volunteer Force began in 1973, cyclical problems in recruiting and retention have been associated with economic factors—the unemployment rate and military pay relative to civilian pay—and attitudes about the military services, which correlate with them. Consequently, supply problems for a given set of manpower requirements can generally be anticipated without difficulty.

But the proposed solutions to manpower supply problems often involve budget increases, which depend on Congress. The Congress is unsympathetic to increasing military budgets in times of fiscal stringency. Even in the best of times, Congress micromanages some military programs, recruiting and reenlistment bonuses, for example. Thus, manpower supply and incentive analyses must take bureaucratic politics into account.

Manpower requirements come under congressional scrutiny and criticism because military readiness cannot be quantified in a profit and loss statement to establish how much of what kind of defense is enough. Progress in establishing requirements has been made in the form of industrially engineered ship and aircraft squadron manning tables, which, though credible, tend to be viewed as sacrosanct. Similar attempts to justify manning for support or shore activities have been less successful, with the result that manpower cuts, for right or for wrong, usually start with the shore establishment.

Manpower requirements analysis has lagged behind manpower supply analysis for three reasons: the difficulty in measuring combat readiness and military productivity, the reluctance to use personnel and equipment substitution as a way of reducing manning, and the resistance to unit consolidation and stabilization to reduce manning costs. Thus manpower requirements analysis must take organizational process into account.

The approach typically used in attacking manpower problems is Rational Analysis: define the problem, lay out the alternatives, predict the consequences, evaluate the outcomes, and recommend a preferred course of action. This approach assumes that action is the choice of the total system. The two other conceptual approaches—Bureaucratic Politics and Organizational Process—are based on different assumptions and have different perspectives, which should be considered when defining future manpower problems and shaping solutions.⁴

Bureaucratic Politics looks at the existing channels for taking action on a problem: Which individuals in what positions are centrally involved; how do the pressures of job, past stances, and personality affect these individuals; what deadlines might force the issue to resolution; and what might impede resolution? Action in this framework is the result of bargaining and compromise among individuals and groups.

Organizational Process looks at what organizations and components are involved, what relative influence they have, how they traditionally act on the problem, and what programs or procedures they have for making information about the problem available and for generating and implementing alternatives. Action in this framework is organizational output subject to present capabilities, administrative feasibility, and institutional stability.

The Rational Analysis framework has demonstrated value. It permits a sorting out of problem explanations and yields an informative summary of tendencies, such as identifying the weights of costs and benefits.⁵ But used alone, it sometimes leads to whimsical conclusions, such as:

- In any given research project, the first 10 percent of the work will take 90 percent of the time.

- The time available for a research task is inversely proportional to the importance of the task.
- The probability that a policy will be enacted from the research decreases as the number of pages of findings increases.
- The probability that a policy will be enacted from research decreases as the importance of the problem increases.
- The probability that a policy will be implemented has a negligible if not negative correlation with the quality of the analysis.

This is not to imply that the Bureaucratic Politics and Organizational Process frameworks do not have their faults, which in some cases make Rational Analysis look like a paragon. It is to say that conceptual breadth is preferable if not superior to analytical depth alone.

What analysis refers to, what part of the problem it captures, and where it should lead need to be more clearly understood. Larger payoffs may come from asking not what goals account for the system's choice of action, but rather what factors determine the outcomes. From the conception of actions as choices explained by reference to objectives, the conception becomes actions whose determinants can be investigated according to modern scientific principles.⁶

At the very least, the manpower analyst must be aware of the elements of the Bureaucratic Politics and Organizational Process frameworks. "Each of the conceptual frameworks . . . influences what the analyst finds puzzling, how he formulates his questions, where he looks for evidence, and what he produces as an answer."⁷ The employment of all three frameworks, then, is more likely to enhance manpower-problem definition and solution in the future than any one alone. Rational, bureaucratic, and organizational imperatives must be acknowledged if the Navy is to be manned effectively, efficiently, and equitably in the future. A strategy for guiding manpower research should be developed with this in mind.

MANPOWER RESEARCH STRATEGY

Manpower research has tended to be diverse and uncoordinated, as illustrated by the various viewpoints described in chapter 2. Policy-makers and analysts need to agree upon a research strategy that concentrates on the most productive lines of work. The expanding scope and influence of manpower research should facilitate policy insights, while improved data and research techniques should permit systematic and integrative analyses.

To further this process, a conference on naval manpower research was held at CNA in mid-1982. It brought together experts from the military, civilian, and academic defense-manpower communities to seek a broad view of Navy manpower research strategy.⁸

An overview of military manpower issues and research set the stage for the conference. Three central questions, common to all four military services, were posed:

- What are valid manpower requirements in both quantity and quality?
- Can an adequate supply of manpower be obtained in the 1980s and early 1990s at a reasonable cost?
- How can outmoded compensation and personnel policies (incentives) be changed to improve manpower management? (Compensation and personnel policies have changed little since the draft era, despite the recommendations of several high-level study commissions.)

The Manpower Requirements Problem

Manpower requirements are based on industrial engineering standards and tend to be viewed as immutable. Pay grade distributions for different ratings are often derived in a similar manner. Quotas are imposed on the number of women, lateral entrants, certain mental-group members, and non-high-school graduates in the Navy. These conditions imply that substitutions among various groups of personnel cannot be made. The questions then become: (1) What is the substitutability

among various quality groupings of personnel? and (2) What quality mix would provide the desired productivity at the least cost? Because military readiness is hard to measure, these questions have been the most difficult for manpower research to answer.



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Nevertheless, the major consensus of the conference was that productivity analysis and substitutability questions were central to determining whom to enlist, train, reenlist, and retire. Studies to date offer some useful tentative conclusions:

- Mental ability is important in high-skill jobs; overall manning level is important in low-skill jobs.
- A high school diploma is important in medium- and low-skill jobs, and is closely related to chances of completing the first term of service.
- Experience is more closely related to productivity than other measures of quality, and career personnel are two to three times as productive as

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first-term personnel, the difference being most pronounced in high-skill jobs.

The Manpower Supply Problem

The major problem for manpower supply over the next decade will be recruiting and retaining enough career-oriented personnel in the face of the shrinking youth cohort. Productivity studies show that careerists are more cost-effective than first-term personnel.

Better management of first-termers could reduce attrition, increase performance, and alleviate supply problems. So would some form of a draft, if national policy required it and the public supported it. Because supply and incentive issues are intertwined, supply issues are further elaborated in the next section.

The Incentive Policy Problem

Maintaining Compensation Levels

The serious problems with recruiting and retention experienced in the late 1970s were caused by lack of military pay comparability and competition from government-funded civilian training programs. The raises in military pay, increases in bonuses, and cutbacks in civilian training that occurred in the early 1980s have alleviated these problems.

Unfortunately, the military services are unable to adjust quickly to such changes in the economy. The budget process results in delays of two to three years before resources are appropriated to correct manpower supply problems. Recruiting budgets need to be increased or decreased when government policies or economic conditions increase or decrease employment opportunities in the private sector. As a step in this direction, the Department of Defense has developed a way to anticipate changes in the economy so that appropriate action might be taken more quickly.

If a stable compensation policy tied to the civilian earnings of youth could be developed, manpower shortfalls caused by economic upturns and population declines would be alleviated. An independent military pay board could be established to track compensation and retention trends and make recommendations to Congress for funding the policy.



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Providing Flexible Compensation Policies

The services' single basic pay table notably lacks variation by military occupation. All personnel with the same pay grade and length of service get the same base pay. The reenlistment bonus is the major tool of discretionary pay policy. Despite other special pays, such as sea and submarine pay and the Variable Housing Allowance, almost 90 percent of enlisted pay is still nondiscretionary.

Because variations in pay do not seem to affect morale or productivity adversely, more flexible compensation tools are called for, including reenlistment bonuses, multiple pay tables, and expanded use of special and incentive pays. Reenlistment bonuses are especially cost-effective; however, they are not continuously visible elements of regular pay, because they are paid out in part at reenlistment and on subsequent reenlistment anniversary dates. Some legislators insist that large bonuses will be squandered by their recipients. To overcome this objection, bonuses could be incorporated into monthly paychecks.

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Eliminating caps on bonus levels would increase the length of reenlistments. The bonus is the product of monthly base pay at the time of reenlistment, a multiple ranging from one to six that reflects the degree of shortage in the rating, and years of reenlistment (ranging from three to six). Congressionally mandated caps on the total bonus that can be awarded are quickly reached in the more critical ratings, resulting in reenlistments for the minimum length of time needed to qualify for the maximum bonus allowed.

Expanding other special pays, such as sea pay, could provide incentives for prolonged service at sea, for example, that reenlistment bonuses do not. Multiple pay tables for different military occupations could also be established and adjusted as manpower supply and requirements dictate.

Designing an Efficient Mix of Enlistment Incentives

Enlistment bonuses can be targeted to occupations in which shortages exist. On the other hand, educational benefits, especially GI Bill entitlements, accrue to most enlistees. Their values are highly discounted by many youths, and they contribute to the number of experienced personnel who leave the service, including those who were not motivated to enlist by them in the first place. Evidence shows that the GI Bill cut retention rates 20 to 25 percent. The enlistment bonus is a far more efficient way to attract and retain recruits than the GI Bill or some similar incentive. The single pay table for first-term pay is also inefficient, because it treats all military occupations alike, regardless of manpower requirements or replacement costs.

Determining an Appropriate Mix of Pay and Benefits

The value of quality-of-service-life benefits is not readily visible to personnel. Because these benefits understate total compensation, retention is lower than it would be under a salary system. The questions are: What kinds of benefits are most important to retention, and what mix of pay and benefits would meet manpower objectives at reasonable cost? Another issue is the inequity between single and married personnel. Married personnel receive more pay and

benefits. The effects of this inequity on morale and productivity have not been determined.

Guaranteed assignment and shore-based homesteading programs for improving career retention are two other quality-of-service-life benefits whose tradeoffs with monetary compensation have yet to be established.

Achieving an Efficient Retirement System

At least five proposals to change the military retirement system have been advanced in the last decade. Despite objections from the services, the Defense Department plan that resulted from the President's Commission on Military Compensation had merit.

First of all, the current compensation system does not produce the greatest possible retention per dollar of expenditure. This is suggested by evidence that young people have high discount rates that greatly exceed the government's discount rate. The cost to the government of providing future benefits therefore exceeds the value placed on those benefits by young people. Reallocating funds from retirement pay to active-duty pay could increase retention. Reducing twenty-year benefits while keeping thirty-year benefits at today's level would substantially increase post-twenty-year retention.

Second, the retention pattern produced by the present retirement system is not the best. This is implied by the higher ratio of marginal productivity to marginal cost for experienced personnel than for inexperienced personnel. In other words, the services get more productivity per additional compensation dollar from experienced than from inexperienced personnel.

