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The Sixth Annual Navy Workforce Research and Analysis Conference: Building on the DON Total Force Strategy

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The Sixth Annual Navy Workforce Research and Analysis Conference: Building on the DON Total Force Strategy

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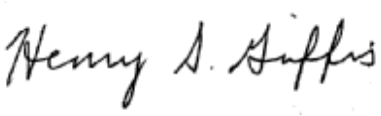

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This document represents the best opinion of CNA at the time of issue.
It does not necessarily represent the opinion of the Department of the Navy.

Contents

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Introduction

For the sixth year, the Center for Naval Analyses (CNA) hosted the Annual Navy Workforce Research and Analysis Conference under the sponsorship of OPNAV (N1). This year's conference took place on April 25-27, 2006, at Marriott Fairview Park Hotel in Falls Church, VA. It was expanded to 2.5 days and was combined with the Second Civilian Community Management Conference. In attendance were senior Navy manpower, personnel, and training leadership along with research analysts from such organizations as CNA, the Navy Personnel Research Studies and Technology (NPRST) laboratory, the Naval Postgraduate School (NPS), and the Office of Naval Research (ONR). Researchers from the various organizations in concert with CNA manpower and personnel analysts gave presentations of collaborative research efforts during the conference. Attendees were encouraged to discuss ongoing research and priorities and to make further suggestions and recommendations.

The theme of this year's conference was "Enhancing the Navy Workplace: A Competency-Focused and Performance-Based Culture." Topics discussed in the various sessions included the following:

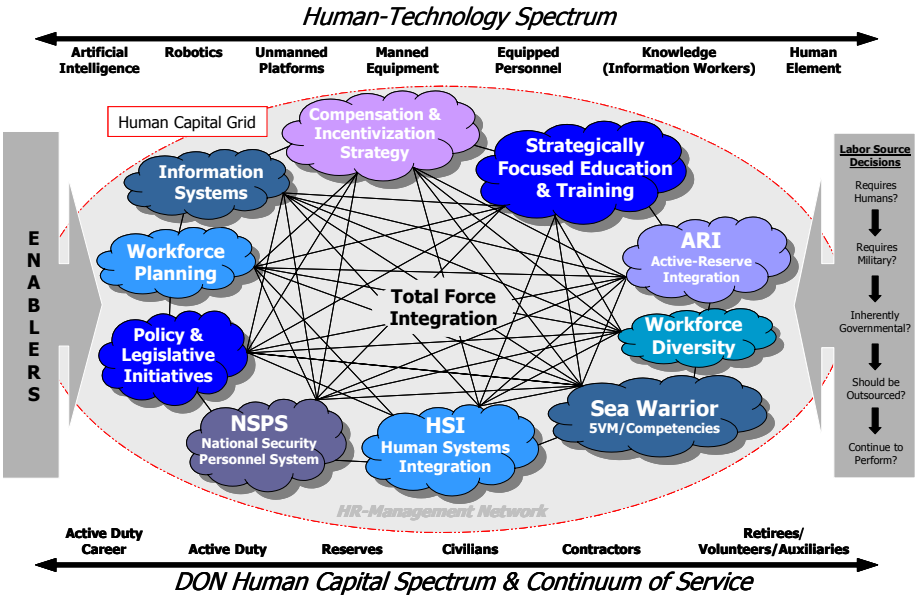
- Human Systems Integration (HSI)
- Human Performance
- Competencies and Performance
- Diversity
- Selection, Classification, and Assignment
- Metrics / Digital Dashboard
- Managing the Future
- Quality of Life
- Reserve and Reenlistment Compensation

- Officer Issues
- Sailor Assignment
- Training
- Female Retention
- Total Ship / System Integration Team
- Alternative Sea Manning
- Modeling and Simulation
- Praxis, Selection, and Classification
- Supporting the Global War on Terror (GWOT)
- Recruiting the Force
- Requirements.

This conference report is structured around the Department of the Navy (DON) Total Force Strategy, which was presented in the keynote address by the Honorable William A. Navas, Jr., Assistant Secretary of the Navy, Manpower and Reserve Affairs [1]. Each session topic has been incorporated into the framework of the various competency and performance *enablers* that make up the DON Total Force Strategy (see figure 1). The strategy includes ten enablers for total force integration:

1. Compensation and Incentivization Strategy
2. Strategically Focused Education and Training
3. Active-Reserve Integration (ARI)
4. Workforce Diversity
5. Sea Warrior
6. HSI
7. National Security Personnel System
8. Policy and Legislative Initiatives
9. Workforce Planning
10. Information Systems.

Figure 1. DON Total Force Strategy[a]



a. Source: [1].

For example, the DON Total Force Strategy enabler, Compensation and Incentivization Strategy, contains presentations on the following topics: Quality of Work Life in the Navy; The Selective Reenlistment Bonus Program; Results of the 2005 Navy Morale, Welfare and Recreation and 2005 Fleet and Family Service Center Surveys; Validation of Work/Non-Work Life Model of Quality of Life and Retention Among Navy Personnel; and Results of the 2004/5 Survey of Army Families.

The purpose of this summary document is to provide a record of research problems and initiatives, insight into the methodology and analyses presented, and foresight into future program developments.

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Compensation and Incentivization Strategy

The Department of the Navy is experiencing an ever-changing operational and market environment in which the talents and preferences of younger workers must be taken into account. These changes require the DON's senior leadership to seek opportunities to better align the compensation and incentive system to maximize its usefulness as a recruiting, retention, and performance-deriving tool. The following presentations discuss various approaches to developing compensation policies that support a compensation and incentive system that is competitive, equitable, flexible, and sufficiently responsive to the changing environment [2].

2005 Navy-wide and Army studies and surveys provide assessments and results of personnel satisfaction with quality of work, command leadership, and promotion opportunities, as well as Sailor satisfaction with Navy Morale, Welfare and Recreation (MWR) and Fleet and Family Service Centers (FFSCs). Surveys show overall satisfaction in most of these aspects of Navy life. Another presentation described analysis aimed at validating quality-of-life (QOL) equations modeling of the impact of work/non-work variables and data on intended and actual retention. The Selective Reenlistment Bonus (SRB) program as an enlistment retention force management tool was also discussed.

Quality of Work Life in the Navy: Results of the 2005 Navy Personnel Survey

Dr. Kimberly Whittam (NPRST) discussed the satisfaction of Navy personnel with their quality of work according to the results from the 2005 Navy Personnel Survey [3]. First administered in 1990 and biannually since then, the 2005 Navy Personnel Survey results indicate that, in general, both enlisted personnel and officers are satisfied with their immediate supervisors and their command leadership. According to Dr. Whittam, the level of confidence in leadership has also been steadily rising since 1998. Enlisted personnel are now more

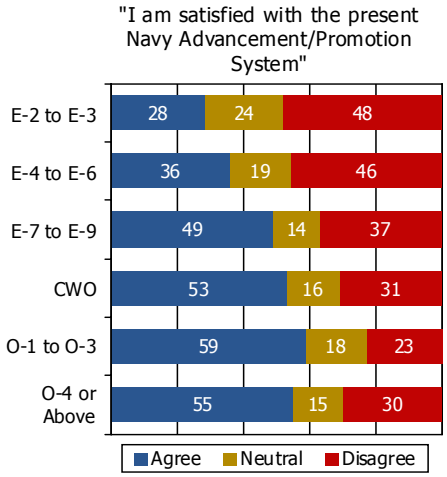
likely to report that "the most qualified and deserving Sailors get advanced/promoted" than they would have been 5 years earlier. (See figure 2.)

Figure 2. Advancement and performance evaluation[a]

The most qualified and deserving Sailors get advanced/promoted

	2000	2003	2005
Enlisted	20%	27%	29%
Officers	41%	46%	41%

	Enlisted	Officer
Clear understanding of the present EVAL/FITREP system	80%	91%
Last EVAL/FITREP was fair/ accurate	66%	84%
Last advancement/promotion recommendation was fair/ accurate	67%	86%
I am satisfied with the present Navy EVAL/FITREP system	49%	62%



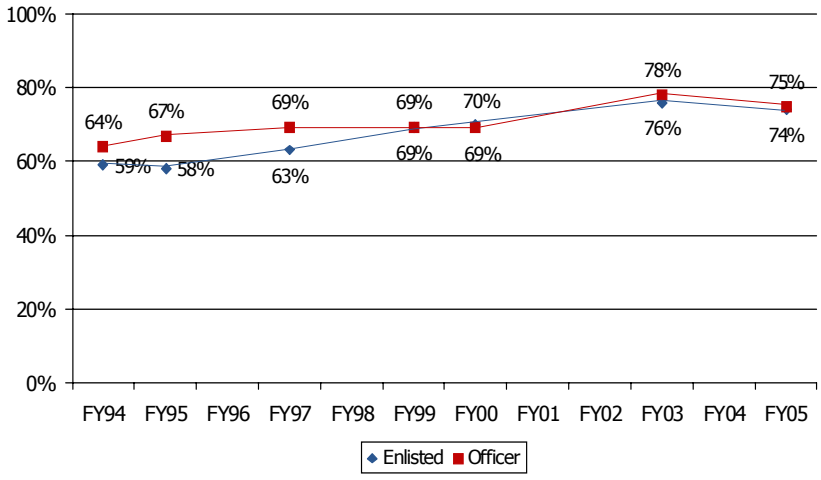
a. Source: [3].

Since 2000, Sailors have also increasingly expressed their desire to reenlist or continue their Navy careers. There was a positive assessment of command morale, a trend that has been steadily rising for both enlisted and officer personnel. In the case of enlisted personnel, the reports of high command morale have more than doubled since 2000. Likewise, Sailors' reports on fair compensation have steadily increased in 2000, 2003, and 2005 surveys; in 2005, 54 percent of enlisted personnel and 75 percent of officers favorably responded to that question. In conclusion, Dr. Whittam stated that recent surveys for both enlisted personnel and officers have shown overall satisfaction with Navy life and Navy job. In fact, job satisfaction is near historical highs.

Results of the 2005 Navy Morale, Welfare and Recreation and 2005 Fleet and Family Service Center Surveys

Dr. Paul Rosenfeld, Zannette Uriell, and Dr. Rosemary Schultz (NPRST) presented findings of the 2005 Navy-wide MWR and FFSC Surveys [4]. These surveys assessed Sailors' satisfaction with MWR and FFSC facilities and programs. Sailors were also asked how these facilities/programs contribute to their personal and professional lives, and how often they use the programs. (See figure 3.) The MWR 2005 Customer Survey found that the fitness center, auto skills center, and bowling facilities were viewed most favorably, while survey responders least favored marina services, lounges/bars, and youth recreation programs. The FFSC Customer Survey showed that Sailors identified Transition Assistance Program, Relocation Assistance Program, and Information and Referral Program as the most important FFSC programs. Of these, the Information and Referral Program, Personal Financial Management Program, and Relocation Assistance Program were used most frequently. Sailors were most satisfied with the Transition Assistance Programs, Personal Financial Management, and New Parents Support Programs.

Figure 3. MWR satisfaction across years[a]



a. Source: [4].

According to Dr. Rosenfeld and his colleagues, comparing results of MWR Customer Surveys from 2000, 2003, and 2005 shows that Sailors consistently select fitness centers, ITT, and gym as the three most important MWR facilities/services. Furthermore, these same facilities/services are consistently chosen as most frequently used by Sailors. Overall satisfaction with MWR in the 2005 survey was slightly less positive than responses in 2003. However, when questioned about individual aspects of MWR services, this trend was less consistent across surveys for these same years. For example, whereas enlisted personnel found MWR recreational facilities lacking, they responded favorably to services involving stress management, help for Sailors' children adjusting to military life, and the importance of MWR as an incentive for reenlistment.

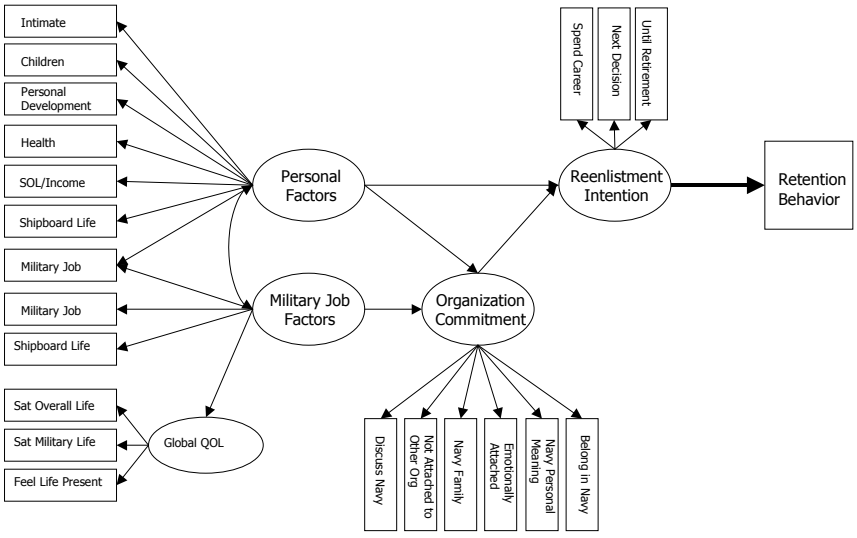
Validation of Work/Non-Work Life Model of Quality of Life and Retention Among Navy Personnel

Dr. Michael Schwerin (RTI International) and colleagues described their research aimed at validating a QOL model of work/non-work with retention data [5]. The presentation builds on previous research in the area of employee turnover and retention. He discussed analysis of the impact of QOL variables on intended and actual retention behavior. The data used in this model come from the 1999 Navy QOL Survey, and the model's results were validated with the 1998 USMC QOL Survey and the 2002 Navy QOL Survey. Dr. Schwerin referenced various research papers in relation to the study's objectives, which were (a) to replicate and extend the Wilcove et al. (2003) model of QOL and retention using new Navy QOL survey data from the 2002 Navy QOL Survey (Wilcove and Hay, 2004), (2) to apply more rigorous multigroup structural equation modeling (SEM) approaches (Bryne, 1994, 2001; Kline, 1998) to the Wilcove et al. exploratory model of QOL and retention intent, and (c) to include actual retention behavior in the work/non-work life model.

Dr. Schwerin's multigroup SEM approach uses equations that were developed to assess the impact of personal factors (e.g., intimacy, children, personal development, health, income, and shipboard life) and military job factors (e.g., job rating, shipboard life, and satisfaction with military life) on organizational commitment and reenlistment

intention and, secondarily, on retention behavior itself. (See figure 4.) According to the model, these aspects of Sailors' lives have the strongest relationship to work productivity and other factors, which in turn affect organizational commitment, reenlistment plans, and actual retention behavior. Dr. Schwerin discussed a compelling new model that describes the relationship between work/non-work domains and Sailor retention, and identifies areas of Sailors' lives with the strongest relationship to work and non-work factors. The model also illustrates how work and non-work factors affect organizational commitment, retention intent, and actual retention behavior. They found several limitations; more variables could be added to alternate models to make the relationship to retention intent and retention behavior stronger. The model describes how variables are related but not why.

Figure 4. 2002 Navy QOL data: overall conceptual model—married with children[a]



a. Source: [5].