The Manpower Planning Problem

The manpower planning process is disjointed. Plans for requirements, accession, retention, training, sea/shore rotation, and compensation are each prepared by different offices. The amalgam of these plans can be internally inconsistent. This

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problem arises because the planning and programming cycle is too short to allow thorough coordination, the analytic tools necessary to coordinate planning are lacking, and the organizational and political factors involved are not thoroughly considered when decisions are being made.

MANPOWER RESEARCH TACTICS

Given a strategy, tactics must be developed to carry it out. A review of the history and highlights of Navy manpower revealed several tactical lessons for analysts.⁹

First of all, manpower research must respond to genuine Navy needs. Analytic resources are limited and should not be spent on short-sighted or trivial topics and staff work. The criteria on which the significance of a problem should be based are the magnitude of budget implications, the structural complications the problem causes in the naval organization, and the potential or emerging problems that affect broad segments of naval administration and operation. The quality and independence of the investigation need to be stressed. Sound, unbiased analysis is imperative.

Second, integrity and credibility must be scrupulously maintained with clients. Manpower analysts must avoid being perceived as one sponsor's advocate or another's adversary. Relationships with rival sponsors must be frank and forthright. Acting as an honest broker serves the best interests of the Navy as a whole.

In addition, alternative solutions and their relative costs should be incorporated in analyses when possible to broaden the Navy perspectives and facilitate feasible solutions. This is especially important when dealing with Department of Defense and congressional concerns, particularly in times of fiscal stringency and retrenchment.

Clients must also be kept informed about progress and results. Frequent contact is a good way to do this. Work must be documented in a written report, and the analyst should be prepared to help the client implement recommendations and see the work through to fruition.

Further lessons emerged during a briefing on model building for Navy sponsors presented in 1982 to a conference of operations analysts from the United States, the United Kingdom, and Canada.¹⁰ The conference began by noting that the list of manpower models built was much longer than the list of successful and surviving ones. The following advice was offered to modelers:

- Overly ambitious attempts to develop grand-scale models should be avoided. If a large model truly is indicated, it should be built incrementally according to need, not globally according to desire.
- The data needs, parameters, and operating requirements of a model should be kept as simple as possible. The more complicated the system, the less likely it is to be accepted and used. Obsession with technique to the detriment of purpose must be avoided.
- A model should be documented for the user, and the user should receive help to install, operate, and maintain the model. Because Navy personnel rotate, interest in and the capability to operate and update a model changes. The analyst must either service the model or help the client get service from other sources.

Finally, a note about the data. Although the lifeblood of empirical analysis, data often are a big problem. Data availability, collectability, quality, consistency, coverage, and processing are perpetual concerns. Cost data, in addition to suffering these frailties, are also susceptible to sometimes vehement disagreements. Consequently, research deadlines are sure to be missed unless sufficient time is allotted to data acquisition and handling.

How do these lessons from past manpower research apply to manning the Navy of the future? This question is addressed in the next chapter.

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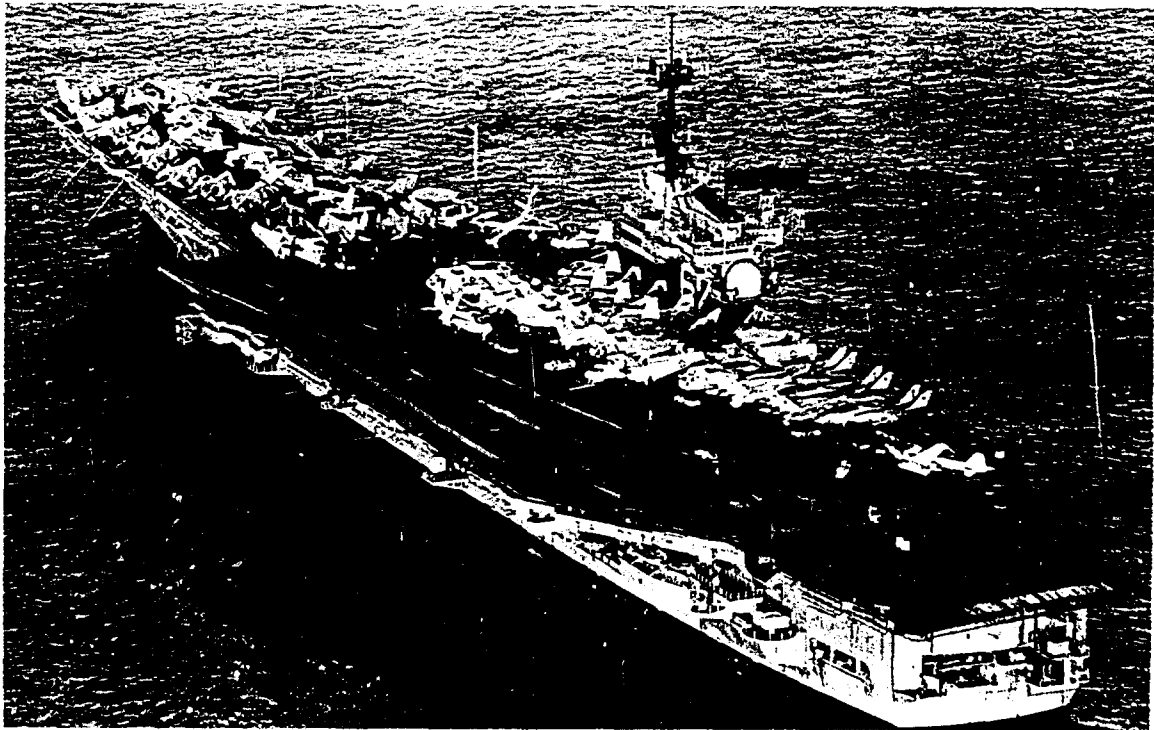
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5 | LESSONS FOR THE FUTURE

The three central concerns of manpower are effectiveness, efficiency, and equity. Effectiveness is personnel readiness, efficiency is achieving readiness at a reasonable cost, and equity is achieving it in a way that is reasonably fair to the personnel involved. Keeping these concerns in mind, the main issues for research in the future are the measurement of productivity to improve manpower requirements and personnel assignment, the evaluation of internal and external manpower supply alternatives, and the development of incentive programs to match manpower requirements and supply efficiently and equitably.

These issues exist in the context of a total force—the combination of the active military, the reserve, and the civilian components of the Navy. The best manpower strategies will consider the advantages and disadvantages of all human resources available to the Navy.



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MANPOWER REQUIREMENTS

Manpower requirements are concerned with the numbers and types of billets needed to man the Navy. The validity of those requirements and the degree to which they are filled will affect both individual and unit performance. One goal of manpower analysis is therefore the measurement of personnel productivity. Here, personnel substitution—tradeoffs of different kinds of personnel either to maintain performance levels at a lower cost or to improve performance without increasing cost—is the key to efficiency. Because military performance (or readiness or effectiveness) is difficult to measure, requirements are often questioned, especially requirements for support personnel who do not contribute directly to the operation and maintenance of the fleet.

Manpower requirements, then, presume some level of personnel productivity. In the Navy's case, the primary contributor to enlisted productivity is experience in the Navy. This has been demonstrated in many ways. Comparisons have been made of the productivity of first-term enlistees with that of personnel who had completed four-year enlistments in ten large ratings representative of Navy occupational groups.¹ Productivity measures were derived from multiple judgments of enlistees' performance made by their petty-officer supervisors. As might be expected, the most technical ratings showed the least growth in first-term productivity and the least technical ratings showed the most growth. Thus, selective retention of the most technical ratings is important to recouping the Navy's investment in them and to ensuring fleet readiness.

Regardless of first-term retention, Class "A" school graduates are more productive over a four-year enlistment than personnel trained solely on the job. Again, productivity differs by rating. Those ratings that involve expensive training ought to require longer enlistment terms and should be filled by more senior personnel.²

Both length of service and pay grade are independently and strongly related to formal Navy training, which contributes to productivity.³ Underway training activities of ship crews and aircraft squadrons also produce measurable payoffs in performance.⁴

Increases in the experience and pay grade of enlisted aircraft-squadron personnel have been tied to the mission capability of deployed attack-aircraft squadrons. Mission-capability rates improved with more senior manning, and readiness was maintained at lower cost because manpower requirements could be reduced.⁵ Table 3 shows current manning and least-cost manning by pay grade for deployed attack-aircraft squadrons with twelve aircraft. The net personnel savings under the least-cost manning structure are thirty-seven billets, costing over half a million dollars per year.

Table 3. Current and Least-Cost Manning for A-7 Squadrons, by Pay Grade

Manning	E1-E4	E5-E6	E7-E9	Total	Cost in millions of FY 1985 dollars
Current	129	65	12	206	\$5.2
Least-cost	86	60	23	169	\$4.6
Difference	-43	-5	+11	-37	-\$0.6

Further productivity analyses can be conducted with available data sets (1) to relate unit (ship or aircraft) performance with crew characteristics, (2) to devise more objective measures of individual and unit performance, and (3) to develop predictors of individual performance from supervisor's responses to survey questions. Work has begun in the first area; variables for both officers and enlisted personnel are being related to the material condition index of surface ships.⁶ If the marginal contribution to unit or work-center productivity can be measured by rating and pay grade, personnel due for rotation can be assigned to empty billets where they would maximize productivity improvement.