Dr. Schwerin and his colleagues recommend continued use of self-report survey data for behavioral modeling studies, the use of personal identifier surveys for secondary data analyses, and the use of methodological studies to determine which survey identifiers might affect data quality. They suggest using alternate models to tell a more comprehensive story and using focus group interviews to learn why life needs are related as they appear: what does that domain really mean to them? They also recommend using the models to shape Sailor and family support programs.

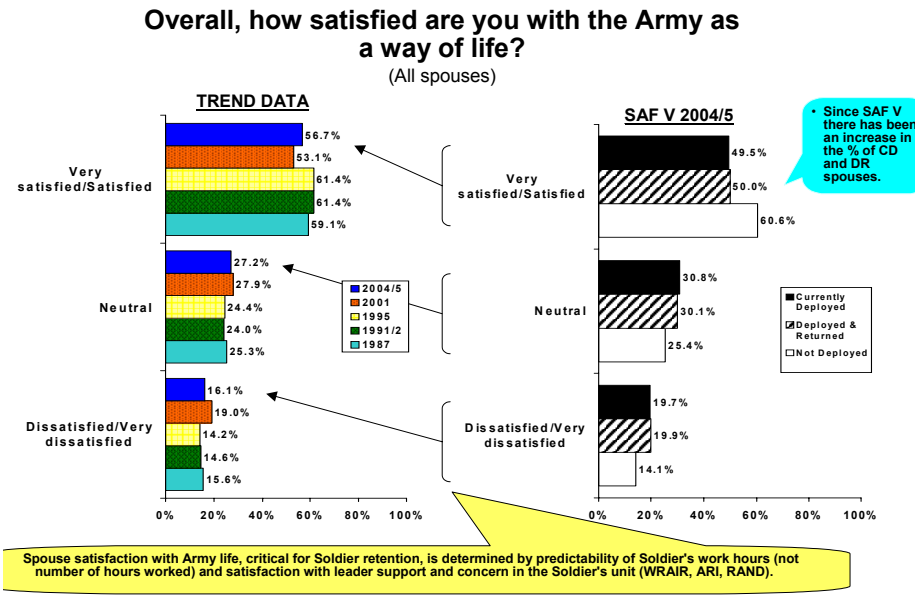
Results of the 2004/2005 Surveys of Army Families V (SAF V)

Dr. Richard Fafara (CFSC) quoted from the 2006 CNO Guidance [6]:

> Our success in defense of this nation depends upon the men and women of the United States Navy—active, reserve and civilian—and their families. Personal and family readiness are vital to combat readiness.

The CNO's Guidance indicates the relevance of quality of work and quality of life for shaping today's workforce as well. Earlier Surveys of Army Families (SAF) were administered from 1987 through 2001. In addition, surveys of Army families on their satisfaction with aspects of readiness involving quality of work and life were conducted in 2004/2005 (SAF V), during Operations Iraqi Freedom/Enduring Freedom (OIF/OEF). Three subsamples, each with its own tailored questionnaire, were developed based on the status of spouses since September 11th, 2001—that is, whether the spouse is currently deployed (CD), has deployed and returned (DR), or has not deployed (ND). The surveys had a 43-percent response rate, composed of usable responses from a total of 24,793 spouses of Active Component officers and enlisted soldiers. SAF V included questions concerning spouses and family experiences from the following categories: overall satisfaction with the Army as a way of life, satisfaction with Army life, spousal absence, participation in Family Readiness Group deployments, eldest child coping with deployment, support and concern for Soldier's family from Army leaders, and personal and institutional resources and deployment adjustment. (See figure 5.)

Figure 5. Survey of Army Families V[a]



a. Source: [6].

According to Dr. Fafara, SAF V results have shown that high percentages (60+ percent) of spouses of active duty Soldiers believe that their family has adjusted well to the demands of being an "Army family." Many are satisfied with the Army as a way of life and would have no problem or a slight problem coping if their Soldier spouses had to go away for 6 months or less on an Army assignment. In addition, many would be supportive if their Soldier spouses were to make the Army a career. Spouses are handling tasks involving managing family/personal daily and child-related activities well and are adjusting easily to reunions with their Soldiers.

Dr. Fafara made recommendations to further improve deployment and separation adjustments. The first is to stress family readiness in leadership development courses at all levels, and to include successful strategies for engaging families and providing support to them. Another recommendation is to maximize predictability by providing spouses accurate and timely information about unit duty schedules, mission, and family assistance, especially during periods of

deployment separation. The findings also suggest sustained or increased child care support to include care for working families and respite care during deployment and separation periods. It is also important to increase awareness, accessibility, and helpfulness of Army support agencies and programs. Another recommendation is to promote opportunities for married couples to spend time together to strengthen their relationships. Finally, effective spousal support networks would help to combat loneliness and isolation.

The Selective Reenlistment Bonus (SRB) Program

Capt Dave Longhorn (USAF) discussed the SRB program, a force management tool designed to increase enlisted retention [7]. He presented the Air Force's new SRB analysis process and optimization model, a comprehensive model for allocating the Air Force SRB budget. Capt Longhorn stated that SRBs serve two basic purposes: (1) to provide incentives to Airmen in critical skills to stay in their skills (via reenlistments), and (2) to encourage Airmen from other skills to retrain into critical skills. According to Capt Longhorn, SRBs are offered at four reenlistment zones within an Air Force Specialty Code (AFSC), thereby allowing targeted retention effects in specific year groups.

The Air Force first offered SRBs to 107 enlisted skills in 1998. Following a period of recruiting shortfalls in 1999 and 2000, however, the Air Force stepped up the program in 2002, offering SRBs to 161 skill sets. In 2005, the Air Force was nearly 20,000 Airmen above its congressionally authorized endstrength and was forced to limit SRB payments to only 32 high-priority, warfighting skills. According to Captain Longhorn, the SRB program remains a critical force retention management tool. The SRB process was constructed to be analytically sound. The two-step process is designed to (1) objectively identify SRB candidate AFSCs and (2) optimally distribute the SRB budget. The model has been run several hundred times under different random effects to provide the best insight into SRB allocation strategies. (See figure 6.)

In conclusion, Captain Longhorn stated that the new SRB process has been briefed to all career field managers (top E-9s in each AFSC), all MAJCOM Command Chiefs, CMSAF, and senior leaders within the

Air Force Directorate of Personnel. March 2006 marks the first use of the new SRB process, and researchers believe that sound analysis can objectively identify SRB candidates and provide insight into cost-effective allocations of funding for SRB.

Figure 6. An example of step 2: best allocation of SRB dollars[a]

	ZONE A	ZONE B	ZONE C	ZONE D
1T2X1 identified as SRB candidate in:	Yes	Yes	No	No
Respective candidate cases are:	Case 1	Case 2	n/a	n/a
Current SRB multiples offered:	6.5	5.5	2.5	0.0
Science back into the SRB process: SRB Optimization Model (Run 1):	6.0	5.5	1.5	0.0
SRB Optimization Model (Run 2):	5.5	4.5	1.5	0.0
SRB Optimization Model (Run 3):	6.5	5.0	1.5	0.0
…	…	…	…	…
SRB Optimization Model (Run 100):	6.0	5.0	1.5	0.0
Average SRB Optimization Allocation:	6.0	5.5	1.5	0.0

BOTTOM LINE: Recommend decrease in Zone A to 6.0, leave Zone B alone, and reduce Zone C to 1.5

a. Source: [7].

Special Operations Forces (SOFs): Challenges in Manning the Force

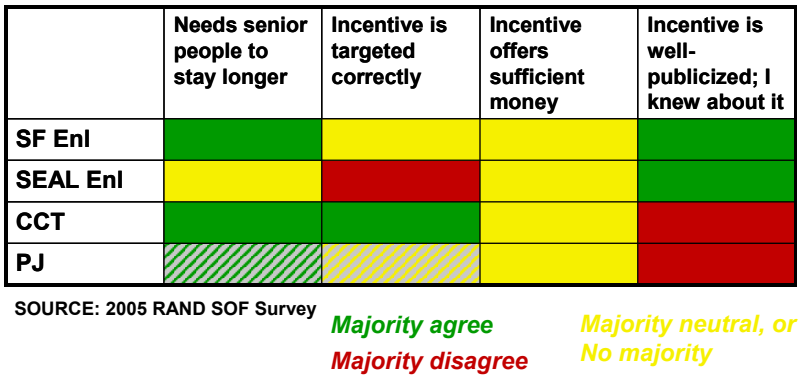
Dr. Margaret Harrell (RAND) said that Special Operations Forces, which provide rapidly deployable, flexible forces for war and peacetime activities, will be needed in larger numbers in future years [8]. However, SOFs are facing some critical current and near-future manning issues: shortfalls in some specialties, a large number of personnel approaching retirement eligibility, and the consequent need to recruit a large number of younger soldiers.

The RAND Corporation's National Defense Research Institute (NDRI) conducted expert interviews and focus groups with SOF personnel to analyze current and projected SOF manning and to identify SOF operators' views toward their profession and factors affecting

their decisions to enter and to stay in SOFs. The categories included positive and negative job aspects, job attitudes, favorable civilian comparisons, and off-the-job factors. The researchers also conducted a web-based survey of SOF personnel to determine the relative strength of those views and whether they vary by either demographic characteristics or military experience and skill attributes. The research also assessed the recently implemented retention initiative for SOF operators. While the incentives appeal to most SOF operators, some still expressed an increased desire to leave. (See figure 7.)

Figure 7. Means of assessing effectiveness[a]

- **Official opinion suggests the incentive is successful**
- **Take rates suggest success regarding Army SF, and potential success regarding Air Force CCTs and PJs**
- **SOF responses to incentive mixed, and are generally linked to retention intentions (all but hatched boxes):**



a. Source: [8].

These analyses were placed in the context of overall recruiting and retention, the projected need for SOF in future missions, and likely future SOF manning. Dr. Harrell concluded with a review of recommendations involving improvements to SOF general management, perceptual management, compensation, career management, local management and leadership, and Service-specific issues.

Effect of Bonuses on Participation in the Navy Selected Reserve

The Navy has changed Selected Reserve (SELRES) bonuses in recent years. In accordance with 2005 NDAA, an increase in maximum bonus amounts awarded resulted in a maximum bonus for a 6-year reenlistment contract being increased from $5,000 to $15,000. In addition, the Navy has implemented a three-tier bonus system that determines bonus amount based on manning levels. Some of the issues surrounding the changes included the recognition that there is no indication that SELRES Sailors will be used less frequently in the foreseeable future and that the Navy Selected Reserve didn't meet its FY05 accession goal. Also, it is believed that a higher proportion of future accessions may be non-prior service (NPS) than in the past.

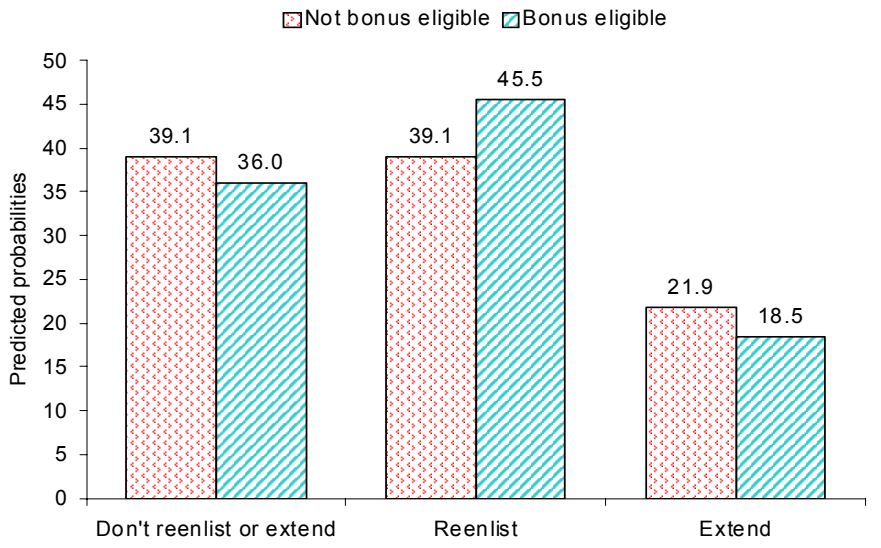
Dr. Diana Lien (CNA) and colleagues examined how bonus eligibility influences decisions to stay in the Selected Reserve, as well as decisions to obligate for 6 or more years [9]. They also examined how receiving a bonus influences continuation behavior for the following groups: 6-year NPS enlistments, 3- and 4-year prior-service (PS) enlistments, 6-year PS enlistments, 3- and 4-year reenlistments, and 6-year reenlistments. The data sources included DMDC's Reserve Components Common Personnel Data System and Navy Reserve Forces Command bonus eligibility listings and bonus recipient data.

Dr. Lien found that bonus eligibility encourages staying and reenlisting among SELRES Sailors. (See figure 8.) She also found that, of those who elect to stay, bonus eligibility influences the length of contract selected. The study revealed that bonuses increase NPS continuation rates. Another observation is that prior-service members are influenced by bonuses perhaps even more than NPS accessions with 6-year contracts. Finally, reenlistment contracts continuation rates were higher when bonuses were offered; however, the bonus effect was lower.

Dr. Lien concludes with several implications for NPS accessions. First, there is no indication that NPS accessions are more likely to leave the Selected Reserve. Continuation rates among NPS accessions are, in fact, similar to that of PS accessions. The estimates also suggest that NPS accessions are responsive to bonuses, but current NPS accessions may not be representative of future NPS accessions. With respect to

the implications for Sailors with prior service, enlistment bonuses can be used to induce enlistment and continuation. Reenlistment bonuses can be used to encourage reenlisting and signing longer reenlistment contracts, and they can potentially utilize lump-sum payments. Finally, enlistment and reenlistment bonuses need to be coordinated to meet Navy SELRES manning requirements.

Figure 8. Sailors eligible for a bonus are more likely to reenlist[a]



Bonus eligibility encourages staying and reenlisting

a. Source: [9].

Strategically Focused Education and Training

A key component of the Navy's Human Capital Strategy is to build on initiatives that modernize manpower/personnel professional development. The goal is to effectively use the workforce to meet expanding roles and mission-essential capabilities. The presentations in this section examine processes for assessing job skill qualifications and mission readiness, such as linking aviation maintainer performance to naval aviation mission tasks. The trend of creating performance measures in the Navy is working to make Mission-Essential Task Lists (METLs) the language to link the following: the Services' missions, the tasks required for these missions, and the training needed to undertake these tasks.

The presenters discussed a variety of technological tools—business and training models—being developed to (a) help the Services better understand Linking Fleet Performance and Training & Education, (b) assist the Services in buying simulators and training, which reduce redundancy and align the financial incentives of industry participants with positive training and technology development outcomes, tailored to Service missions, and (c) build game-based training and integrate games into the training curriculum, considering requirements and budgets, and integrate trainers into the fleet and/or the field. In addition, computer-based simulation using open source game-engine technology is being modified to enhance leadership modeling and to enable practice, assessment, and feedback on targeted leadership skills (i.e., critical thinking).