Organizational consolidation is another way to reduce manpower requirements. For example, billet requirements for both officers and enlisted personnel could be reduced by combining like-aircraft squadrons that are located close together. Substantial costs would be incurred in such an organizational change, but detailed examination shows that savings outweigh measured costs, with no

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loss of readiness because fewer maintenance personnel would be needed. Possible management problems, however, including reduced command opportunity, must be considered. A test of this concept could help settle such concerns.⁷

More efficient use of the personnel the Navy does have is yet another way to reduce requirements. A survey of a random sample of aviators in the grades of lieutenant (junior grade) through commander revealed that the majority of pilots and flight officers were satisfied with their chances of advancement in the Navy. Most of them said, however, that given the option, they would choose a permanent flying billet over the normal career path that alternates flying and non-flying assignments. Nearly half of them said that flying was the most positive job characteristic of a career in naval aviation.⁸

Automation, another way to reduce manpower requirements, has been designed into naval systems to varying degrees. Historically, automation has contributed to the reduced number of personnel required on surface ships. For new, more automated ship classes, however, manning requirements have been greater than planned because expected savings are overestimated, overall maintenance workload is underestimated, and manual backup features are added. The technology is available for increasing the level of ship automation, but lack of fleet acceptance and general design policy have hindered its greater use. Resistance stems from officers' reluctance to take responsibility for a ship without being able to exercise direct control, and from a general lack of confidence in automated systems.⁹

In the longer run, capitalizing on man-machine technology is another option for saving money. The Naval Research Advisory Committee in 1980 concluded that increased attention to man-machine interfaces in naval systems could avoid potentially disabling mismatches between these systems and the personnel who operate and maintain them. The committee recommended that the Navy establish an organizational structure and policy to direct and enforce the incorporation of existing man-machine technology in the development of new weapons systems, and provide sponsorship and direction for related research, development, test, and evaluation programs.¹⁰

The Congressional Budget Office has studied key manpower issues surrounding the buildup to a 600-ship force. They are: (1) How many military and

civilian personnel are required to support the force? (2) What are the main factors affecting recruitment and retention and what are their costs? and (3) What options can the Navy pursue if a ceiling is placed on manpower costs? Three ways to reduce active manpower costs and requirements were suggested: substitute targeted bonuses for pay raises, increase sea-tour length and sea pay, and transfer some ships to the Naval Reserve.¹¹



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MANPOWER SUPPLY

Manpower supply refers to both military and civilian personnel. Attaining peacetime requirements depends on a larger supply of manpower as the Navy grows to 600 ships. Another goal of manpower analysis is to estimate the costs of various supply alternatives. Navy competition with the civilian sector and the other military services for recruits will intensify over the next few years because of the shrinking population of young men, the traditional source of

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military manpower. Because of the increasing technological sophistication of equipment, competition for technically trained personnel will also increase.

To alleviate these problems, alternative sources of manpower supply must be found. Among the alternative sources are women, civilians, contractors, older men, and aliens. Other ways to solve the problems include increasing retention and expanding the role of reservists. Reserve missions, performance, costs, and manpower attainability relative to the regular Navy are prominent questions in total force manning.

The pool of male youths will continue to shrink over the next few years, but the low it will reach in 1993 is not unprecedented. As figure 5 shows, the number of 17- to 21-year-old males in 1993 will be the same as it was in 1966. Peacetime requirements can probably be met if first-term pay is increased. To keep pace with civilian wages, military billets will need to pay 10 to 12 percent more in real wages by 1995 than they did in the early 1980s.¹²

A link has been demonstrated between male youths' attitudes toward military service and their subsequent enlistment behavior. The public image of the military, military pay, and youth unemployment all play a part. This points to the influence that both economic and patriotic factors have on peacetime recruiting.¹³

If peacetime conscription were reinstated, the Navy would benefit only if first-term enlisted pay were sizably cut. Any savings, however, might vanish if the Navy budget were cut disproportionately or if America's youth were to boycott the draft.¹⁴

The main factors contributing to both regular-enlistment and delayed-enlistment contracts are the number of recruiters and the rate of youth unemployment. This holds true in both good and poor recruiting climates. Typically, a 10-percent decrease in youth unemployment requires a 6-percent increase in the number of recruiters to keep enlistment contracts from falling. For the Delayed-Entry Program (DEP), an 8-percent increase in recruiters is required.¹⁵

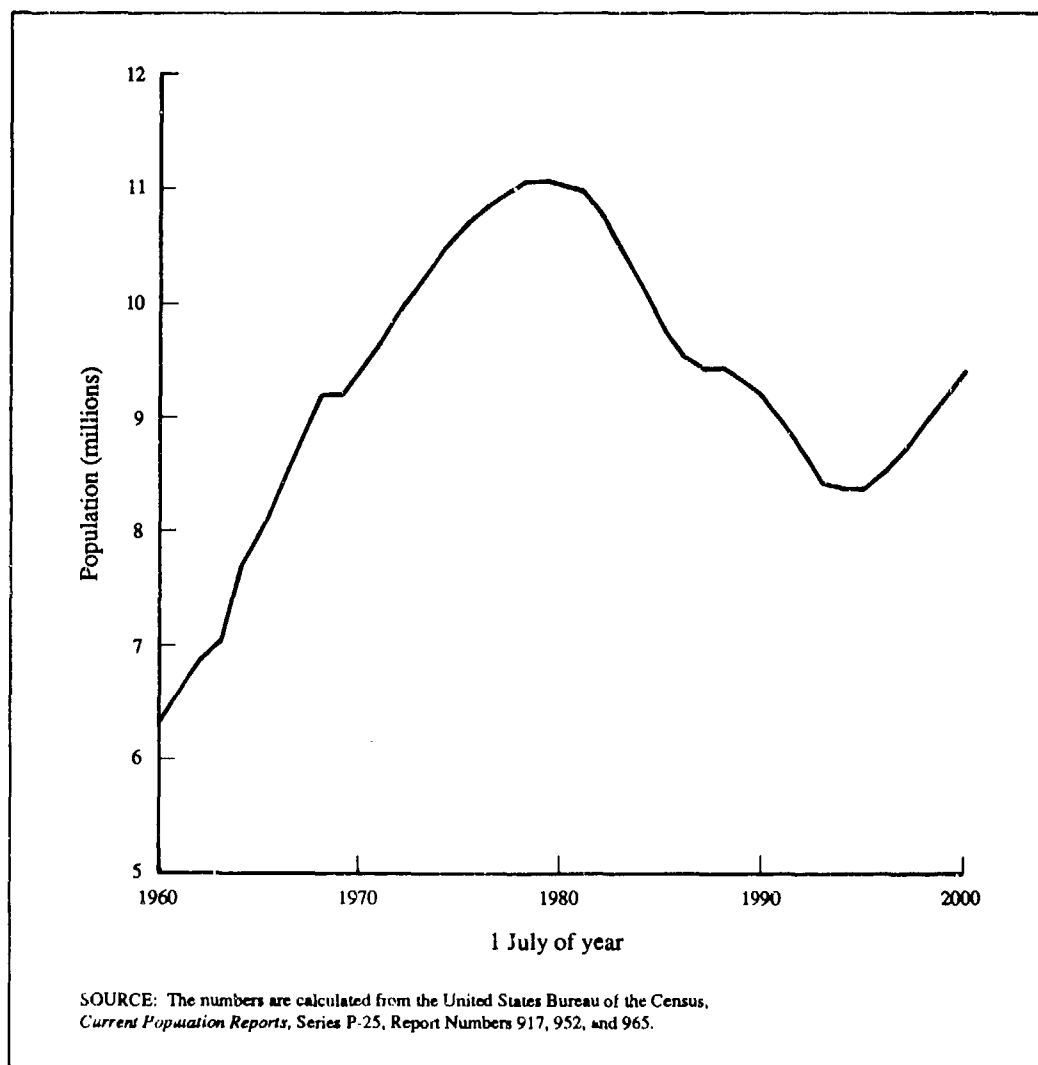


Figure 5. Population of 17- to 21-Year-Old Males, 1960-2000

For mental groups I and II, the upper 35 percent of the youth population, the unemployment rate and the ratio of civilian to military pay are major factors in enlistments when recruits are in short supply. Overall, a 10-percent increase in the youth unemployment rate will produce about a 5-percent increase in contracts, while a 10-percent increase in recruiters will produce about an 8-percent increase in contracts.¹⁶

The chances of recruits completing their first term increase if they participate in the DEP, even after such factors as education, mental ability, and age are accounted for. Contract attrition from the DEP is about 12 percent, but it is cheap attrition compared to that which occurs on active duty. In FY 1982, 76 percent of the 56,000 male recruits without prior service who joined under the DEP program were still in the Navy thirty months later. Only 65 percent of the 10,000 who joined and were sent directly to recruit training were still in the Navy thirty months later.¹⁷

As the population of male youths shrinks, the proportion of the non-prior-service male accession goal in DEP will also shrink. The seasonal, economic, and retention factors involved in DEP are being examined to determine the appropriate sizing and timing of the program. This work is facilitated by the construction of a longitudinal enlisted data file that allows past experience and characteristics to be related to subsequent training, advancement, and retention experience.¹⁸

Recruiting problems for selected ratings could be mitigated by Job-Oriented Basic Skills (JOBS) training. The Navy JOBS program involves an innovative technique designed to compensate for the skill deficiencies of lower-aptitude personnel through job-specific remedial training. The program has demonstrated success rates similar to those of regular Class "A" schools (that teach basic specialized skills) at the same cost.¹⁹ Greater use of computer-based training techniques can also help ameliorate supply problems. The Navy was a pioneer in this field, but the full potential of computer-based training has not yet been realized.

A different approach to supply problems would be to reduce the complexity of equipment, thereby lowering requirements for scarce high-quality personnel. Human-factors engineering involves the design of sensors and weapons that are

easy to operate and require the least amount of time to maintain and repair. This is another promising field whose potential has not yet been fully realized.

The most important predictor of recruit survival is whether or not the recruit is a high school graduate, but chances of a recruit completing the first term of service increase with mental ability for recruits who go to Class "A" school; the chances decrease with mental ability for those who do not.²⁰ Separate screening tables can be used for these two kinds of recruits to predict more accurately their survival chances. In fact, screening tables that take the type of enlistment program as well as the characteristics of recruits into account can be used to improve survival prediction.²¹ Table 4 is a comprehensive screen table for all non-prior-service male recruits who entered the Navy from FY 1978 through FY 1983. It shows the number and proportion of these recruits who completed the first year of service according to their mental group, level of education, and age at entry.

About 70 percent of the recruits who are promised Class "A" school after they have spent four to ten months in the fleet actually attend. Of those who do not, the majority either leave the Navy or become rated by on-the-job training.²²

Other recruits go directly to the fleet after recruit training without promise of schooling. Those who later attend Class "A" schools do well in school and reenlist at up to twice the rate of recruits who go to Class "A" school directly after recruit training. Their number is small, however, and they tend to be concentrated in the lower mental groups and the least technical Class "A" schools.²³

Historically, over two-thirds of recruits attend Class "A" schools, but only one-third of them reenlist. This suggests that the Navy may get a low return on its training dollar. Requiring longer initial contracts in exchange for training and inducing higher first-term reenlistments are two ways to improve the return. A model was developed in which pay and contract length are set jointly to minimize the cost of meeting manpower requirements.²⁴ A demonstration of the model using Navy data showed minimal savings. By implication, however, savings would be greater for the highly technical ratings that entail substantial training time. To test this implication, the model must be made rating-specific.