Aviation Maintenance Training and Readiness Profiling: A Navy Web-Based Process

According to Mr. Michael Welch (SYS Technologies, Inc.), the Navy has no other effective processes for assessing aviation maintenance readiness and individual skill qualifications than Navy Enlisted Classification (NEC) "billet fills" [10]. A constraint, which has hampered

efforts to link aviation maintainer performance to naval aviation mission tasks, is the inability to establish readiness links from the maintainer's job task to operational and mission tasks. These issues have been recognized by the Navy and are being addressed by the Total Force Readiness Cross Functional Team (TFR CFT). SYS Technologies has developed a web-service data model framework application that (1) provides logical linking of the maintainer's job task performance in an operational unit to primary mission derived from Naval Tactical Activity (NTA) tasks, (2) links mission-critical training objectives to actual maintenance tasks and training refreshment through a maintenance training and readiness (M-T&R) matrix, and (3) establishes a process for automating measurable maintainer performance in the operational environment to a meaningful readiness metric, such as Ready-for-Tasking (RFT).

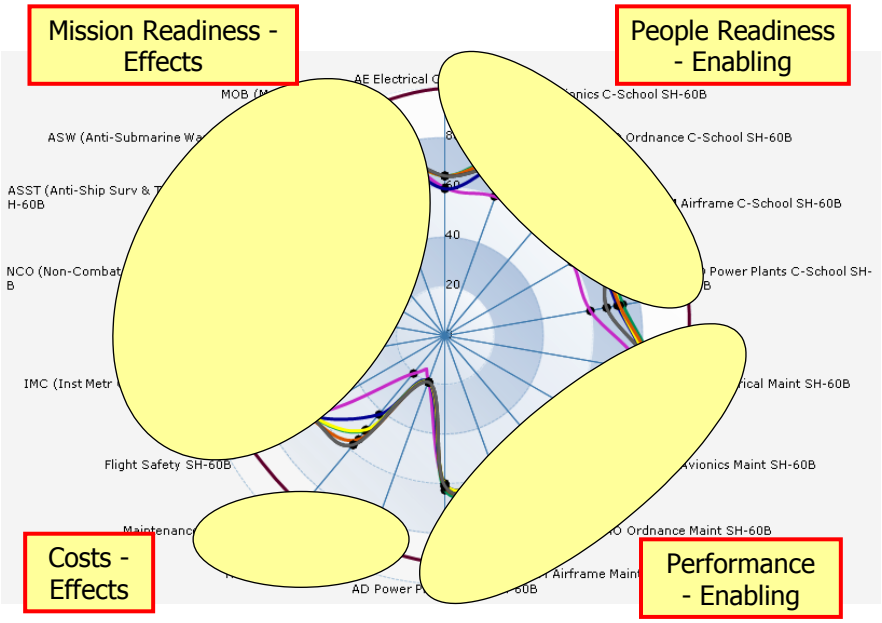
The project provided decision-makers in the Naval Aviation Enterprise (NAE) with information needed to make informed choices about maintenance training and readiness. The project also provided ongoing research to eventually visualize the qualified proficient technician (QPT) program and maintenance skills sustainment through an M-T&R matrix. Developed by SYS Technologies, The Assessment Profiling System (TAPS) state space model links and provides timely readiness and training information tailored for specific readiness decision-makers via an easy-to-use web-based visualization.

The TAPS display simultaneously presents trend data and the current status of each drilldown element. It includes a data collection agent designed to acquire the metrics needed from the heterogeneous collection of disparate databases, such as Decision Knowledge Programming for Logistics Analysis and Technical Evaluation (DECKPLATE). TAPS uses agent-extracted Navy data that are input to a Microsoft SQL server multiple-attribute utility data model to display information in Bowser Kiviat format. The M-T&R was also provided and can be used in naval aviation squadrons to track quantifiable individual performance and proficiency to skill group standards. (See figure 9.)

Through a Small Business Innovation Research (SBIR) NAVAIR project, now in phase III, the company has developed TAPS, to give decision-makers knowledge and awareness of aviation maintenance

proficiency and mission contribution. TAPS has been commercially released, licensed, and demonstrated to NAVAIR. Although created for the H-60 helicopter, the TAPS technology is extensible to readiness reporting and training management for other aircraft platforms and systems, such as Sea Warrior and CVN-21.

Figure 9. The four quadrants of TAPS[a]



a. Source: [10].

Linking Fleet Performance and Training & Education (LFP&TE)

Dr. Gerald Cox (CNA) presented research on a study intended to help the Navy better understand the link between Fleet Performance and Training & Education [11]. The current training revolution has the potential to substantially affect both the Individuals' Account (IA) and Human Performance Center (HPC) in order to explore approaches to performance analysis. CNA has identified existing data on various aspects of fleet performance, has identified other data on training, education, and personnel attributes, and has described

methods for LFP&TE (see figure 10). CNA has also explored HPC case studies, suggested approaches for gathering new data, and made policy recommendations regarding analysis and data collection. The available data on fleet performance compose an irregular patchwork—the exceptions being the naval aviation and submarine communities.

Figure 10. The methodologies for LFP&TE[a]

- Methodology in education analysis is currently in the national spotlight
- *No Child Left Behind* demands "Scientifically Based Research"
- NSF has called for greater use of experiments—the "gold standard" for analysis in T&E
- NSF cites other requirements for rigorous analysis—among these are
  - –Peer review
  - –Sharing data for replication
  - –Rigor & independence in setting research agenda

a. Source: [11].

According to Dr. Cox, in light of the trend of changing performance measures, the Navy is working to make METLs the language to link the Services' missions, the tasks required for these missions, and the training needed to undertake these tasks. Change is occurring as the Services move to the Defense Readiness Reporting System (DRRS) and the Joint Training Information Management System (JTIMS). In addition, the new performance measures require personnel to perform the task to particular conditions and standards. Dr. Cox reviewed several examples in which methodology in education analysis is currently in the national spotlight. He noted that the No Child Left Behind Act of 2001 demands "Scientifically Based Research," and the National Science Foundation (NSF) has called for greater use of experiments—the "gold standard" for analysis in T&E. NSF

also cites other requirements for rigorous analysis, including peer review, sharing data for replication, and rigor and independence in setting research agenda. He also reviewed both the strengths and limitations of experiments (using control and treatment groups), regression analysis, and surveys of subject matter experts.

Dr. Cox made recommendations for gathering data. He stated that decisions on methodology and data should be made jointly, with consideration given to the costs of training and costs of potential failure in fleet performance. He suggests that a determination be made concerning what areas of TE and FP should be analyzed in consultation with, yet remaining independent from, the fleet and those overseeing training initiatives. Finally, he recommended making better use of existing data and getting better feedback to training.

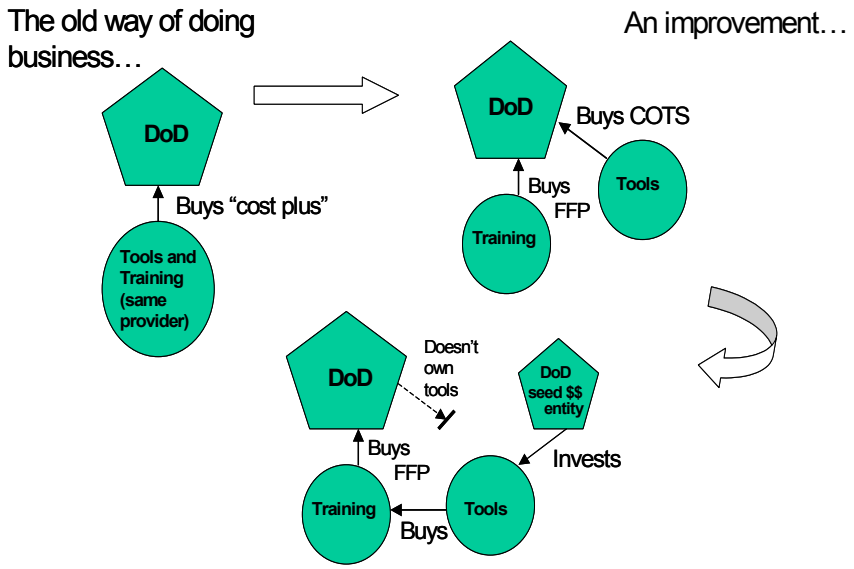
Implementing and Evaluating an Innovative Approach to Simulation Training Acquisitions: Training Capabilities Analysis of Alternatives

Dr. Christopher Paul (RAND) and Dr. Harry J. Thie (RAND) presented findings from a RAND report on an alternative business model for buying simulations and simulation training [12]. With the new business model, the Department of Defense (DOD) would stop buying both tools and training support and buy only training support. The "old" business model, which this would replace, is characterized as being both fiscally wasteful and a hindrance to innovation. The new model seeks to align the financial incentives of industry participants with positive training and technology development outcomes. The new model proposes that what has traditionally been the acquisition of training simulators will become a service acquisition (the acquisition of training support) with a private-sector "tool vendor" marketplace to provide necessary tools to the training service providers. Under this model, DOD would stop buying training support with cost-plus contracts and start buying it on firm-fixed-price contracts. (See figure 11.)

Dr. Paul and Dr. Thie discussed the model in light of economic theory and relative to other business models related to the acquisition of training and simulations. Their research includes review of relevant academic literature and publicly available information about various simulation training initiatives, and they report on interviews with

those in industry and DOD with experience in developing, procuring, or using simulations for training.

Figure 11. The transformation envisioned by an alternative model[a]



a. Source: [12].

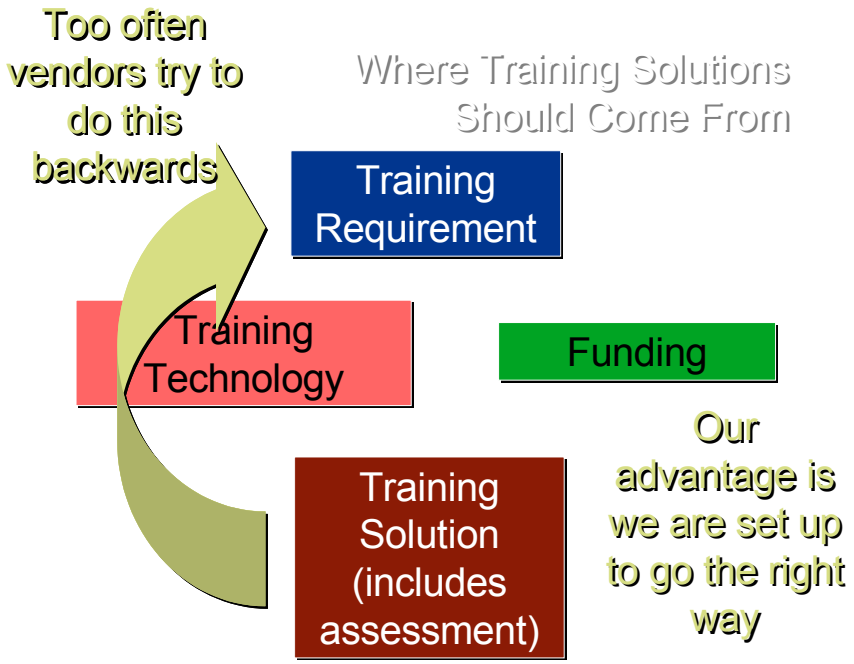
According to Dr. Paul and Dr. Thie, economic theory and experience suggest that the proposed business model is based on sound economic principles, but actual implementation is not without risk. They conclude that the model is ideal for a prototype effort to see if sound theory can result in effective practice. Some of the risks associated with the model involve ensuring competition and innovation in training tools and training support. The new model hopes to encourage competition and innovation by untying the training support provision and tool development markets, requiring compliance with adopted technical standards to guarantee product interoperability, and creating a mechanism by which DOD can inject seed money into the tool market. The complete analysis, as well as an implementation and evaluation plan for a prototype of the new business model, can be found in RAND MG-442, *Implementing and Evaluating an Innovative*

Approach to Simulation Training Acquisitions (available at http://www.rand.org/pubs/monographs/MG442/).

Getting Past the Hype of Game-Based Training

Mr. Chris Clark (MOVES Institute, Naval Postgraduate School) and colleagues report that many in military training circles have viewed "PC game-based training" as almost a panacea for training difficulties [13]. Whenever training difficulties are mentioned (falling budgets, short turnaround time between deployments, increase in the number of tasks to train, etc.), training experts usually mention game-based training as one method to overcome the difficulties. Mr. Clark believes, however, that very little is truly understood about how to build game-based training and how best to integrate games into the rest of the training curriculum. (See figure 12.) He discusses research efforts at the MOVES Institute on this topic, covering three important issues for understanding and building game-based trainers.

Figure 12. Integrating games into the training[a]



a. Source: [13].

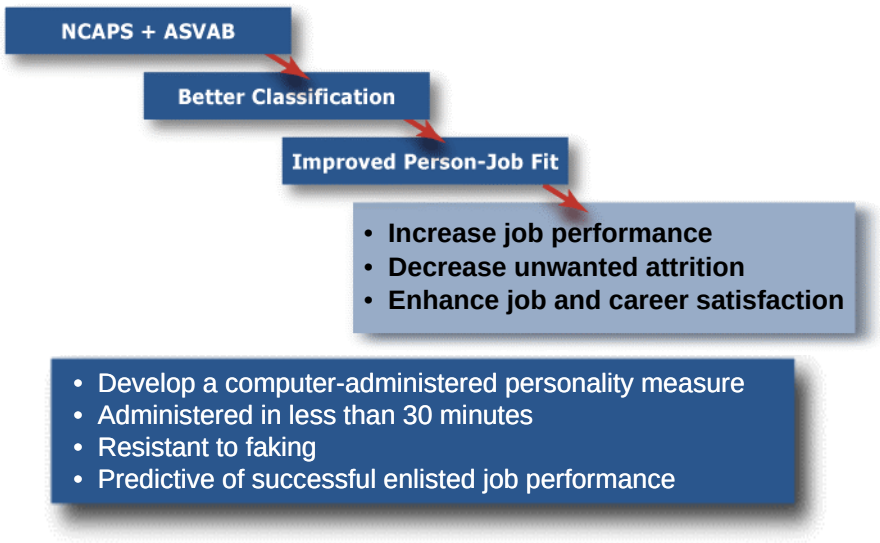
The Delta3D open-source game engine, which is designed specifically for military applications, lowers the costs of building game-based trainers. A gaming community should be developed (or existing ones leveraged) so that the military can share financial responsibility. Because Delta3D is open source and does not contain proprietary software, anyone can use it, allowing program managers to contract with companies consecutively, thereby extending foregoing work. This also allows project managers to search for the best value for follow-on projects. Near-term improvement projects have been funded, and others have been planned and proposed. Delta3D's website was designed to maximize the user base. The website makes it easy for users to get started, and it helps with building advanced applications. There are many examples of code as well as tutorials. Forums are read and responded to by Delta3D staff daily. (See the website at http:/ / delta3d.org.)