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Table 4. First-Year Survival of Non-Prior-Service Male Recruits, FY 1978-1983

Mental Group		High School Graduates		GED		Non-Graduates		Total	
1	17-18	4,644	0.94	361	0.83	369	0.86	5,374	0.93
	19-20	4,706	0.94	110	0.85	317	0.82	5,133	0.93
	21-22	2,886	0.93	45	0.73	175	0.83	3,106	0.93
	23+	3,418	0.91	39	0.79	166	0.82	3,623	0.91
	TOTAL	15,654	0.93	555	0.83	1,027	0.84	17,236	0.93
2	17-18	48,711	0.94	11,507	0.84	5,719	0.85	65,937	0.91
	19-20	36,005	0.93	3,507	0.85	3,774	0.84	43,286	0.91
	21-22	14,641	0.92	1,000	0.81	1,753	0.85	17,394	0.90
	23+	14,313	0.89	808	0.81	1,518	0.81	16,639	0.88
	TOTAL	113,670	0.93	16,822	0.84	12,764	0.85	143,256	0.91
3U	17-18	30,974	0.93	18,429	0.83	5,047	0.83	54,450	0.89
	19-20	22,474	0.91	4,585	0.82	3,395	0.84	30,454	0.89
	21-22	7,094	0.90	790	0.81	1,688	0.82	9,572	0.88
	23+	6,300	0.85	430	0.72	1,132	0.77	7,862	0.83
	TOTAL	66,842	0.91	24,234	0.82	11,262	0.83	102,338	0.88
3L	17-18	27,863	0.91	10,832	0.80	4,565	0.82	43,260	0.88
	19-20	21,570	0.89	2,923	0.81	2,783	0.83	27,276	0.88
	21-22	6,169	0.88	335	0.81	989	0.79	7,493	0.86
	23+	4,963	0.84	221	0.70	669	0.77	5,853	0.83
	TOTAL	60,565	0.90	14,311	0.80	9,006	0.82	83,882	0.87
4A	17-18	14,127	0.89	2,784	0.78	835	0.83	17,746	0.87
	19-20	13,321	0.87	881	0.80	414	0.84	14,616	0.86
	21-22	3,542	0.83	80	0.83	73	0.86	3,695	0.83
	23+	2,570	0.80	38	0.84	50	0.72	2,658	0.80
	TOTAL	33,560	0.87	3,783	0.79	1,372	0.83	38,715	0.86
4BC	17-18	10,881	0.86	719	0.76	216	0.81	11,816	0.85
	19-20	11,187	0.80	325	0.73	121	0.80	11,633	0.80
	21-22	2,571	0.76	32	0.78	21	0.86	2,624	0.77
	23+	1,562	0.75	12	0.67	12	0.67	1,586	0.75
	TOTAL	26,201	0.82	1,088	0.75	370	0.80	27,659	0.81
Un-known	17-18	1,750	0.91	878	0.82	136	0.84	2,764	0.88
	19-20	1,417	0.88	304	0.87	98	0.82	1,819	0.88
	21-22	472	0.83	75	0.71	43	0.77	590	0.81
	23+	458	0.80	47	0.77	27	0.56	532	0.78
	TOTAL	4,097	0.88	1,304	0.82	304	0.80	5,705	0.86
TOTAL	17-18	138,950	0.92	45,510	0.82	16,887	0.84	201,347	0.89
	19-20	110,680	0.90	12,635	0.82	10,902	0.84	134,217	0.89
	21-22	37,375	0.89	2,357	0.81	4,742	0.83	44,474	0.88
	23+	33,584	0.86	1,595	0.77	3,574	0.79	38,753	0.85
	TOTAL	320,589	0.90	62,097	0.82	36,105	0.83	418,791	0.89

Some billets called for in total requirements can be filled by either military or civilian personnel. Pressure to reduce military end-strength despite growth in fleet size can be reduced by substituting civilian for military personnel in shore billets. One way of evaluating the potential of substituting civilians in these ratings results in a standardized factor score based chiefly on the costs of training and retaining personnel and the length of time spent at sea.²⁵ Figure 6 shows the score distribution for 71 ratings. These scores are general guides only; other factors must be considered when using them. For example, many uniformed shore billets are filled by women, and civilian substitution could adversely affect their opportunities for promotion. Nonetheless, the method highlights potential candidates for "civilianization" and permits estimation of potential end-strength savings. It also highlights mission-critical and sea-intensive ratings.

Navy civilian manpower, however, has problems of its own. The peacetime inventory of civilians on the Personnel Automated Data System file was matched with the peacetime and mobilization requirements on the Civilian Position File.²⁶ Reservists and retired military personnel age 60 and under were assumed to leave their civilian jobs for military service. An aggregate peacetime shortage of 23,000 workers (7.4 percent of authorized positions) was found. The shortage would rise to 56,000 (17.7 percent) upon mobilization, especially in blue-collar occupations involving a variety of skills. To avert such shortages, the mix of occupations could be changed in peacetime, while policies to retrain and expand the work force could be planned for mobilization.

The use of reservists is another option for manning the Navy, not only during mobilization, but also in peacetime. Congress has been very interested in this option. Comparisons of reserve and active units with similar missions and manning have been made with regard to readiness and cost. Commissioned Naval Reserve squadrons are numerically comparable to active squadrons with respect to manpower requirements and equipment. They must, however, rely on part-time personnel. This reduces personnel costs, but it also reduces flying opportunities (practice). Reserve squadrons may therefore not achieve the readiness of active squadrons.²⁷

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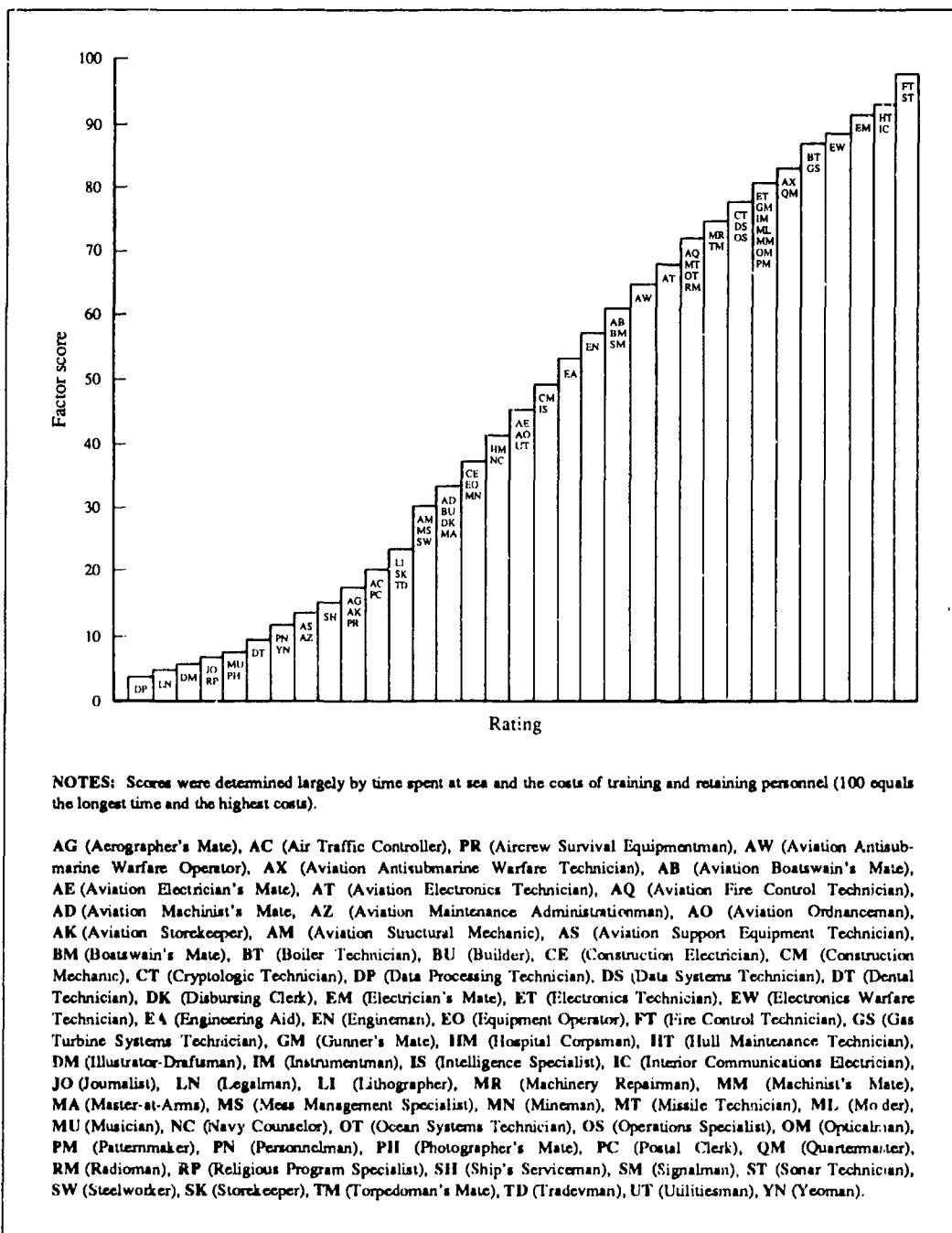
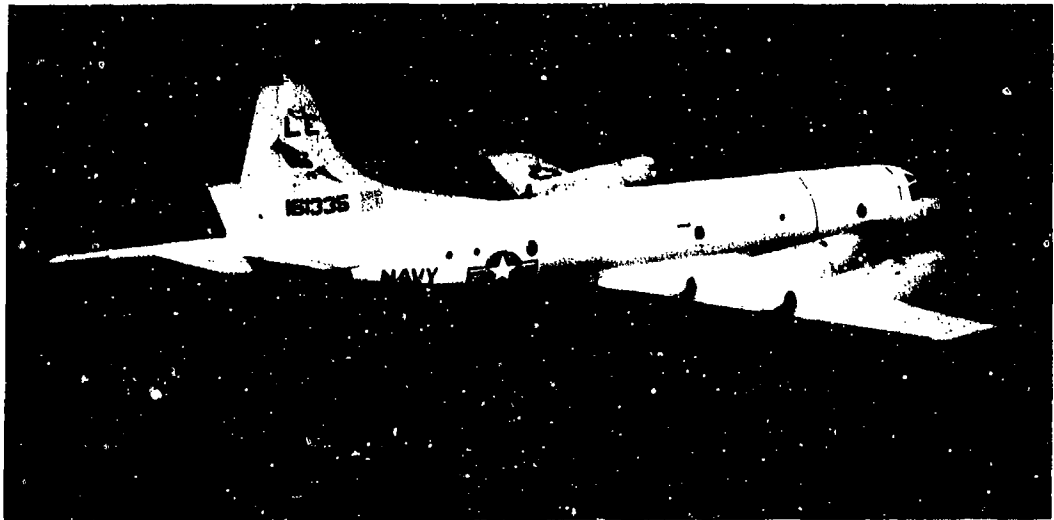


Figure 6. Navy Ratings, by Factor Score

In the case of patrol aircraft (VP), however, the difference in the training readiness of reserve versus active squadrons is insignificant.²⁸ Because VP squadrons are land-based, VP reservists, even though part time, fly weekend sorties similar to those of their active-duty counterparts. In short, they get practice that other part-time reservists do not.



Courtesy of Patrol Squadron 11

Part-time reservists who are VP crewmen show little loss over time of antisubmarine warfare (ASW) skills as measured on ASW flight simulators. These reservists perform as well as their full-time, active-duty counterparts. Experience in the simulator produces substantial increases in scores on subsequent simulator evaluations, as figure 7 shows.²⁹ Although the relationship between flight-simulator training and operational performance has not been tested, the simulators are very realistic, so transfer of training to actual flying operations is a reasonable expectation.

In the areas of manpower supply and incentives, evidence shows that³⁰:

- Active-duty training contributes to skill retention of reservists.
- Enlistments of Navy veterans in the Selected Reserves (SELRES) are more cost-effective than enlistments of Ready Mariners, who spend time on active duty only for basic or initial-skill training.

- Of the high school graduates who enlist in the Active Mariner reserve program for three years of active duty, 80 percent would otherwise have enlisted in the regular Navy.
- Regular Navy separatees who still have reserve obligations under the Universal Military Training Act (six years combined active and reserve service) are more likely to join the SELRES than those who do not.
- Retirement pay is important to senior reservists, while basic pay is important to junior reservists.

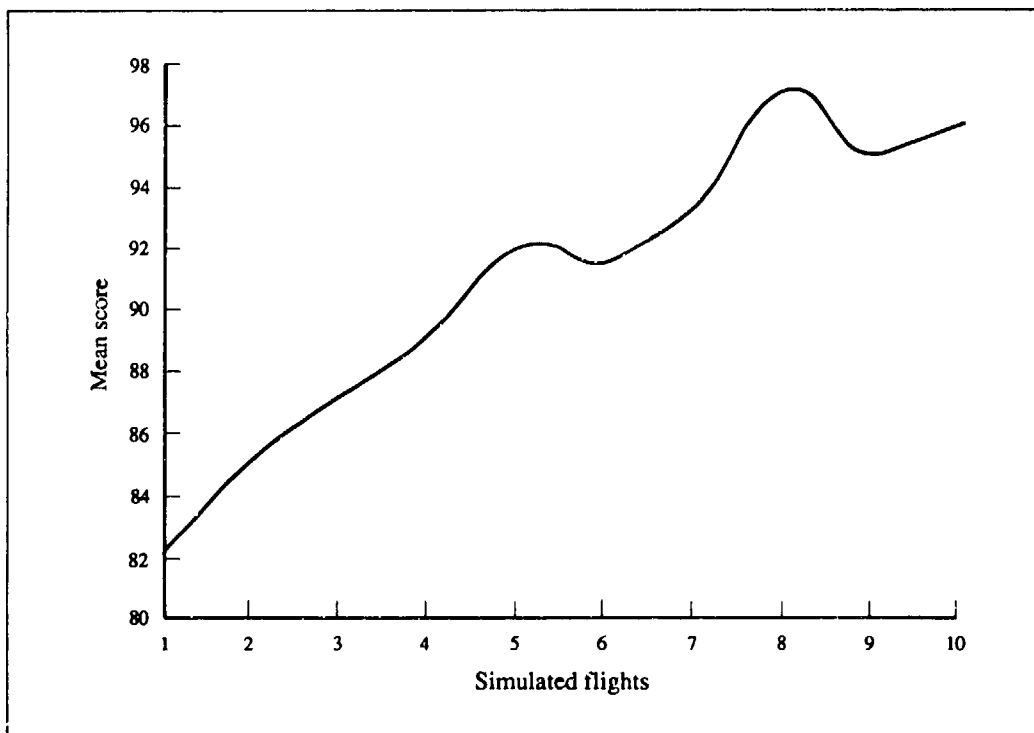


Figure 7. Simulator Score, by Experience

The direct procurement of vocational-technical school graduates into the SELRES Sea and Air Mariner (SAM) program is a promising way of obtaining graduates with medical and construction skills.³¹

The expected survival profiles for reservists from four SELRES entry programs are depicted in figure 8. The SAM profile extends only 18 months because the program was first instituted in FY 1984 to replace the Ready Mariner program.³² Survival rates differ greatly, depending on both program and length of service. The steady-state cost in constant 1985 dollars per entry into SELRES shows that Navy veterans are less expensive than SAM recruits with no prior service—chiefly because the training costs for Navy veterans are already sunk.³³

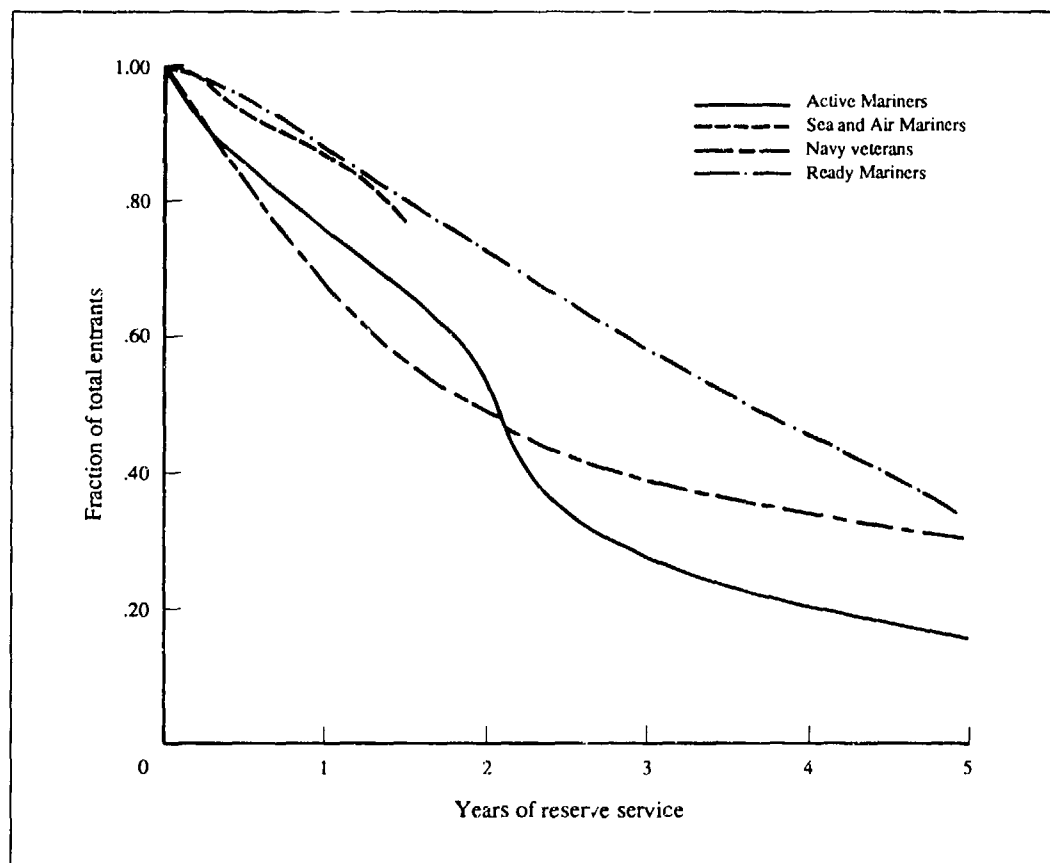


Figure 8. Survival Profile of Recruits in the Selected Reserve

Analysts of manpower, personnel, and training program planning argue that the 600-ship Navy can be manned by personnel with the requisite skills and experience if appropriate retention and accession resources are available. Compensation

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needs to be targeted on mission-critical and sea-intensive ratings, primarily combat systems and engineering ratings. The personnel in these ratings account for one-third of the enlisted career force, fill one-half of sea-going jobs, and spend up to two-thirds of their time at sea.

Additional recruiting resources are needed to attain goals for non-prior-service males with above-average mental abilities and high school diplomas. Recent recruiting experience implies that better enlistment benefits may make naval service more attractive to high-quality recruits.

In a period of increasing fiscal stringency, however, additional resources for military manpower, however well justified, cannot be expected. Manpower, personnel, and training programs will probably be subject to budget cuts, which would surely affect the manning of the future Navy.

Unacceptable manpower policies under budget cuts include lowering recruit quality in order to meet end-strength, and tying up ships or manning them with skeleton crews. Lower-quality recruits result in higher personnel turbulence—premature attrition, disciplinary problems, wasted training, decreased experience, and administrative and supervisory burdens. Likewise with ships that do not operate properly or at all, because missions and tasks cannot be fulfilled and readiness cannot be maintained.

Viable options in the face of budget cuts have been examined.³⁴ They include: offsetting limited pay raises with higher enlistment and reenlistment bonuses targeted on mission-critical and sea-intensive ratings, shifting the mix of deployable ships toward the Naval Reserve and civilian/contractor manning, and lengthening average sea tours while raising sea pay to reduce the demand for active-duty personnel in shore-rotation billets. These options could save the Navy substantial sums, and they have been used successfully in the past.

MANPOWER INCENTIVES

Incentives, both monetary and non-monetary, connect manpower requirements and supply. Manpower analysis is also concerned with the design, delivery,

and evaluation of incentives. Monetary incentives can be targeted by service, occupation, billet, and location. They can be distributed as basic pay, special pay, and retirement pay. Non-monetary incentives, traditionally called "fringe benefits" and now more broadly referred to as "quality-of-life factors," include tour and contract lengths, benefit policies and programs, and job satisfaction.



Official U.S. Navy Photo

The design of incentive mixes and options within a total compensation package has received little attention. This is partly due to the difficulty in quantifying the effects of quality-of-life factors. Another contributing factor is that compensation policies have been developed piecemeal over the years. For example, the military basic-pay system is based solely on pay grade and length of service, regardless of occupation, billet, or location. To provide differential compensation for scarce skills and knowledge, as well as hazardous and onerous duty, nearly fifty kinds of pays and allowances for officers and enlisted personnel have been legislated and are presently in force.³⁵

In large measure, this piecemeal approach to military compensation policy has been dictated by single-year funding and congressional focus on parts versus the whole. Interest centers on specific incentives—basic pay, reenlistment bonuses, and retirement pay—rather than on compensation or incentive policy and how it may affect manpower requirements and supply in the longer term.