In 2004, two USMC students decided to rebuild FOPCSIM, a trainer for Forward Observers in Delta3D for Marines in the fleet. The product was evaluated for effectiveness in a scientifically rigorous study, and the product was again well liked by PM-TRASYS. When using Delta3D, however, there are no licensing costs associated with the product, so FOPCSIM is being produced for the entire USMC. Research was conducted to determine how to best modify commercial off-the-shelf (COTS) games to meet training needs. The study was evaluated at Ft. Benning, but further experimentation is needed on various issues—for example, determining the best format for the new training paradigm, fitting game elements into the Sharable Courseware Object Reference Model (SCORM), blending training in light of requirements and budgets, using the games for evaluation, and comparing games with current methods. Mr. Clark also explained that Delta3D fits into the training spectrum. It can be used to build full, large-scale training systems. Furthermore, Delta3D is ideal for smaller, quicker training systems of short durations (15 to 60 minutes). According to Mr. Clark, DOD can truly reach the potential offered by game-based training if strides are taken to understand better how to build, implement, and integrate the trainers into the fleet and/or the field.

Navy Computer Adaptive Personality Scales (NCAPS): Initial Results From Response Distortion and Large-Scale Validation

Dr. David Alderton (Bureau of Navy Personnel) presented the initial results from the Response Distortion and Large-Scale Validation studies involving NCAPS—an innovative instrument designed to improve current selection and classification processes for enlisted U.S. Navy personnel [14]. These initiatives improve on existing processes by including personality assessments (i.e., NCAPS) along with existing Armed Services Vocational Aptitude Battery (ASVAB) tests to enhance the predictive capability of Sailors' performance during training and their performance once on the job. Statistical tests have shown that personality assessments account for an additional 10 to 38 percent of on-the-job performance variance, which is separate from cognitive ability measures. According to the study's findings, personality assessment, part of the whole person assessment approach, can potentially reduce unwanted attrition resulting in increased job performance. NCAPS will allow Navy classifiers to create personality profiles of new recruits that will be matched to available Navy jobs for optimal person–job fit. (See figure 13.)

Figure 13. Improving selection and classification processes[a]



a. Source: [14].

NCAPS assesses Sailors on ten traits determined to be important across all Navy enlisted jobs (Achievement, Adaptability/Flexibility, Attention to Detail, Dependability, Dutifulness/Integrity, Self-Reliance, Social Orientation, Stress Tolerance, Vigilance, and Willingness to Learn). Three additional traits (Leadership, Perceptiveness/Depth of Thought, and Self-Control) are in development. Two response distortion (faking) studies are under way. These studies examine the resistance of the NCAPS format to people faking traits or "gaming" the measure. Large-scale validation is in process at five Navy Learning Centers. Preliminary results from NCAPS are expected to provide global trait levels and job-family-specific trait levels required for success.

Validation of a Computer-Based Simulation To Teach Critical Thinking Skills

Ms. Amy Griffin (Human Performance Center, N74) presented work that the Navy is conducting to validate a computer-based simulation using open-source game-engine technology that will enable practice, assessment, and feedback on targeted leadership skills (i.e., critical thinking) [15]. Leadership skills play a vital role in the orchestration of naval operations, and technological advances using simulation may prove to be an effective training solution for critical thinking skills.

Ms. Griffin noted that the Human Performance Center (HPC) and National Center for Excellence in Distance Learning (NCEDL) are developing a measurement prototype that synthesizes critical thinking dimensions and an expert critical thinking model. The critical thinking dimensions are developed from the existing Navy Leadership Competency Model, which uses four stages (or cognitive steps) taken during the critical thinking process. Emphasis is placed on mission accomplishment, decisiveness, risk management, and problem solving. (See figure 14.) The model will eventually be modified to measure skill sets based on Curriculum Case Studies from the Center for Naval Leadership (CNL).

In the study, multiple events were scripted to elicit critical thinking behaviors. The events were linked together into scenarios that simulate selected experiences of a Navy Division Officer (DiVO). Situational characteristics of scenarios are systematically varied, and

branching technology-enabled events unfold based on the trainees' decision-making behaviors. On completion, a "simulated coach" guides trainees through a review of their responses compared with expert responses. The study validates responses by using pre- and post-simulation knowledge tests and assigns a critical thinking performance measure to determine retention and performance levels. According to Ms. Griffin, the study's results will demonstrate training effectiveness and identify variables that can be used to enhance skills during future leadership training using simulation-based technology.

Figure 14. Critical thinking dimensions[a]

a. Source: [15].

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Active Reserve Integration (ARI)

Active Reserve Integration (ARI) is the integration of the capabilities of both the active force and the Naval Reserve Force Components, and making the most effective and efficient use of those resources. In support of the Fleet Response Plan directed by the Chief of Naval Operations (CNO), fully integrating the forces will create a more cohesive, surgeable, ready force [16].

The presentations in this section discuss some key issues surrounding the more intensive use of the Reserves. For example, concerns have been raised that many reservists suffer financial losses due to call-ups, and analyses and proposals are under way for increasing the compensation for activated reservists to lessen the impact of such losses. Another presentation examined the effectiveness of the Marine Corps' Selected Reserve Incentive Program (SRIP) bonuses in lowering attrition. The analysts recommended enhancements that could be made to the program to improve recruitment and retention of Marines.

Activation and the Earnings of Reservists

Jacob A. Klerman (RAND) began the discussion noting DOD's heavy reliance on the Reserve Components in conducting the Global War on Terrorism [17]. A large fraction of the reserve force has been activated at least once since September 11th, 2001, and many of these activations have lasted for more than a year. According to Klerman, this more intensive use of the Reserves has been accompanied by concerns that many reservists suffer substantial financial losses because of being activated. Some legislative proposals at the federal and state levels would increase compensation of activated reservists to offset these financial losses. Klerman then presented results from joint work with David Loughran and Craig Martin, also of RAND. Unlike previous analyses that have relied on survey data, their analysis uses administrative data (Social Security Administration data on civilian earnings

and Defense Military Data Center data on military pays and allowances) and imputes values to the tax preferences associated with some components of military compensation and to service in combat zones. They argue that these administrative data provide higher quality information than can be derived from the survey data. They estimate both gross effects (while activated vs. before activation) and net effects (while activated vs. what earnings would have been if not activated), finding that average earnings rise sharply with activation and that the earnings increase is increasing in the time on active duty. (See figure 15.) About a quarter of reservists, however, do experience earnings losses—sometimes large ones. Those experiencing losses do not appear to be disproportionately drawn from any component or rank. Compared with earlier survey-based results, these results based on administrative data suggest less need for earnings replacement legislation and indicate that such legislation would, if adopted, be cheaper than expected.

Figure 15. Reservist earnings loss according to differing data sources[a]

- **Estimates of earnings losses attributable to activation derived from payroll data are more accurate than those derived from survey data**
- **The payroll data indicate earnings loss is less common than is implied by survey-based analyses**

Data Source	Avg. Change in Earnings	Percent with Loss	
		Any Loss	>10%
2004 SOFRC	–$3,396	49%	43%
Payroll data	$13,539	17%	11%

a. Source: [17].

SELRES Attrition and the Selected Reserve Incentive Program (SRIP) in the Marine Corps Reserve

Ms. Anita Hattiangadi (CNA) discussed Selected Reserve (SELRES) attrition and suggested several improvements to the Marine Corps' Selected Reserve Incentive Program for those in Selected Marine Corps Reserve (SMCR) units [18].

Aside from any recruiting effects, Ms. Hattiangadi and her colleagues found that SRIP bonus recipients have lower attrition than nonrecipients even after holding constant other factors that can affect attrition. Their statistical analyses showed that reenlistees who received a bonus had a lower estimated probability of attriting than those who did not. Bonus effects increased with months since reenlistment, and attrition ranged from 11.4 to 17 percentage points lower for bonus recipients within 6 to 36 months of reenlistment, respectively. They also examined the effect of bonuses on non-prior-service (NPS) enlistees' attrition. Although the researchers found no bonus effect within 6 months of reaching drilling status, receiving a bonus significantly lowered the estimated probability of attriting by 24 or 36 months, other factors held constant. (See figure 16.)

Figure 16. Summary of results for 24-month loss model—reenlistees[a]

Statistically significant results only

Predicted probability of attriting from the SelRes 24 months after reenlisting		
Independent variable	Predicted probability (percentage points)	Marginal effect (percentage point change from baseline predicted probability)
Reenlistment conditions		
No bonus	43.7	
Received either a 3- or 6-year reenl. bonus	19.8	-23.9
Other demographic variables		
Male	35.8	
Female	55.4	19.6
All other race/ethnicities	37.1	
Native American/Alaskan	20.3	-16.8

Sample size – 1,913
Sample probability of attriting = 36.7%

a. Source: [18].

She noted that, despite these benefits, the SRIP's scope has been fairly limited with only about 2.5 percent of 6-year obligors in the SMCR receiving enlistment bonuses. Relatively low rates of SRIP bonus receipt may be due to limited SRIP budgets. In fact, Ms. Hattiangadi and her colleagues found that the SRIP's enlistment and affiliation incentives were less generous than some other Guard/Reserve Components' programs (particularly the Army Guard/Reserve). Also, the Marine Corps Reserve (MCR) does not offer bonuses for college credit, off-peak shipping bonuses, or High Priority Unit Pay. And, unlike some of these other components, the MCR does not offer tuition assistance or Student Loan Repayment incentives that many in CNA's Individual Ready Reserve (IRR) focus groups said would entice them to join an SMCR unit.

Ms. Hattiangadi recommended several changes to the SRIP that could help improve its ability to recruit and retain Marines in SMCR units. She first recommended an assessment of the cost-effectiveness and affordability of additional bonuses/incentives. The analysts suggested off-peak shipping bonuses, retention bonuses for critical skill or high-priority units, and deployment breaks as top contenders (deployment breaks have since been implemented). The next recommendation was to continue to refine SRIP by adding a paygrade dimension, considering payments to reenlistees in undermanned military occupational specialties (MOSs), even if a particular unit is overmanned, and promoting the program. Ms. Hattiangadi also recommended relaxing legislative/policy restrictions and developing more force controls.

Compensation and Voluntary Participation in a Continuum of Service (CoS)

Increased use of Reserve and Guard units has required the Services to "work around" the traditional model. Dr. Michael Hansen (CNA) and Dr. Diana Lien (CNA) discussed Continuum of Service, a new paradigm for how DOD may organize and manage its personnel assets, replacing the traditional structure of the Active and Reserve Components with a more flexible structure [19]. The new model of participation will facilitate seamless movement between varying levels of service (full- and part-time status) throughout a career. According

to Dr. Hansen, the current compensation system is not designed to support CoS, and should be examined for cost-effective reform possibilities that will promote volunteerism.

According to Dr. Hansen, the existing compensation data are problematic for several reasons. First, they lack variation in current bonus authorities, and changes to compensation might not be "marginal." A "menu option" survey, Choice-Based Conjoint (CBC), was developed to help identify preferences. The survey is not traditional, but rather helps respondents compare different "bundles" of compensation and reserve participation and then choose the preferred bundle. The survey is built on eight characteristics of reserve service (grouped under three categories):

1. Extent of participation in the Reserves
   - Level of participation
   - Frequency of activations
   - Frequency of deployments
2. Financial compensation
   - Affiliation bonuses
   - Mobilization bonuses
3. Retirement incentives
   - TSP matching
   - Retirement age
   - Retirement points.

Results show that reservists have different preferences for participation (days in obligated duty) even apart from changes in compensation. Some reservists prefer frequent activations and have mixed preferences for deployment. In examining preferences separately for enlisted personnel and officers, different civilian employment statuses, and mobilized and nonmobilized reservists, there does appear to be a different distribution of preferences among these groups. (See figure 17.) Differences, however, are driven by intentions to

leave the Reserve. If the option to leave the Reserve is excluded, distributions are very similar. Preferences differ slightly by mobilization history, but differences are minor for those who intend to stay. Results also show that targeted bonuses can increase voluntary participation, yet across-the-board changes in compensation are not effective. Also, different incentives have very different costs. For example, lowering the retirement age is very expensive relative to targeted bonuses. The costs of changing different incentives must be compared with their benefits. In a future study, the costs of CoS should also be compared with costs of increases in recruiting / retention, which was beyond the scope of this analysis.

Figure 17. Conclusions based on survey of preferences[a]

- Heterogeneous preferences for participation
  - Even without changes in compensation
- Reservists will respond to targeted incentives
- Across-the-board changes do not encourage participation in a CoS
- Targeted compensation is more cost effective
- CoS-related compensation changes don't appear to increase retention
- CoS presents an alternative to increasing manning through recruiting / retention

a. Source: [19].

Workforce Diversity

The Department of the Navy now faces more complex challenges that require more competition to attract, develop, and retain a top-quality workforce capable of the highest levels of mission success. The Navy seeks to strengthen its workforce by leveraging the capability, creativity, and productivity of people of all backgrounds, making full use of our nation's human capital. Furthermore, the Navy must create a diverse workforce environment where people can excel, as well as be treated with dignity and respect, and be given recognition for their contributions [2].

The following presentations provide a review of the ongoing diversity initiatives, which focus on the state of diversity in the Navy. Researchers discuss the Navy's goals and obligations to future diversity strategies. According to recent surveys, the Navy is very strong in some areas of diversity (e.g., recruiting, growth and development, and leadership support), while other areas remain moderately improved. On examination of some key issues, such as deficiencies in female recruiting/retention and racial and gender discrimination, studies show that there has been a continual decline over time but there remains room for improvement.

Workforce Diversity and Organizational Productivity

The discussion by Mr. David Breslin (NAVSEA) focused on the idea that the Human-Capital goal and future obligation to a modern knowledge-based organization is to hire, grow, and retain quality workers [20]. According to Mr. Breslin, an organization's capability, creativity, and productivity can be improved by removing any qualifying restrictions placed on any potential new candidate applying for a new job opening. By doing so, organizations will attract a greater number of applicants and will therefore be able to select better new employees. This claim hinges on an assumption that employee traits that affect worker productivity are distributed normally along the

spectrum and that, by adding previously excluded groups of applicants to an applicant pool, the levels of desired traits at each end of the spectrum are increased in an all-inclusive applicant pool. Since organizations tend to select only the best applicants, or those with highest levels of desired traits, they will necessarily select from candidates located at the extreme points of the desired traits' distribution, the part of distribution that is positively affected by an increase in the size of the applicant pool. Therefore, by limiting the number of applicants for any new job opening, organizations fail to capture the greatest possible levels of the mean value of the desired traits from the pool of new hires, and they lose productivity gains derived from hiring from a larger pool of workers with higher levels of desirable traits. (See figure 18.)

Figure 18. Let's hire some people: scenario 1 versus scenario 2[a]

a. Source: [20].

The research Mr. Breslin presented expands substantially on an earlier work that (1) reviewed recent econometric advances relative to understanding the positive relationship between diversity and productivity, (2) provided some rudimentary tools for quantifying the potential effect that increased diversity can have on the quality of new

hires into the workforce, and (3) offered a statistically based mathematical proof. Inferences are made concerning the ability to improve workforce productivity across the enterprise by modifying hiring practices. Mr. Breslin reviewed case studies, empirical evidence, and a mathematical approach to valuing the benefit of broadening the numbers and types of people considered for employment. Results indicate that broadening the diversity of the applicant pool increased the quality of new hires by 25 percent.

Cross-Cultural Communications Between Americans and Iraqis, 2003–2004

Mr. Philip Romanelli (Strategic Communications) addressed the issue of cross-cultural communications, which he believes to be a vital issue for the U.S. Navy and the Department of the Navy as operations continue in Iraq and throughout Central Command (CENTCOM) [21]. Mr. Romanelli noted that, in specific tasking to N1/NT, N3/N5, and N2, ADM Mullen called for the Navy to "develop practical cross-cultural skills needed to further relations with emerging partners."