The Selective Reenlistment Bonus (SRB) is one of the most cost-effective ways to get Navy personnel to reenlist. By expanding the program and relaxing the bonus ceilings for technical ratings, the Navy could save \$100 million a year in recruiting and training costs.³⁶ Each additional SRB dollar saves over two dollars in replacement costs for maintaining fifth-year (career-entry) manpower inventories. SRB is most effective when paid in a lump sum, rather than partly (as is the case now) or wholly in installments. Increasing retention in turn leads to a more productive enlisted force.³⁷

Different ratings respond differently to the SRB. A 10-percent increase in regular military compensation, which is the total value of pay and tax benefits, increases first-term retention from 11 to 27 percent and second-term retention from 9 to 38 percent, depending on occupational group.³⁸ (In technical terms, the elasticity of the probability of staying in the Navy with respect to regular military compensation ranges from 1.1 to 2.7 for first-term personnel and from 0.9 to 3.8 for second-term personnel.) Both reenlistments and enlistment extensions were included in retention statistics. The elasticities for the occupational groups are shown in table 5 for first- and second-term retention.

For first-term retention, construction and aviation maintenance ratings have the highest elasticities or responses to pay, while health care ratings have the lowest. Other occupational groups fall between these extremes with elasticities of about 2.0 (which is the aggregate, all-Navy value). These other groups include electronics, electrical, mechanical, ship and aviation support, cryptology, administration and media, and logistics ratings.

For second-term retention, logistics and aviation maintenance ratings have the highest second-term responses to pay, while electrical, mechanical, cryptology, and health care ratings have the lowest. The other occupational groups between the extremes include electronics, ship and aviation support, and administration and media ratings.

Table 5. Percentage Increase in Retention Due to a 1-Percent Increase in Regular Military Compensation

Occupational Group	First Term	Second Term
Construction	2.7	n/a
Aviation maintenance	2.4	3.0
Electronics	2.0	2.6
Electrical and mechanical	1.9	0.9
Ship and aviation support	1.9	2.5
Cryptology	1.8	1.3
Administration and media	1.8	2.5
Logistics	1.7	3.8
Health care	1.1	1.4

Second-term reenlistments relate negatively to first-term reenlistments. From 20 to 60 percent of first-term enlistees induced to reenlist by the SRB leave the Navy at the end of their second terms.³⁹ Consequently, knowledge of occupation-specific elasticities for both the first and the second term enables bonus managers not only to allocate the SRB more efficiently than an all-Navy elasticity would allow, but also to flexibly apply the SRB to maintain the desired supply of careerists.

Sea pay is another incentive that leads to increased retention as well as to extensions of voluntary sea duty. So far, only the effect of sea pay on retention has been studied. Real increases in sea pay of 2 to 6 percent, depending upon rating, can prevent the loss of reenlistments that would be caused by a 10-percent increase in sea duty. Sea pay should be changed to reflect the demand for careerists at sea, just as the SRB is targeted to the demand for ratings throughout the Navy.⁴⁰

Advancement can be a powerful retention incentive. Its effect on first-term retention is dramatic. The predicted reenlistment rate for an enlistee at pay grade E-5 (petty officer, second class) is more than 50 percent higher than it is at E-4 (petty officer, third class), even though the increase in pay is only 5 percent.⁴¹

The responsiveness of first-termers to pay differs by mental group as well as by rating and pay grade. A 10-percent pay raise for enlistees in the top two mental groups results in a 40-percent increase in their reenlistments (elasticity of 4), twice the all-Navy average. For those in the average range (mental group III), a 10-percent pay raise results in only a 10-percent increase (elasticity of 1). The top two mental groups are also the most sensitive to changes in the civilian unemployment rate. Because most of these enlistees are high school graduates, the conclusion can be drawn that increases in Navy pay have the most influence on the retention of the highest-quality personnel. The corollary is that when military pay is less than civilian pay for comparable jobs, the highest-quality personnel will have the lowest retention rates.⁴²

Moves due to a Permanent Change of Station (PCS) also lower retention. Such moves are responsible for a 10-percent drop in the overall reenlistment rate because of the spouse's loss of income. Over 25 percent of the military wives studied earned over \$4,200 a year in 1984 dollars. PCS moves would result in these wives' losing the equivalent of one-and-a-half years' earnings over a three-year period.⁴³

To make the Navy more attractive to mid-grade petty officers in mission-critical sea-going ratings and to their families, ways to improve geographic stability or compensate for the lack of it need to be found. This effort becomes all the more important when considering that the retention of high-skill ratings is expected to drop about 5 percent in the late 1980s and early 1990s due to expanding civilian opportunities.⁴⁴

Attitude surveys have shown that quality-of-life factors affect second-term and subsequent reenlistments more than do job-related factors, which are more important in first-term reenlistments.⁴⁵ The disproportionate increase in first-term reenlistments of personnel who achieve pay grade E-5 when compared to the small monetary gain is consistent with the survey findings. Such information can be useful in designing differential incentive plans for controlling retention.

Although quality-of-life benefits have been related to retention and productivity, they have rarely been quantified in a way that would permit both tradeoffs with monetary compensation and calculation of response elasticities. Can quality-of-life benefits substitute for monetary incentives at an equal or lesser cost to the Navy? This remains an open question.

Among officers, pay has been shown to have the dominant effect on retention of aviation, nuclear power, and medical personnel. For example, analysis of the effect of compensation on pilot retention during the five years following completion of the initial service obligation showed that retention decreased as the difference between commercial and military pilot compensation increased. Fluctuations in Navy requirements, the number of hours flown, and overall civilian economic opportunities had little influence on retention.⁴⁶

As a means for increasing pilot retention, an annual bonus for the five years following the initial service obligation was recommended as a far cheaper way than Aviation Career Incentive Pay.⁴⁷ Extending the minimum initial service obligation, as it has been in the enlisted community, is another option worth considering.

Other manpower incentives under study include the use of the enlistment bonus program as a procurement method. Past studies generally show that a 10-percent increase in pay results in a 10-percent increase in enlistments (elasticity of 1). Target groups for bonuses, however, such as recruits for the nuclear power program and for special reserve programs, may respond differently to pay. These responses should be considered in designing enlistment bonus policy.

In addition to the effect of sea pay on retention discussed previously, the effectiveness of sea pay for manning sea billets is being examined. For FY 1982 through 1984, an average of 114,000 enlisted personnel or 30 percent of the number of rated personnel (pay grades E-4 through E-9) received career sea pay. Of these recipients, 15,000 received a bonus for spending more than three consecutive years at sea. (As an interesting aside, some single personnel can lose money by going to sea, because the sea pay they receive is less than the value of the commuted rations they receive on shore duty.)

For ratings classified as mission-critical (electronics, hull, electrical, and mechanical occupations) or shore-intensive (aviation, construction, cryptology, and administration and media occupations), the effect of sea pay is magnified.

Figure 9 shows the average years spent at sea by pay grade for these two groups of ratings. As pay grade increases, personnel in the mission-critical ratings serve two to three times as many years at sea as those in the shore-intensive

ratings. In contrast, figure 10 shows that the curves for monthly career sea pay are nearly the same over pay grade. The mission-critical group of ratings enjoys only a small advantage over the shore-intensive group. Thus, the current Navy sea-pay table depends more on pay grade than on cumulative time spent at sea. The effectiveness of sea pay for compensating personnel for arduous duty or for increasing retention in sea-intensive ratings is being analyzed; it is a vital topic for future manning.

PROSPECTS

Proposals for manning the future Navy are easier to make than to implement, especially under tight budgets. The central issues have been described several times in several ways: valid requirements, adequate manpower supply, and appropriate incentives.

Valid requirements are based on the mix of manpower that produces readiness at the lowest cost. Requirements call for a high proportion of career personnel to first-term personnel. Experience has repeatedly been found to count heavily: careerists are two to three times more productive than first-term personnel, particularly in highly technical (electronics) ratings. These ratings are part of the priority mission-critical and sea-intensive ratings that operate and maintain the ships, aircraft, and submarines of the fleet. They require extensive and expensive technical training, which is highly marketable in the civilian sector. Their sea-intensive counterparts in the engineering ratings perform arduous and hazardous duties, which discourage reenlistments.

Selective retention of active and reserve enlisted personnel is the best way to man the future Navy. An extra dollar spent on reenlistment bonuses at the end of the first term of active service saves more than two dollars in replacement costs for recruiting and training four-year enlistees. The productivity (or readiness) advantage is equally impressive.

The incentives for keeping the priority personnel in the Navy—and for attracting future careerists—need to be targeted and flexibly administered in both the active and reserve components. Basic pay has been shown to be an inefficient

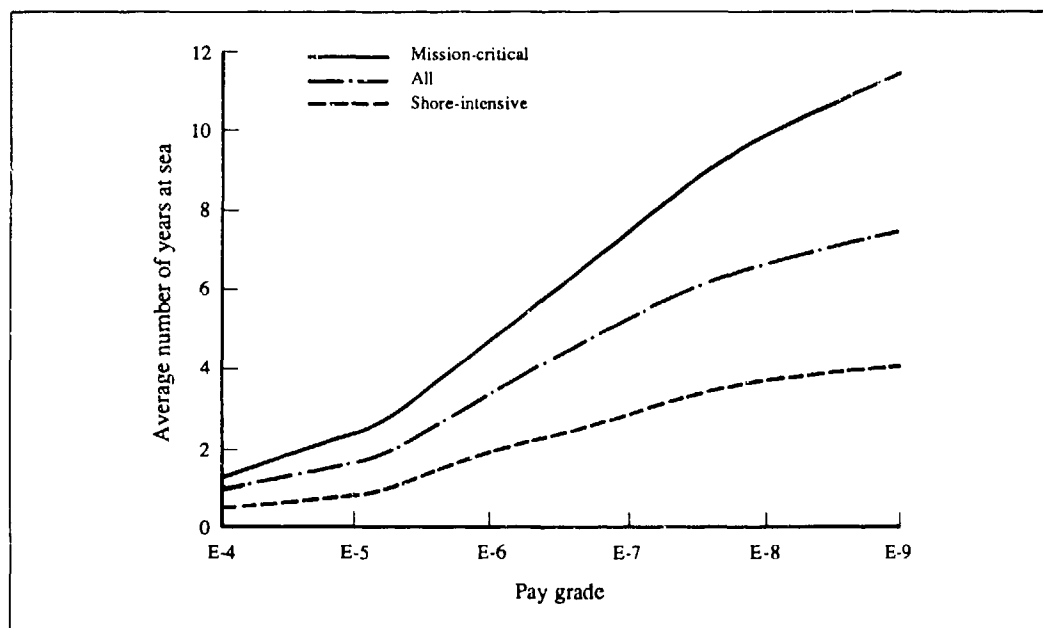


Figure 9. Average Sea Time, by Group and Pay Grade

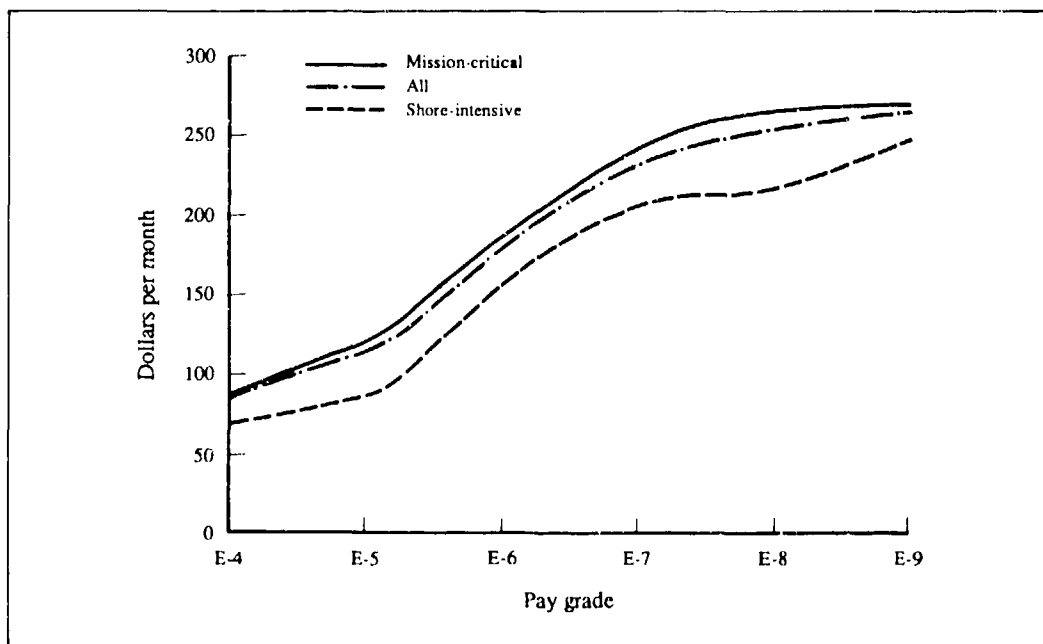


Figure 10. Monthly Career Sea Pay, by Group and Pay Grade

way to compensate personnel, whereas the reenlistment bonus and enhanced sea pay are efficient ways. The quality of service life is also important, but its effects have been difficult to assess behaviorally compared to targeted pays.

Progress in manning the future Navy will require building on such lessons learned from the past, while focusing on the concerns of manpower effectiveness, efficiency, and equity. The future will see wider application of the problem-identification techniques and problem-solving approaches discussed in chapter 4. More attention will be paid to the approaches of Bureaucratic Politics and Organizational Process, as well as to the Rational Analysis approach, which has been the mainstay of manpower research in the past.

Manpower research strategy and tactics have been reasonably well elucidated, and computerized data bases and sophisticated methodologies are increasingly available for answering analytic questions. Consequently, progress in manpower planning and management will be facilitated by drawing on the insights gained from all three approaches. It will also depend on increased collaboration among the various disciplines and technologies that contribute to the manpower/human resources field, from both the military and civilian sectors of society.

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APPENDIX A: Human Resource Planning Process

This conceptualization of manpower planning represents a contemporary approach in the civilian sector for helping organizations anticipate and meet changing needs related to the acquisition, deployment, and utilization of people.¹

Needs Forecasting

Analysis of External Conditions

- Economic, social, political
- Government and legislation
- Population and work force
- Markets and competition
- Technologies

Future Human Resource Requirements

- Organization and job design
- Plans and budgets
- Management policies and philosophy
- Technologies and systems
- Affirmative action/EEO goals and plans

Future Human Resource Availability

- Current inventory
- Forecasted attrition
- Forecasted movement and development
- Effects of past human resource programs

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APPENDIX A

Forecasting of Human Resource Needs

- Immediate and longer term
- External hiring needs
- Reductions and reallocations
- Improved utilization
- Development

Program Planning

Performance Management

- Organization
- Performance appraisal
- Reward structures

Career Management

- Policies and systems
- Management succession
- Development and training
- Career opportunities
- Individual career planning

REFERENCE

1. The process is from Walker, James W. *Human Resource Planning*. New York: McGraw Hill Book Company, 1980: p.11.

APPENDIX B: Classification Scheme for Manpower, Personnel, and Training Research

This scheme was devised to provide a logical and coherent structure for categorizing research, studies, and analyses dealing with manpower, personnel, and training.

100 Manpower Requirements

110 Estimation

- 111 Determination**
- 112 Modeling**
- 113 Optimal Mix (active, civilian, contractor, reserves)**
- 114 Planning, Programming, Budgeting**
- 115 Reserves (Active Mariners, Ready Mariners, role, SAM, strength, TAR)**
- 116 Tradeoffs (capital-labor, man-machine)**

120 Productivity Analysis

- 121 Personnel (performance, readiness, substitutability)**
- 122 Unit (effectiveness, readiness, output)**

200 Manpower Supply

210 Estimation

- 211 Determination, Forecasting, Modeling, Projections**
- 212 Draft vs. All-Volunteer Force**
- 213 Effects of External Factors (attitudes, civilian earnings, demographics, legislation, technology, unemployment)**
- 214 Effects of Service Policies (benefits, compensation, contract length, training)**
- 215 Manpower Information Systems**

APPENDIX B

- 216 Manpower/Personnel Costs
- 217 Sources of Specific Types (lateral entrants, nurses, physicians)
- 218 Veterans

- 220 Recruiting and Procurement
 - 221 Enlistment Programs
 - 222 Mental Standards (AFQT, education)
 - 223 Motivation for Joining
 - 224 Officer Programs
 - 225 Physical Standards
 - 226 Recruiting and Advertising
 - 227 Screening and Selection

- 230 Assignment and Utilization
 - 231 Classification, Assignment, and Distribution Techniques
 - 232 Classification Tests (ASVAB)
 - 233 Inventory Characteristics, Profiles, Utilization
 - 234 Rotation (sea/shore, unit)

- 240 Training and Education
 - 241 Alternatives (civilian, contract, fleet)
 - 242 Evaluation (curriculum, program, syllabus)
 - 243 Design and Technology (computer-assisted/managed, self-paced, simulator)
 - 244 Individual/Unit Performance (exercises, grades, proficiency)
 - 245 Planning and Programming
 - 246 Training Costs

- 250 Advancement and Promotion
 - 251 Advancement in Rating Examinations
 - 252 Career Development/Progression
 - 253 Enlisted Performance Evaluation
 - 254 Officer Fitness Report

- 260 Attrition and Retention
 - 261 Personnel Attrition (discharges, losses, quit rate, turbulence, turnover)
 - 262 Personnel Retention (career decision, continuation, eligibility, extensions, reenlistments, survival)
- 300 Incentives
 - 310 Monetary Compensation
 - 311 Allowances (family separation, travel, transportation)
 - 312 Regular Military Compensation
 - 313 Retirement
 - 314 Special and Incentive Pays/Bonuses (enlistment, flight, nuclear, reenlistment, sea, submarine)
 - 315 Structuring Compensation Policy
 - 320 Military Benefits
 - 321 Commissaries, Exchanges, Homeowners Assistance, Insurance, Leave
 - 322 GI Bill, Professional and Voluntary Education and Training
 - 323 Medical/Dental Care
 - 330 Quality of Life
 - 331 Human Resources Management (EEO, community and personal services, family programs, housing, substance abuse)
 - 332 Job/Navy Satisfaction (attitudes, motivation)
 - 333 Living and Working Conditions (habitability, morale)
- 400 Manpower, Personnel, and Training Overviews
 - 410 Bibliographies
 - 420 Critiques, Reviews, and Summaries

GLOSSARY

ACOL model—Annualized Cost of Leaving model.

Active duty¹—Full-time duty in the military service of the United States. *See also* Active duty for training.

Active duty for training¹—Full-time duty of inactive reserve personnel in the military service for training purposes, usually for a limited number of days or months. *See also* Active duty.

Activity¹—A unit, organization, or installation of distinct identity performing a specific function or mission and established under a commanding officer, officer-in-charge, etc.; for example, a naval station, naval shipyard, naval air station, specific ship, or air squadron.

ADSTAP System—Advancement, Strength, and Training Planning system.

AFQT—*See* Armed Forces Qualification Test.

Armed Forces Qualification Test (AFQT)—A composite of four aptitude test scores from the Armed Services Vocational Aptitude Battery used by the military services for qualifying personnel for enlistment. The tests are Arithmetic Reasoning, Word Knowledge, Paragraph Comprehension, and Numerical Operations. AFQT scores, expressed as percentile ranks, are categorized into eight Mental Groups. *See also* Armed Services Vocational Aptitude Battery *and* Mental Group.

Armed Services Vocational Aptitude Battery (ASVAB)—A battery of aptitude tests used by all of the military services in qualifying personnel for enlistment and training in different occupational specialties. It consists of ten tests: General Science, Coding Speed, Auto and Shop Information, Mathematics Knowledge, Mechanical Comprehension, Electronics Information, Arithmetic Reasoning, Word Knowledge, Paragraph Comprehension, and Numerical Operations. The

GLOSSARY

last four tests together are used to compute an Armed Forces Qualification Test score. *See also* Armed Forces Qualification Test.

ASVAB—*See* Armed Services Vocational Aptitude Battery.

AVF—All-Volunteer Force.

BAA—*See* Baseline Area Appraisal.

Baseline Area Appraisal (BAA)—A periodic in-depth evaluation of a critical individual area or program in its entirety. It provides resource sponsors with a realistic assessment of the capabilities provided by programmed resources vis-a-vis the capabilities required to achieve the program's mission, identifying shortfalls and providing alternatives to improve overall capability.

Billet¹—A specific military manpower space that is assigned qualifiers that define the duties, tasks, and functions to be performed and the specific skills and skill level required to perform them. *Billet* connotes military manning, whereas *position* connotes civilian manning.

Budgeting¹—The process of translating approved resource requirements (manpower and material) into time-phased financial requirements.

Career manning¹—The ratio of career personnel to career requirements.

Career personnel¹—Enlisted personnel on active duty with over four years of service.

CBO—Congressional Budget Office.

CNA—Center for Naval Analyses.

CNO—Chief of naval operations.

CNO Program Analysis Memorandum (CPAM)¹—An appraisal by mission area regarding current programs, alternative programs, and modifications thereto

or to any other methods of solution provided to the chief of naval operations and his executive board. It is used to determine in a "macro" sense the desired direction or change of direction within a program during the years covered by the Program Objective Memorandum.

Continuation rate—The ratio of the number of personnel in the force at the beginning of the year to the number still in that force at the end of the year.

CPAM—See CNO Program Analysis Memorandum.

DCNO—Deputy chief of naval operations.

DEP—Delayed Entry Program.

Elasticity (of manpower supply)—The percentage change in the quantity supplied divided by the percentage change in price. For example, an elasticity of retention with respect to pay of 2.0 implies that a 2-percent increase in retention is produced by a 1-percent increase in pay.