Mr. Romanelli's presentation highlights how cultural, language, and other factors affect the communications between Iraqis and Americans. It focuses on how members of these groups perceive the world around them, and how these perceptions limit the acceptable or appropriate actions and reactions to everyday situations. Inevitably, these perceptions affect their communications with one another, where appropriate format, sequence, and topics of these communications differ across both groups. For example, whereas Iraqis tend to be more diffuse in their speech, or are more often accustomed to using exaggerations, Americans tend to get straight to the point, stick to the facts, and be more direct. Because such differences decrease communications, understanding, and cooperation between both groups, learning about them could be a worthwhile topic for future training.

Mr. Romanelli uses seven dimensions of dilemma theory to address the issue of cross-cultural communications: Universalism vs. Particularism, Individualism vs. Communitarianism, Neutral vs. Affective, Specific vs. Diffuse, Achievement vs. Ascription, Inner Direction vs. Outer Direction, and Sequential Time vs. Synchronous Time. He has

also studied the problem of psychological distance between Iraqis and Americans, and the major reasons for that distance: the war itself, language, and religion. (See figure 19.) Mr. Romanelli believes that the importance of cross-cultural communications is reflected in CNO Guidance for 2006: Meeting the Challenges of a New Era, and the Marine Corps' founding of the Center for Advanced Operational Culture Learning.

Figure 19. Key points of dilemma theory[a]

- "All values take the form of dilemmas"
  - Not positive and negative poles
  - Cycle between two positive values that mirror one another and must be integrated
- Culture emphasizes one value over the other
  - "Cultures tend to assert that to which no final answer can be given"
- Supported by a database of > 50K questionnaire replies in 50 countries

a. Source: [21].

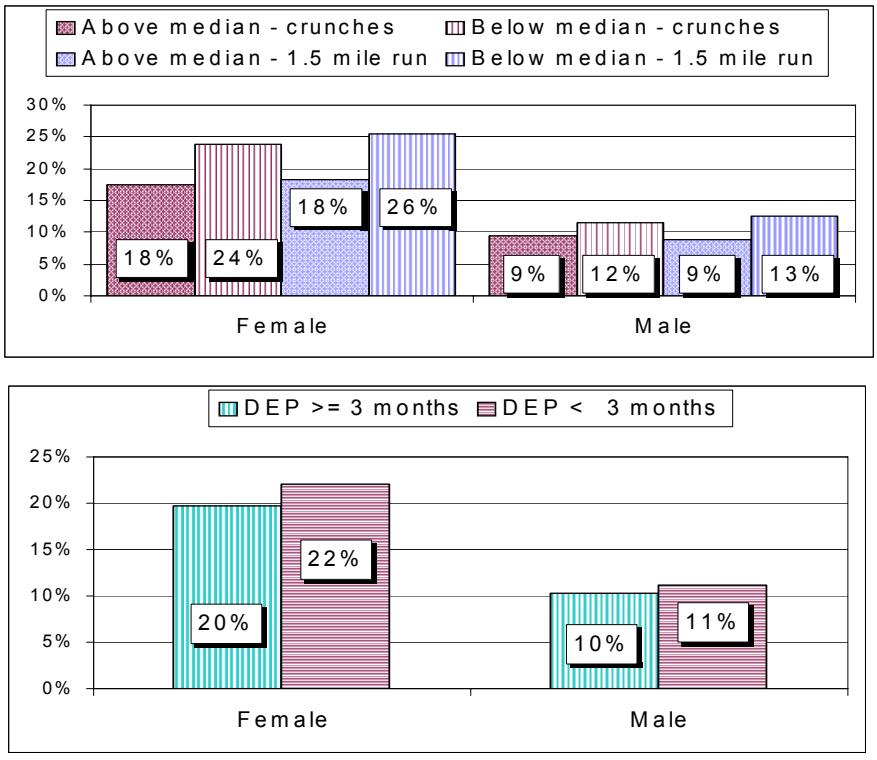
Female Bootcamp Attrition in the Marine Corps

Female accessions have increased from 1979 through 2003, and there is also a trend that suggests a higher rate of bootcamp attrition—in fact, double—for female recruits than for male recruits. Dr. Cathleen McHugh (CNA) and Dr. Aline Quester (CNA) noted that, while there is ample evidence concerning male recruits to suggest correlations between certain characteristics (such as season of entry, Armed Forces Qualification Test (AFQT) scores, and Tier I, Tier II, or Tier III status) and successful completion of bootcamp, less evidence of such correlations exists for female recruits [22].

Dr. McHugh and Dr. Quester used CNA databases to follow recruits through the first term of service. The databases provide data on race,

AFQT score, and level of physical fitness. Logistic regressions were run to determine the probability of attriting from bootcamp for men and women. According to Dr. McHugh and Dr. Quester, it does not matter if a female recruit enters bootcamp as a Tier I, II, or III recruit, but her level of physical fitness and the time she spent in the Delayed Entry Program (DEP) does matter. (See figure 20.) These two characteristics matter much more for female recruits than for male recruits. They stated that further analysis will examine whether specific types of physical fitness measures matter more (e.g., running ability versus strength) and whether these physical fitness measures can be related to female participation in high school athletics.

Figure 20. Predicted probability of attrition: physical fitness and DEP[a]

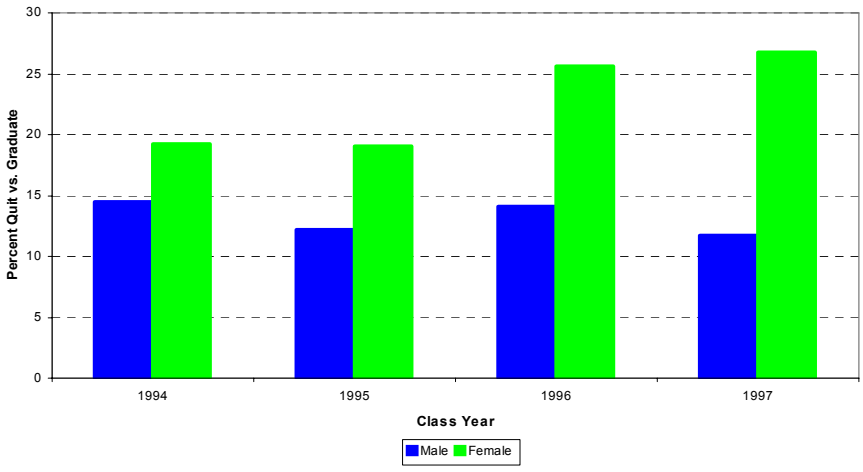


a. Source: [22].

The Role of Applicant Selection at the U.S. Naval Academy in Female Surface Warfare Officer Retention

Since the end of the combat exclusion law in the early 1990s, a greater proportion of newly commissioned surface warfare officers are women. However, Dr. William Bowman and Dr. Steve Mehay (both of the Naval Postgraduate School) discussed findings that women are underrepresented at command grades because their retention rates are significantly lower than those of their male peers [23] (see figure 21). Although research often suggests that marital status and dependents are major factors in a person's decision to stay or leave the Navy or surface community, little is known about the role that initial candidate selection may play in commissioning people who, all else equal, are more predisposed to making the Navy a career.

Figure 21. Voluntary quit vs. graduation by gender[a]



a. Source: [23].

Dr. Bowman and Dr. Mehay stated that the objectives of this study were to identify early traits, characteristics, and experiences of women who are offered and who accept appointments to the Naval Academy, complete the 4-year immersion program, select surface

warfare upon graduation, and remain in the surface community beyond their minimum service requirements. Data were analyzed for the period from 1993 to 1997, including women who are required to serve in a nonrestricted URL billet upon graduation and who have graduated long enough ago to experience a stay-leave decision.

Working backward in the education-training pipeline, the study first analyzes the relationship between academic achievement and fleet experience for the pooled sample as well as samples of men and women separately. Nonlinear regression models are specified to differentiate those who remain in the surface community for 7 or more years, assuming that anyone who stays this long will have accepted the Surface Warfare Officer Continuation Pay (SWOCP) payment and will at least remain in the community through the end of his or her Department Head tour. Once academic achievement (e.g., order of merit) and military performance factors have been identified that are related to fleet retention, selection models are specified and estimated to test the effect of selection criteria, such as high school grades and SAT scores, on academic and military performance at USNA. The analysis aims to determine the extent to which achievements—along with extracurricular activities and awards—are undertaken and explained by the selection criteria used by the USNA Admissions Board to select both male and female applicants.

The authors presented some key findings of the study, such as the relationship of background characteristics and early achievements to success in college and fleet retention. Preliminary findings suggest that, for female high school applicants to the Naval Academy, few factors identified from their early school years are related to eventual fleet retention. Several factors are clearly related to academic and military success at USNA, but there are differences in which factors predict success for men and for women. According to Dr. Bowman and Dr. Mehay, there are some indirect effects between high school characteristics and fleet retention that define the role selection plays in female surface warfare officer retention.

Female Recruiting and Retention in the Coast Guard

LT Teresa Ripley (USCG) presented an analysis of raw data for 2004 that revealed that a higher rate of enlisted women than men were

being involuntarily discharged in their first tour [24]. The Future Force staff partnered with Leadership Development program managers and visited the National Records Center in St. Louis to review more than 750 records to identify commonalities and trends that could be offset by a targeted mentoring program. Analysts found that the most common reasons for involuntary discharges were medical, psychological, and unsuitability of recruit. Company commanders stated that many of these recruits were not adequately prepared mentally or physically for recruit training. Often recruits used the policies to find a way out. Involuntary discharges also occurred due to misconduct, personality disorders, and excessive weight gain. Some findings have determined that many of these female recruits had no desire for Coast Guard careers but entered for the benefits, including tuition assistance. In addition, findings show that some female recruits often leave because they have a desire to start a family.

Followup research was conducted, primarily through phone conversations, with more than 100 female members who had been discharged in incidents that appeared to involve uncharacteristic behavior. As the report was being finalized, a series of findings from the Woman's Advisory Council from 1991 were discovered and the Future Force staff made a followup visit to the Cape May Recruit Training Command to compare the present state with the decade-old findings. Comparison analysis found that little had changed, so they combined the reports and recommended some aggressive transformations for the purpose of improving female retention.

Retention of Female Surface Officers

Dr. Pete Stoloff (CNA) and Dr. Albert Monroe (CNA) presented a study designed to determine the size of differences between female and male SWO retention and to identify policies that might increase female SWO retention [25]. The study focused on characteristics of those retained, rather than on *why* women do or do not remain SWOs. In this study, cohorts were constructed for participants for FY 1990–2000. A longitudinal profile was constructed of those who have ever had a SWO designator. Participants were grouped by years of service (YOS) since accession. Attrition/retention profiles were constructed based on gender, accession source, and other variables.

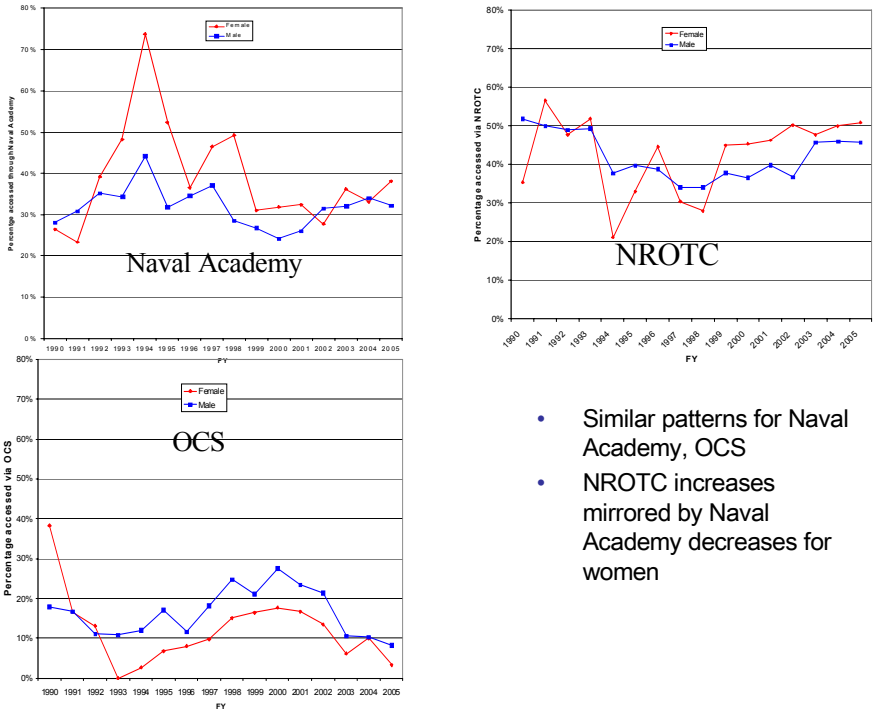
Effects on retention were observed based on demographics, Navy experiences, and the Combat Exclusion Act (CEA) (before and after). It may be too soon to observe long-term effects.

The analysts noted that there were few female accessions before the repeal of the CEA in 1994, but female accessions rose after 1994 and leveled off at 25 percent. Female SWOs made up about two-thirds of female URL accessions. Male retention rate was higher beyond the minimum service requirement (MSR), and the gap widens with YOS. Furthermore, the lower female retention "drags down" the overall rate as the proportion of women increases. The detractors for women included lateral-in, having children and a military spouse, college science major, coming from "competitive" college, and accession before 1994. The study also included some differential effects. According to Dr. Stoloff and Dr. Monroe, the study reveals that female SWO retention lags behind male retention by more than 10 percentage points. Also, female USNA graduates are less likely to stay than other females and more likely to have military spouses. Finally, female SWOs with children and/or military spouses are less likely to stay. Policy interventions examined have small (i.e., less than 1 percentage point) effects on overall SWO retention.

Dr. Stoloff and Dr. Monroe conclude that increasing the number of women among all retained past YOS 9 requires an increased number of women at entry (decreased number of men). Gains are found only where the female retention rate is greater under the new policy. Male losses would result in fewer SWOs overall. They also suggest a change in the source of entry (SOE) distribution—that is, recruit more from OCS and NROTC (see figure 22). They also suggest changes in the character and culture of the SWO community and Officer Corps. They note that policies can only be indirectly aimed at women due to potential discrimination issues; use of policy must be open to all but would be favored by women. They pose the question of whether the Navy should recruit officers on the basis of retention in particular communities. Future studies will extend empirical results by expanding the sample size, including additional cohorts, will focus on factors influencing early career attrition, and will seek to understand reasons for female SWO attrition. The effects of the 1994 repeal of the CEA will be studied as Naval Academy and NROTC initial cohorts mature

to YOS 9 in 2008. Future studies will also examine such opportunities as these: Do women get an equal share of "career enhancing" jobs? Do job assignments take advantage of college training? Do women from top colleges leave because they are more marketable? Finally, future studies will look at cultural factors, such as balancing a Navy career and family life and attitudes and perceptions.

Figure 22. Male vs. female SWO accession sources[a]



a. Source: [25].