End-strength¹—The number of active-duty Navy personnel on the last day of an accounting period, including those serving with the Marine Corps and those for whom reimbursement is received from other agencies or foreign nations. It does not include Navy personnel paid from reserve personnel funds.

Enlistment—A voluntary contract made by an individual with no prior service to serve a two- to six-year term of active duty in the military services.

Extension—A voluntary obligation made by an individual with prior military service to remain on active duty for less than two years.

Fiscal year—From October 1 of a calendar year through September 30 of the next calendar year.

GED—General Educational Development tests used nationwide to establish high school equivalency.

Grade—See Pay grade.

GLOSSARY

Five-Year Defense Program (FYDP)¹—The official program that summarizes the secretary of defense's approved plans and programs for the Department of Defense. It is published at least once annually.

Force¹—An aggregation of military personnel, weapon systems, and necessary support or a combination of such elements.

Force structure¹—The number of personnel by rate or rating, distributed by length of service.

FYDP—*See* Five-Year Defense Program.

Incentives¹—Monetary and non-monetary (quality-of-life or fringe benefits) influences on behavior. For example, bonuses and choice of assignment are incentives for increasing enlistments and reenlistments.

JOBS Program—Job-Oriented Basic Skills Program.

Manning¹—The specific inventory of people at an activity in terms of numbers, grades, and occupational groups.

Manning level¹—The number of personnel on board an activity divided by the billets authorized for the activity. It can be related to specific occupational classifications, i.e., the percentage of authorized billets that can be filled in various rates and ratings based on current or projected personnel inventories.

Manpower authorization¹—The qualitative and quantitative expression of military manpower requirements authorized by the CNO for a naval activity. It is the authority used by the chief of naval personnel to provide requisite personnel distribution and Naval Reserve recall, and the single official statement of organizational manning and billets authorized.

Manpower management¹—Planning, statistical forecasting, balancing, and approving manpower requirements. Planning and control of manpower, and the effective utilization of manpower to meet military requirements, are proper functions of management (command) coordination.

Manpower requirements¹—(1) A stated tentative need for manpower by quantities and skills. (2) The end-fiscal year apportionment of manpower based on known needs in the years for which the secretary of defense, by means of the Five-Year Defense Program, has limited the end-year military manpower ceiling. (3) The tentative end-fiscal year apportionment of manpower based on both known and estimated needs in projected years for which the secretary of defense has not prescribed an end-year strength ceiling. (4) A statement of the quantity and quality (rating and pay grade) of manpower (billets) needed to perform specific capabilities in a projected environment. For ships, aircraft squadrons, and shore activities, these requirements are displayed in manpower documents. *See also* Military requirement.

Manpower resources¹—Human resources available to the services that can be applied against manpower requirements.

Manpower Supply—*See* Personnel inventory.

Manpower Validation¹—The process of establishing, through on-site manpower utilization studies, the validity of stated military and civilian manpower requirements.

MANTRAPERS Plan—Manpower, Training, and Personnel Plan.

Mental group—Any of eight categories of percentile ranks on the Armed Forces Qualification Test equated to the distribution of scores in a nationally representative sample of American youth tested in 1980. The groups and their percentile rank limits are as follows:

I	93—100
II	65—92
III U	50—64
III L	31—49
IV A	21—30
IV B	16—20
IV C	10—15
V	1—9

GLOSSARY

Mental groups I, II, and III U often are referred to as the “upper mental group” and III L and IV as the “lower mental group.” Mental group IV C and V personnel are not qualified for naval service. *See also* Armed Forces Qualification Test.

Military requirement¹—An established need justifying the timely allocation of resources to achieve a capability to accomplish approved military objectives, missions, or tasks. *See also* Manpower requirements.

Mobilization¹—The process by which the armed forces or part of them are brought to a state of readiness for war or other national emergencies. It includes assembling and organizing personnel, supplies, and material for active military service.

MPT—Manpower, personnel and training.

NARM—Navy Resource Model.

Navy Enlisted Classification (NEC)¹—A structure that supplements the enlisted rating structure for personnel on active or inactive duty and billets. It reflects special knowledge and skills that identify personnel and requirements when the rating structure is insufficient for manpower management purposes.

NEC—*See* Navy Enlisted Classification.

NPRDC—Navy Personnel Research and Development Center.

ONR—Office of Naval Research.

Pay grade¹—A step or degree in a graduated scale of officer or enlisted rank that has been established by law or regulation. Sometimes referred to as “grade.” The pay grades for the Navy are as follows:

Officer

O-10 admiral



O-9 vice admiral



O-8 rear admiral (upper half)



O-7 rear admiral (lower half)



O-6 captain



O-5 commander



O-4 lieutenant commander



O-3 lieutenant



O-2 lieutenant (junior grade)



O-1 ensign



Enlisted

E-9 master chief petty officer



E-8 senior chief petty officer



E-7 chief petty officer



E-6 petty officer first class



E-5 petty officer second class



E-4 petty officer third class



GLOSSARY

E-3 seaman



E-2 seaman apprentice



E-1 seaman recruit



PCS—Permanent Change of Station.

Personnel¹—Those individuals required, in either a military or civilian capacity, to accomplish the assigned mission/tasking. In the context of Navy manpower management, *personnel* connotes individuals, whereas *manpower* connotes requirements or billets.

Personnel inventory¹—Numbers of persons available to fulfill manpower requirements, for example, by occupational classification, pay grade, and distribution (assignment) category.

Planning, Programming, and Budgeting System (PPBS)¹—An integrated system for the establishment, maintenance, and revision of the Five-Year Defense Program and the Department of Defense budget.

POM—*See* Program Objective Memorandum.

PPBS—*See* Planning, Programming, and Budgeting System.

Program¹—A plan or scheme of action designed for the accomplishment of a definite objective. It is specific as to the time-phasing of the work to be done and the means proposed for its accomplishment, particularly in quantitative terms, with respect to manpower, material, and facility requirements. The program provides a basis for budgeting.

Program Objective Memorandum (POM)¹—The document in which each military department and defense agency recommends and describes annually its

total resource and fiscally constrained program objectives to the secretary of defense. To allow flexibility for each service to develop a balanced program, reallocation of funds is permitted between major mission and support categories unless specifically prohibited by fiscal guidance.

Quality—(1) The rating and pay grade distribution of a personnel inventory. (2) The mental ability and educational categorization of personnel. Usually connotes upper (versus lower) mental group members and high school graduates (versus non-high school graduates).

R&D—Research and development.

Rate¹—Identifies personnel occupationally by pay grade. Within a rating, reflects levels of aptitude, training, experience, knowledge, skills, and responsibilities. For example, *radioman* is a rating, whereas *radioman third class* is a rate within a rating.

Rating¹—An enlisted career field that requires related aptitudes, knowledge, training, and skill. A petty officer always serves in a rating. A non-petty officer who has special training or experience or has demonstrated qualifications for a petty officer grade may be designated a “striker” for a particular rating and thus be assigned duties in that occupational career field.

Readiness (combat)¹—The availability of organizations or equipment for combat operations; personnel qualified to carry out combat operations in the unit to which they are assigned.

Reenlistment—A voluntary contract made by an individual with prior military service to serve an additional two to four years of active duty.

Reenlistment rate—The ratio of the number of reenlistments to the number eligible to reenlist during a given period. Usually computed for first, second, or third term of active duty, or for first-term and career reenlistments.

Requirement—See Military Requirement and Manpower requirements.

GLOSSARY

Retention Rate—The ratio of the number of personnel who had less than thirteen months of obligated service at the beginning of the year to the number who remain in the force at the end of the year.

SAM Program—Sea and Air Mariner Program.

Schools¹—Categories of enlisted schools and courses designed and maintained to assist the forces afloat by giving instruction, which because of the time allowed and facilities available, can be given more advantageously ashore. Activities that provide training to enlisted personnel include the following classes:

Class "A"—Provides the basic technical knowledge and skills required to prepare for job-entry-level performance and further specialized training; includes Apprenticeship Training.

Class "C"—Provides advanced knowledge, skills, and techniques to perform a particular job.

Class "F"—Provides team training to fleet personnel or individual training, such as refresher, operator maintenance, and technical training, of less than 13 calendar days.

Class "R"—Provides general indoctrination training upon initial enlistment and prepares the recruit for early adjustment to military life; called recruit training or "boot camp."

Sea-shore rotation—Alternating assignments of personnel to sea and shore billets.

Selected Reserve (SELRES)—The portion of the Ready Reserve consisting of members in a drill pay status. (Ready Reserve members serve under a statutory military obligation or written agreement.) A drill is a period of training on inactive duty, usually of four hours' duration, for which members earn one day's active-duty pay.

SELRES—See Selected Reserve.

Ship Manpower Document (SMD)¹—A publication issued by the deputy chief of naval operations (manpower) that displays the minimum quantitative and qualitative manpower requirements of an individual ship or class of ships and the rationale for their determination. Requirements are predicated upon statements of Required Operational Capabilities under a Projected Operational Environment, ship configuration, specified operating profile, computed workload, and established doctrinal constraints, such as standard work weeks and leave policy.

SHMD—See Shore Manpower Document.

Shore Manpower Document (SHMD)¹—A publication issued by the deputy chief of naval operations (manpower) that displays the minimum quantitative and qualitative manpower requirements for a shore support activity and their source. Requirements are predicated upon statements of Shore Required Operational Capabilities, workload data, and established doctrinal constraints.

SMD—See Ship Manpower Document.

SQMD—See Squadron Manpower Document.

Squadron Manpower Document (SQMD)¹—A publication issued by the deputy chief of naval operations (manpower) that displays the minimum quantitative and qualitative manpower requirements of an individual aircraft squadron or class of squadrons and the rationale for their determination. Requirements are predicated upon statements of Required Operational Capabilities under a Projected Operational Environment, aircraft configuration, specified operating profile, computed workload, and established doctrinal constraints, such as standard work weeks and leave policy.

SRB—Selective Reenlistment Bonus.

Supply—See Personnel Inventory.

Training¹—Instruction that provides the knowledge and skills required for immediate application in the accomplishment of a specific task or combination of tasks.

GLOSSARY

Unrestricted line officer¹—Officers of the line of the Navy and Naval Reserve who are not restricted in the performance of duty and may succeed to command at sea, in contrast to limited, engineering, and special-duty officers of the line and Staff Corps officers who may not succeed to command at sea.

VRB—Variable Reenlistment Bonus.

ZOE—Zone of Executability.

REFERENCE

1. Definitions derived from Office of the Chief of Naval Operations, Instruction 1000.16E, *Manual of Navy Total Force Manpower Policies and Procedures*, 2 March 1981.

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