Navy Diversity: An Update

CDR John Hefti and CAPT Patricia Cole (Head, Navy Diversity Directorate, and CNO Special Assistant for Diversity, respectively) discussed efforts to implement diversity throughout the Navy enterprise [26]. The Navy workforce is experiencing demographic, generational, and external shifts that require more balance between manpower and capability. As the size of the force decreases, more talent is needed to meet the capability demands. The Navy will need to draw

from the largest, most capable, and thus diverse, pool of resources available to meet the new demands. The Navy has embarked on a mission to shift from a majority-based culture to a diverse, talent-based culture with shared attitudes, values, goals, and practices.

According to CDR Hefti and CAPT Cole, the Navy's approach will use existing tools—recruitment, assignment, growth / development, promotion, and retention—in more deliberate ways. The Concept of Operations (CONOPS) calls for three phases at all echelons: Phase I, Assessments; Phase II, Decisive Action; and Phase III, Sustainment and Accountability. The desired "end state" is to produce an institutional framework that maintains a diverse total force, through enduring, effects-based assessments. The initial assessments revealed that the Navy is very strong in many areas (e.g., recruiting, growth and development, leadership support) but moderate in alignment of efforts through Navy-wide consistency and coordination.

Major initiatives are under way to support diversity throughout the "Big 3"—that is, the Aviation, Surface, and Submarine communities. (See figure 23.)

Figure 23. Major events supporting diversity[a]

a. Source: [26]

Results of the 2005 Navy Diversity Quick Poll

Ms. Carol Newell (NPRST) presented the results of the 2005 Navy Diversity Quick Poll, the Navy's first scientific poll of diversity issues administered to officers and enlisted [27]. Primary assessment of Enlisted Officers in the Navy focused on discrimination and sexual harassment experiences (e.g., NEOSH). According to Ms. Newell and associates, as the Navy broadens its diversity efforts, a survey instrument that accurately captures the effectiveness of these efforts is needed. The Navy defines diversity as "all the different characteristics and attributes of individual Sailors and civilians that enhances the mission readiness of the Navy." The 2004 Navy Officer Survey was the first survey to assess diversity in the Navy, and it focused on broader facets of diversity, including awareness and support, organizational impact, and resistance to the Navy's diversity strategy, as well as mentoring and Navy culture/values. The Diversity Quick Poll expands diversity efforts and serves as a baseline Navy-wide assessment of diversity between both officers and enlisted. A scientific methodology using representative sample selections was employed to conduct the poll. Participants were stratified by race (majority/minority), gender, and officer/enlisted status to ensure adequate representation.

Ms. Newell discussed the following key findings. The response rate for the Navy was 35 percent. The majority (>75 percent) of officers and enlisted are aware of and support the Navy's diversity efforts, and most agree that diversity will positively affect the Navy. More than 50 percent indicated that diversity is important to building a quality force, that the effort will benefit everyone, and that it will unify personnel. Less than one-third of those polled believe that diversity will lower Navy standards. Two-thirds of officers and half of enlisted are personally committed to diversity or actively supported diversity efforts. More than 80 percent of officers and enlisted have had an informal mentor during their careers, while about one-third of officers and half of enlisted report having been assigned a formal mentor in their careers. Most have been satisfied with the mentoring they have received. Interestingly, half of enlisted and one-third of officers believe that diversity is the same as military equal opportunity (EO) legal policy, which it is not.

Diversity Workforce Development:
Using the DEOMI Equal Opportunity Climate Survey (DEOCS)

Dr. Herbert F. Coard (LT, USN) and colleagues from Defense Equal Opportunity Management Institute (DEOMI) discussed the evolution, from paper to electronic, of the military unit climate assessment called the DEOCS, as well as the incorporation of the Navy Data Retrieval System (NDRS) as a way to roll up and compare EO and performance [28]. DEOCS has matured over time from the Military Equal Opportunity Climate Survey (MEOCS), which began in 1990, to a full-scale survey in 2005 that is online through NDRS in 2006. DEOCS is intended for organizations of any size and is suitable for military and/or civilian personnel. The survey measures climate factors associated with the military equal opportunity (EO) program, civilian equal employment opportunity (EEO) program, and organizational effectiveness (OE) issues and can be administered in two versions: on paper and web based. The DEOCS is designed to assess the "shared perceptions" of respondents about formal or informal policies, practices, and procedures likely to occur in the organization.

Through EO/EEO scales, the survey measures sexual harassment and (sex) discrimination, differential command behavior, positive equal opportunity behaviors, racist behaviors, age discrimination, religious discrimination, disability discrimination, EO climate, organizational commitment, trust in the organization, perceived work group effectiveness, work group cohesion, leadership cohesion and job satisfaction. DOD respondents to the MEOCS/DEOCS survey have increased by more than one-third between 2000 and 2006. Navy respondents have increased most dramatically from 2005 to 2006.

Results of the 2004 Marine Corps Climate Surveys (MCCS)

Dr. Paul Rosenfeld and Ms. Carol Newell (NPRST) presented the results of the latest (2004) administration of the Marine Corps climate, equal opportunity, and sexual harassment surveys called the MCCS [29]. The racial/ethnic discrimination surveys included measures for enlisted and officers, by gender and race, of satisfaction with the Marine Corps, fair discipline, and perceived racial/ethnic discrimination. Overall, the climate trends were positive for active duty enlisted; there were fewer racial disparities than reported in the 1999

survey. The bottom line indicators, retention intentions, and overall satisfaction increased for both active duty enlisted and officers.

Racial discrimination rates have dropped, displaying a clear downward trend since 1994. Religious discrimination rates are low for both active duty personnel and reservists. Reports of extremist / hate group activities were lower than in 1999. In fact, the activity rate of such groups and / or gangs in communities near Commands has shown the largest percentage reduction in recent surveys. Despite overall positive trends in racial discrimination, however, about one-fourth of active duty enlisted minorities report that they experienced negative racial / ethnic comments, remarks, or offensive jokes during the year in 2004.

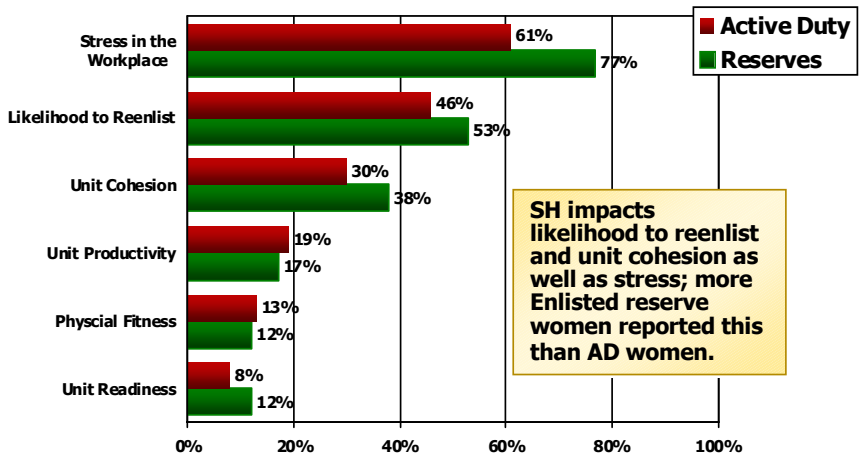
Sexual harassment is typically measured using two different approaches: direct questioning and a behavioral checklist for gathering survey responses. Both methods have been used to measure sexual harassment within DOD and have sometimes resulted in inconsistent and conflicting reports of the rate of sexual harassment within the department. Uniform DOD sexual harassment measurement was mandated in 2002. The 2004 MCCS Survey adapted the behavioral checklist approach, which led to a new baseline for sexual harassment measurement in the Marine Corps.

The survey included measures for enlisted and officers who have experienced harassment as well as rank / status characteristics of harassers. Surveys measured unwanted impacts on respondents (e.g., stress, interference with productivity, and disrupted unit cohesion), satisfaction with the USMC, and perceived gender discrimination. (See figure 24.)

According to the results presented by Dr. Rosenfeld and Ms. Newell, there is a positive trend in 2004 indicating that active duty female sexual harassment rates have declined compared with the 1995 DOD survey. The decline was noted for both officers and enlisted ranks. Respondents most frequently reported "milder" forms of sexual harassment (e.g., jokes, teasing); reports were rare for more severe forms of sexual harassment. More than 90 percent of all groups report that they know what behavior qualifies as sexual harassment. The majority of respondents believe that sexual harassment training

is useful in their work environments. Gender discrimination rates for females have declined since 1999.

Figure 24. Unwanted impacts of sexual harassment (SH)—enlisted female active duty vs. Reserves[a]



a. Source: [29].

Note that a large percentage of enlisted women continue to report sexual harassment by higher level supervisors. In addition, close to one-third of enlisted women reported gender discrimination. Milder forms of harassment (negative comments, offensive jokes) continue to predominate more severe forms (physical threats and assaults). Female reservists reportedly show a larger negative impact due to sexual harassment than do women on active duty. Statistics also indicate that sexual harassment and gender discrimination experiences may influence decisions to stay in or leave the Marine Corps. The USMC assessment of sexual harassment is in compliance with DOD requirements and, despite changes in measurement, the overall trends found in previous MCCS surveys remain consistent.

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Sea Warrior

According to a recent article in *Naval Institute Proceedings* [30],

> The goal of Sea Warrior is: to integrate the Navy's manpower, personnel, and training organizations—active and reserve—into a single, efficient, information-rich human resources management system.

Sea Warrior will incorporate processes to identify Sailors' skills and capabilities, match them to specific job requirements, and implement incentive programs and flexible scheduling within a job-based compensation system. In the acquisition processes, platforms and systems are being designed with warfighter performance as a key parameter. Furthermore, commands are operating in market-based, near-real-time environments that are highly responsive to manpower, personnel, and training demands of military operations.

The presentations that follow discuss some of the ongoing initiatives, which address many of the Sea Warrior goals. Dr. Stephen Watson (NPRST) introduced the session on improving the Navy's selection and classification process. Several studies focus on how innovations will have direct application to improve the Sailor–rating matchmaking process through the Rating Identification Engine (RIDE) in accessions and through Fleet RIDE during in-service conversions. According to Dr. Watson, optimally, the process of military selection and classification screens the right personnel for military service and matches them to the best-fit training and occupation. Historically, this process has relied on mental tests, such as ASVAB, medical information (e.g., visual acuity), and moral history (e.g., security history).

The Navy has developed a new guidance counseling system to aid in the matching of Sailors to ratings (viz., Navy jobs). This system, RIDE, optimizes the use of ASVAB scores to identify Sailor–rating matches that will challenge the Sailor to an appropriate level. That is, since people perform at the highest level when appropriately challenged,

the best Sailor–rating match will be one that is neither too easy nor too hard for the Sailor.

Dr. Watson believes that, as the Navy moves forward in the improvement of selection and classification, RIDE is a critical element. It is the foundation that will allow additional "noncognitive" (e.g., personality) tests to be used in the classification process. By reducing what we have referred to as the "exaggeration" of high ASVAB scores in the classification process, we create larger numbers of ratings tied for "best." By encouraging this large number of ties, additional methods can be installed to break ties.

Another important concept of Sea Warrior is military operations in a marketplace environment, requiring the use of dynamic incentives for specific assignments. There always will be jobs that, because of their geographic locations or task descriptions, will be hard to fill. Examples of such jobs can be found in the studies of Sea-Swap and Alternative Sea Manning initiatives. Analysts discuss how the use of incentives—both monetary and nonmonetary, administered independently or in packages—is fundamental to eliminating involuntary assignments and getting qualified Sailors to tough jobs.

Rating Identification Engine (RIDE) and Job Opportunities in the Navy (JOIN): Linking Qualification and Interest in Classification

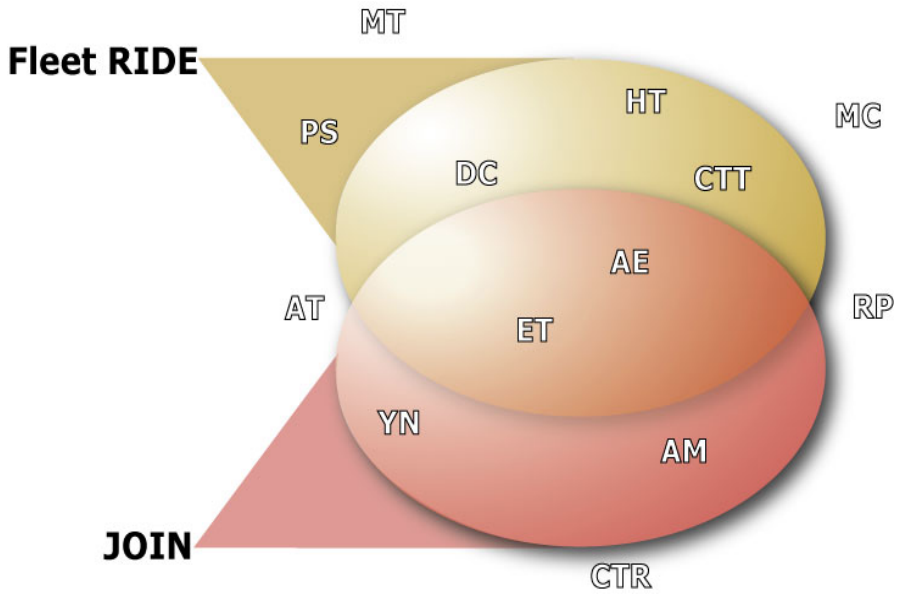
Dr. Andrew Jones (NPRST) discussed the Navy's Rating Identification Engine, a qualification and ranking algorithm designed to optimize entry-level enlisted rating classifications through the use of applicants' mental, moral, and physical qualifications juxtaposed against training performance in First Pass Pipeline Success (FPPS) [31]. Fleet RIDE is an adapted variant of RIDE that serves as the principal qualification engine for rating conversions in the Navy's Perform-to-Serve process. Both the recruiting-based RIDE and the operationally based Fleet RIDE tools provide an empirically anchored job-matching ability.

Job Opportunities in the Navy is a pictorially based rating interest assessment tool that produces an individual interest index (i.e., JOIN Fit score). JOIN employs a self-report methodology to Likert-scaled questions that cover communities of work (e.g., surface, aviation),

work styles (e.g., physical vs. mental), work environments (e.g., indoor vs. outdoor), and work activities (a verb/noun pair, such as repair electrical equipment). All three tools use algorithms to produce empirically validated ranked scores of optimized individual fit (i.e., qualification fit or interest fit).

Dr. Jones's discussion covered the theoretical underpinnings of the RIDE algorithm development, the creation of a Navy-specific interest inventory, and the empirical analysis required to link the two formulae into a single weighted composite classification score. (See figure 25.) Developed in a composite scoring scheme, people's job qualification scores (i.e., RIDE Rank) are integrated with JOIN Fit scores to produce a set of weighted composite scores. Dr. Jones explained that the resulting composites offer a ranked list of potential ratings for which personnel are fully qualified and have demonstrated interest in performing.

Figure 25. Interlocking Fleet RIDE with JOIN[a]



- Fleet RIDE produces a limited list of ratings a person is qualified for and which have saleable quotas
- JOIN filters RIDE selections to program/ratings a person is likely to be satisfied and interested in

a. Source: [31].

Fleet RIDE: Operational Impact for Sailor Career Management and Navy Force Shaping

Mr. Thomas A. Blanco (EDS) discussed the operational impact of the "Fleet" RIDE enabling technology as a multiplier for the Sailor and his/her Career Counselor for continuous career counseling, education and training, and career advancement on board Navy ships, aviation squadrons, and shore activities worldwide [32].

Fleet RIDE is a classification algorithm and prototype decision support system developed jointly by NPRST and EDS. Fleet RIDE provides the best match for recruits based on their qualifications and stated interest to Navy requirements, reflected in critical lists and available training quotas. (See figure 26.)

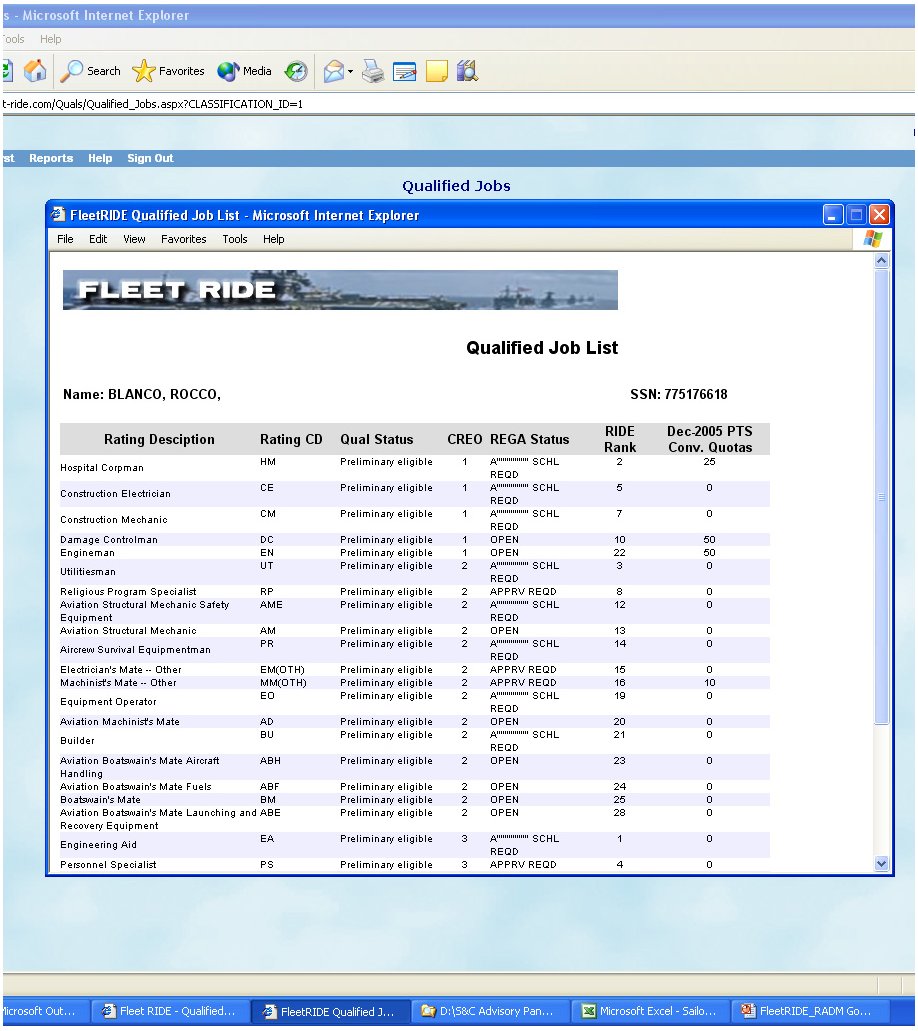
The Director of Navy Selection and Classification (CNO-N141) sponsors Fleet RIDE. It transforms the proven and accepted RIDE processes and technologies for fleet use in support of Perform-to-Serve (PTS) conversion force shaping, and in support of transition of the General Detail (GENDET) Seaman, Airman, and Fireman to rated careers. An approach called spiral implementation is used along with operational mandate, having Navy-wide impact. Performance metrics, such as reduced PTS application error rates, increased Sailor career opportunities and training success, and increased Command Career Counselor productivity, are provided. Mr. Blanco also discussed recent Senior MPT&E Leadership acceptance for Navy-wide use within the Sea Warrior Enterprise, using a Service-Oriented Architecture (SOA).

Uncovering the Potential of Rotational Crewing: Atlantic Fleet DDG Sea-Swap Initiative

Mr. Carl Morris (CAPT, USN (Ret.), AMSEC) and associates presented an overview of analysis for the Atlantic Fleet DDG Sea-Swap Initiative [33]. In response to a VCNO tasker, the objectives of Navy Sea Swap are as follows: (a) to determine the true cost and potential savings of the Sea-Swap rotational crewing option, (b) to continue to develop and experiment with multiple crews for various platforms, further defining platform requirements and associated infrastructure needs, and (c) to better use taxpayer investments. PACFLT

conducted proof-of-concept demonstrations for Sea Swap from 2002 through 2004, consisting of 3 DDs/4 crews for a 22-month deployment and 3 DDGs/3 crews for an 18-month deployment, supporting battle group operations in 7th Fleet Area of Responsibility (AOR). CNA's task was to collect data afloat and ashore, as well as examine operations, readiness, manpower, and infrastructure.

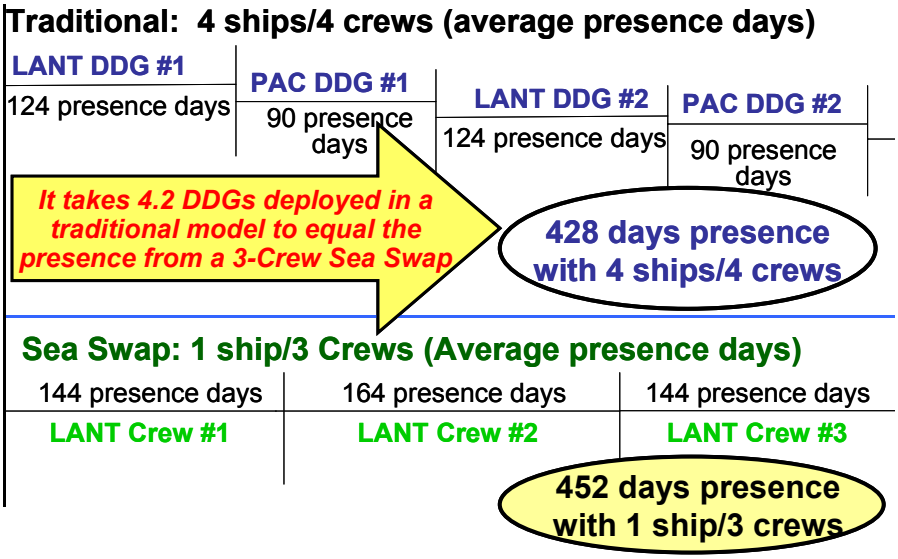
Figure 26. Example of Fleet RIDE qualified job list[a]



a. Source: [32].

Using various issues identified in the VCNO tasker, the analysis plan developed "analysis questions" to observe how Sea Swap affects crew morale and retention, how Sea Swap affects days on station in theater, and potential cost savings from Sea Swap. The analytical approach consisted of an experimental group of 3 ships/3 crews (GON, LAB, STT), a comparison group of 4+ ships/4+ crews, and a control group of 3 ships/3 crews (COL, ROS, SUL). (See figure 27.)

Figure 27. LANTFLT Sea Swap and traditional CONOPS for Expeditionary Strike Groups (ESGs) in 5th Fleet AOR[a]



a. Source: [33].

The researchers sought to answer questions about morale and retention, training, material condition, forward presence days, and overall cost issues with respect to any differences between Sea-Swap deployers and nondeployers. They observed differences between Sea-Swap and non-Sea-Swap ships when comparing them with the control group and comparison group construct. They also compared Sea-Swap with Navy-wide data. The high-level issue, however, is cost performance tradeoffs compared with those of traditional deployments

in terms of morale and retention (port calls), training, operations, FRP support, and repair and maintenance.

The lessons learned are useful for other crew rotation operations and will draw on three sources: ships and crews, AMSEC analysis team, and staffs and others. The lessons will be kept in a database and reviewed and categorized; some will be passed down directly to crews, trainers, and policy analysts. According to Mr. Morris, Sea Swap is believed to be executable as Sea-Swap DDGs continue to support 5th Fleet Operational Commanders. But Sea Swap is not business as usual, and it requires careful management and coordination. The analysts concur that final cost determination and the true impact of Sea Swap on material condition, morale and retention, and training and operations requires long-term monitoring and analysis. Final analysis results will be completed in April/May 2007.

Alternative Sea Manning Concepts and Incentives

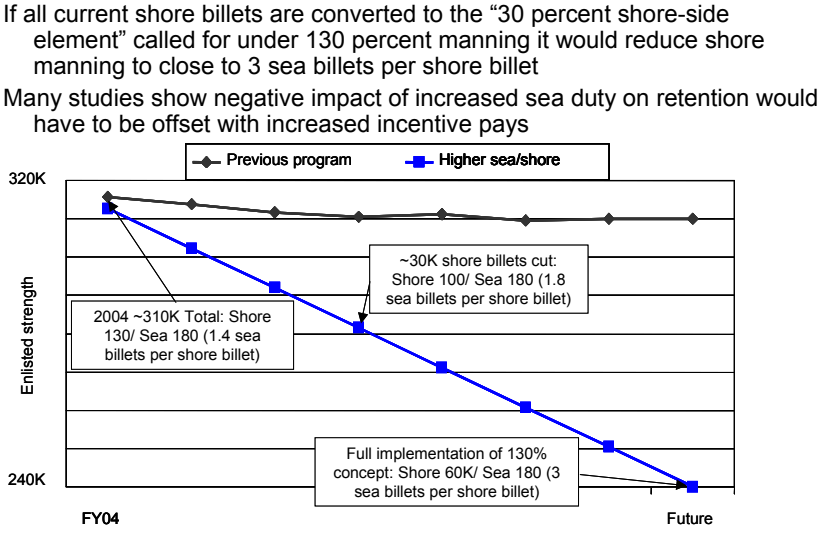
Dr. Martha Koopman (CNA) discussed alternative sea manning and the new operating concepts that are changing every part of the fleet today [34]. There is increased surge capability through the Fleet Response Plan (FRP), greater forward presence through rotational crewing concepts, reduced manpower costs by way of optimal manning (OM) in operational units, and more sea- or mission-centric careers through "right-sourcing" non-military-essential billets.

Dr. Koopman noted that a more sea-centric force is part of the Navy's future. Accordingly, the emphasis of individual careers is toward more operational assignments. Even while ashore, many jobs will be more related to mission. The Navy is "right-sourcing" shore jobs that aren't military essential and/or can be done more cost-effectively by civilians. Also, the culture of readiness implies that Sailors must be in a state of readiness over longer periods of time while ashore. According to Dr. Koopman, the higher readiness requirements of the new sea manning concepts imply a need for extra manning. This extra manning to support operational units requires an increase in shore billets to support operational units. How will the Navy pay for extra manning pools? Shore cuts would be needed to offset the cost. In addition, the nature of shore duty would change as extra manning pool billets replace traditional shore billets. The effectiveness of

shore cuts will depend on the size of extra manning pools and on the feasibility and cost-effectiveness of proposed shore cuts.

Sea-shore rotation will require the use of existing policies as well as the creation of new ones. As the Navy grows more sea intensive, it will require more sea duty from E-5s through E-9s and a means of quickly filling gaps. It will become more necessary to refine and shift paradigms involving targeted, expanded sea pay for Sailors who reenlist or extend at sea and Assignment Incentive Pay (AIP) for volunteers to fill gaps in sea billets. (See figure 28.) Dr. Koopman also discussed costs and retention consequences. She said that Sailors' retention will be affected by a higher ratio of operational to nonoperational billets, and more time will be spent maintaining training readiness. She also stated that moving to higher sea-intensity under any alternative means that costs must be incurred to alleviate negative retention consequences. For example, incentives must be provided for more sea duty from E-5s and E-9s, and in order to quickly fill losses in operational billets.

Figure 28. Effects on sea/shore ratios[a]

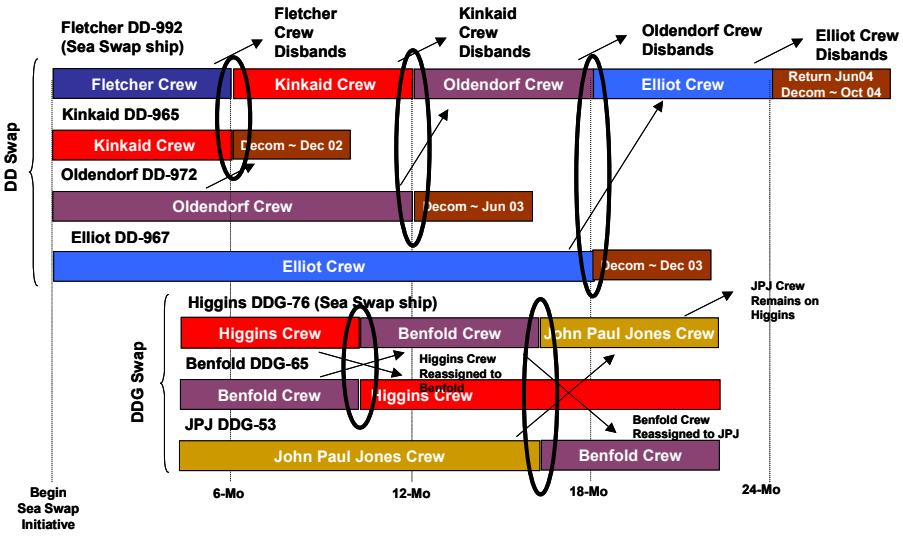


a. Source: [34].

The *Fletcher/Higgins* Sea-Swap Experiment and Retention

Dr. Chris Duquette (CNA) presented findings from the *Fletcher/Higgins* Sea-Swap study [35]. The standard CENTCOM deployments involve 3 ships and 3 crews for 100 days' presence per ship/crew for a total of 300 days' presence. The USS *Higgins* (DDG-76) Sea-Swap deployment involved 3 crews and 1 ship for 121, 159, and 136 days of presence per crew, respectively, for a total of 416 days of presence. (See figure 29.) The study looked at the results of fitting Sea Swap into the deployment phase of the FRP cycle as well as reenlistment rates for crews who participated in specific deployments, such as Operation Iraqi Freedom (OIF), and for crews in various other phases of the deployment cycle.

Figure 29. How the Sea-Swap experiment worked[a]



a. Source: [35].

According to Dr. Duquette, reenlistment rates were higher for crews that participated in OIF and for crews that did not participate in Sea Swap. Slightly higher rates for DD crews were more than offset by lower rates for DDG crews, which were of greater interest in the study.

Also, reenlistment averages were lower for middle crews. Note, however, that the results are preliminary. The bulk of crews didn't encounter reenlistment windows while they were deployed, and tracking deployers affords a clean comparison. Finally, Dr. Duquette stated that Sea-Swap crews for *Fletcher, Higgins,* and *Gonzalez* need to be tracked further.

Dr. Duquette also presented the results from a survey of those participating in Sea Swap. One-time effects indicating the impact of Sea Swap on participants' reenlistment revealed that 55 percent were less likely to stay in the Navy, 1 percent were more likely to stay, and 44 percent were neutral. A survey of the long-term effects of Sea Swap on participants' reenlistment revealed that 73 percent were less likely to stay in the Navy, 3 percent were more likely to stay, and 24 percent were neutral. A survey of Sea-Swap participants' intent to reenlist revealed a slightly greater percentage who said they did not intend to reenlist compared with those Navy-wide who had not participated.

According to Dr. Duquette's survey findings, the weight of responses was negative with a small fraction of respondents indicating a positive effect from their Sea-Swap experience. Sailors were willing to "tough it out" on a one-time basis, but they were less willing to stay if Sea Swap becomes the norm. Finally, survey results are consistent with reenlistment findings reported earlier and thus can't simply be attributed to a penchant for complaining. Rather, both point to a slight decline in reenlistment rates after Sea-Swap experiences.

Civilian Mariner Pipeline Assessment

Mr. Daniel Steeples (CNA) presented research on a CNA-developed simulation model that emulates the mariner work process [36]. The Military Sealift Command operates a fleet of 41 ships crewed by civilian mariners (CIVMARs), classified by job rating and fleet assignment. Each ship has a requirements manning scale. Aggregating all ship requirements yields a total mariner requirements vector by job rating. The model simulates an assessment of the MSC Pipeline of CIVMARs. The Pipeline is the buffer stock, defined as a percentage of hired mariners over the total required number of mariners. Using an operations research paradigm, the Pipeline assessment presents a resource allocation problem. (See figure 30.) Analysis involves the

use of a stochastic vector of requirements r1, . . . rk,. As the ship inventory changes, so does the requirements vector. Also, management controls the resource vector h1, . . . hk, depending on available resources, and determines targeted or desired performance measurement metrics. Because the process includes tradeoffs—the more mariners employed in each job rating, the better the observed performance characteristics—increased performance comes at a greater cost.

Figure 30. Analogy of a resource allocation problem[a]

- The mariner allocation problem is similar to the machine repair problem where there are a finite number of spare parts
  - Shipboard billets correspond to machines which are subject to breakdown
  - Mariners waiting for a ship assignment are analogous to the inventory of spare parts
  - This is a special queueing system

a. Source: [36].

A Monte Carlo, steady-state simulation of the mariner's work process was developed. As Mr. Steeples noted, mariners remain in their ship assignments for a random length of time. The mariner has control, to a great extent, over the assignment length. The length of time in a ship assignment will depend on the ship type, job rating, and fleet to which the mariner is assigned. Following a ship assignment, mariners are unavailable for a random length of time and then become available for another assignment. One objective is to model the shipboard assigned times by job rating and by ship type. Another is to model the time between assignments, including annual leave, sick leave, shore leave, training and other (disciplinary, not fit for duty, leave without pay, etc.). The process also incorporates operational decision rules, looks at what types of leave can be interrupted, and restricts where a mariner can be assigned. Modeling assumptions include a distribution of assigned times that job rating j is independent of the Pipeline.

Assigned time distributions are based on observations taken from 2000 through 2005.

According to Mr. Steeples, the Monte Carlo simulation model iterates the number of mariners, within a job rating, until the desired performance characteristics are achieved. This allows the simulator to calculate required Pipelines by job rating along with an overall Pipeline measure. CNA is working on additional refinements to enhance the model, but the model is very flexible. It allows the addition of ships and adjustments to ship manning requirements. Results from current CNA analyses determined that significant economic gains are achievable by reallocating the CIVMARs across job ratings. Analysis shows that some job ratings are overstaffed, while others are understaffed. Currently, the overall Pipeline is approximately 29 percent, and the analysis shows that required performance metrics are achievable with an estimated Pipeline of approximately 19.6 percent.

Total Ship System Integration Team (TSIT) in Support of a PMS 400F Effort: A Systematic and Coherent Approach to Developing and Optimizing Crew Manpower/Manning Profiles

Presenters Mr. John White (GD/BIW), Mr. Shane Bowen (MAAD), Mr. Jeff Miller (MAAD), and Mr. Gerry Costello (ACT) discussed the purposes and roles of the Total Ship System Integration Team to support Program Executive Office (PEO) ships' decision-making [37]. TSIT employs systems engineering principles, uses computer models and tools, performs analyses of proposed changes to ship configurations (including equipment, organization, mission, procedures, and policy), and produces evaluations using metrics pertinent to the decisions being made. TSIT analyses currently focus on manpower. According to the research team, because Navy policies, missions, and technology are not stagnant, in order to achieve desired balances of cost and risk acceptance, the Navy must continually (1) assess impacts to manpower resulting from changes in these driving forces, (2) make cost-responsible adjustments to manpower requirements, and (3) plan for future manpower needs.

The analytic team stressed that it is essential for the Navy to make critical ship design and manpower decisions and be able to quickly understand the effects of policy and technology on crew

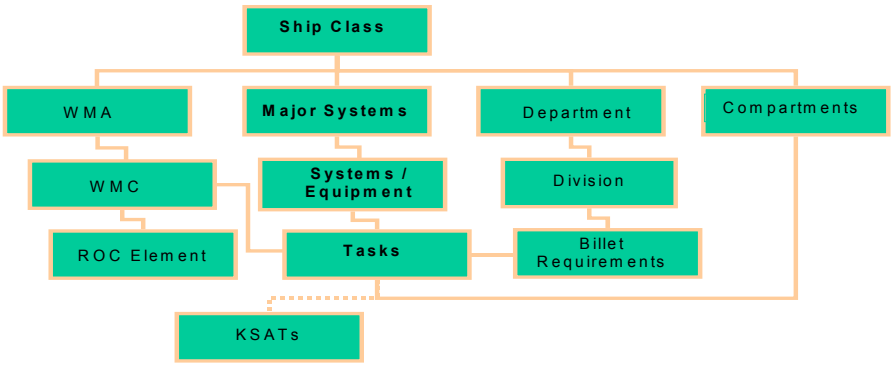
configurations. Doing this well for surface combatants is particularly challenging. It has been demonstrated that, by employing reliable, well-grounded and well-constructed processes and tools, it is possible to confidently propose effective and adaptable crew configurations that optimally support and carry out Navy missions as required.

The researchers suggest that the process must easily analyze the impact of change and develop fully capable crew manning hypotheses for both naval combatants undergoing modernization and future naval combatants in the early stages of design. Objectively developing and optimizing a crew structure requires matching crewmembers' skill sets to a comprehensive set of tasks needed to operate, maintain, and support the ship. Testing and validating the structure requires exercising the entire crew in an operational scenario where the components of work, mission requirements, schedules, and crew availability can interact realistically.

According to Mr. Bowen, the Total Ship/System Integration Team (TSIT) has developed and exercised the processes, tools, and metrics necessary to quickly and economically develop and analyze proposed crew configurations. The results have provided the Navy with an array of dynamic decision-making information as the manpower impacts associated with various technology insertions and policy/procedure changes are considered. (See figure 31.)

Mr. Costello explained that the TSIT Task Manager is used to optimize crew manpower/manning levels as well as to determine skill set and training requirements. The TSIT Total Crew Model is used to predict potential periods of elevated fatigue and to estimate the most effective work-rest cycles and recovery times for specific crew configurations. TSIT tools are in web-based collaborative environments that support "what if" comparative analyses with traceability and auditing. The user can not only manage the task-related data more effectively to analyze various configurations, but can easily apply new rules and parameters to each configuration to quickly determine the optimal crewing of the ship for a set of mission requirements. As the process and tools continue to be exercised to produce meaningful decision-supporting results, they may enjoy wider application in the Navy, being transparently and consistently employed across multiple ship classes.

Figure 31. The initial TSIT model task manager[a]



a. Source: [37].

Human Systems Integration (HSI)

Human System Integration requires successful integration of the HSI elements (manpower, personnel, training, safety and occupational health, human factors, survivability, and habitability) and the system platform (hardware and software) to optimize total system performance and determine the most effective, efficient, and affordable design. In today's joint military environment, integration across fully networked systems is critical to joint warfighting capability. Highly efficient and effective operations require system analysis, modeling, and testing to identify opportunities for integration, synchronization, collaboration, and coordination of capabilities. HSI also requires a fully integrated investment strategy with joint sponsorship from initial concept development through many iterative developmental phases [38].

The presentations in this section examine the potential for using HSI tools, processes, policies, and practices to integrate human constraints with organizational and technological design in order to optimize manning of systems and increase total system capabilities while reducing system costs across the Navy. The various presenters discuss the utility of the following:

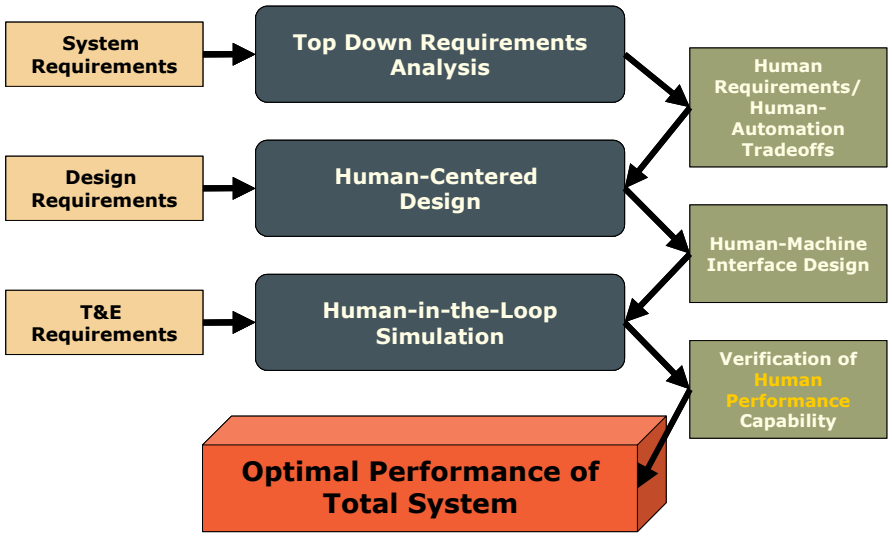
- Powerful database tools that provide real-time information, resource tracking, and decision aids, which tailor HSI to specific acquisition needs
- Integrated performance-based technical processes that address HSI factors and considerations
- Ongoing studies and initiatives that assess HSI program impact (e.g., reduction of Carrier Manpower).

HSI Tools To Promote Workload Optimization Within System Design

The Navy is restructuring its workforce to more efficiently use existing manpower for optimal manning of its systems. Mr. Ken Robinson

(SERCO, Inc.) discussed the utilization of "HSI Tools to Promote Workload Optimization Within System Designs" [39]. According to Mr. Robinson, difficulties arise as acquisition programs attempt to optimize workload in system design or modernization efforts without the tools provided by implementing HSI. Using HSI tools, human constraints (e.g., manpower, personnel, training, retention, recruiting, environment, safety, occupational health, survivability, and habitability) are concurrently integrated with organizational and technological design. HSI practices incorporated early in the design stages of acquisition programs are key to optimizing manpower and personnel, and early design decisions have the potential to drive Total Ownership Costs (TOC). (See figure 32.) .

Figure 32. How HSI achieves objectives[a]



a. Source: [39].

SERCO has developed a web-based tool, the HSI PORT, to provide information and decision aids to help program managers understand HSI capabilities, tools, and activities. The tools assist with making tradeoff decisions during design, provide information about policy changes, and help tailor HSI to specific acquisition needs. The

enhanced version of this tool set will allow real-time information, track resources for HSI, and aid the development of future generation software decision aids for HSI from the concept development stage throughout the total system life cycle. (See figure 33.)

Figure 33. SERCO HSI PORT[a]

http://hsiport.resourceconsultants.com/

a. Source: [39].

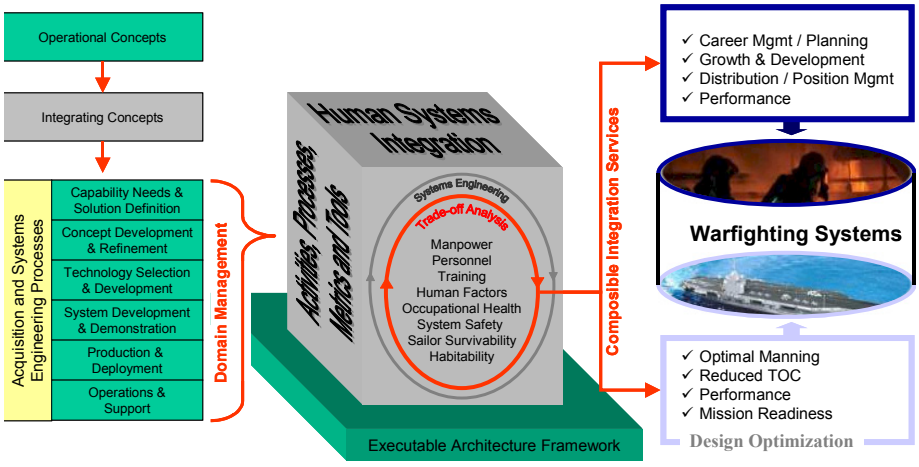
According to Mr. Robinson's results, proper use of the HSI PORT tool is expected to (a) increase capability and performance of the total system and reduce system costs, (b) optimize human performance within overall system performance, (c) enhance HSI information sharing among all domains, (d) minimize training requirements before using the system, and (e) identify workload decisions in which changes to existing Navy policy may be required.

Human Systems Integration in Policy, Process, Practice

Dr. Jennifer McGovern Narkevicius (OPNAV (N-173)/SkillsNET) and Mr. John Owen (NAVAIR (N-173)) presented the Systems Engineering Acquisition and Personnel INTegration (SEAPRINT) program, which provides the Navy with an integrated performance-based process addressing all aspects of HSI in the Systems Engineering Acquisition, incorporating ongoing initiatives, and enabling Navy-wide standardization [40]. SEAPRINT emphasizes enterprise processes, supporting architecture, and organizational policy. The program includes both Management Tenets that integrate human and technical design elements, proactive design tradeoffs, and continual evaluation and source selection and Programmatic Tenets to initiate early HSI, identify issues/plan analysis, crosswalk HSI requirements, factor HSI into source selection, execute the integrated technical process, conduct proactive tradeoffs, and assess HSI milestones.

The process focuses on integrating contributions from the HSI domains (e.g., manpower, personnel, training, human factors, safety, habitability, survivability, and Environmental Occupational Safety and Health (EOSH)) to enhance the definition, specification, and utilization of the systems, with heavy reliance on context and predictability measures. (See figure 34.)

Figure 34. HSI integrated architecture[a]



a. Source: [40].

SEAPRINT's integrated architecture aids understanding of domains, facilitates communication of domains, and provides a framework for project developments. In addition, SEAPRINT processes and practices can be integrated with developing capabilities, such as the Navy's Sea Power 21 Sea Shield, Sea Strike, and Sea Basing missions.

Carrier Manpower Reduction Study (CMRS): Identifying and Assessing the Impact of Potential Reductions in Future Carrier Manpower

Mr. David Hegland (Whitney, Bradley & Brown, Inc.) presented research sponsored by the Defense Advanced Research Projects Agency (DARPA) that identified initiatives that could significantly reduce crew requirements in the future class of aircraft carriers and their embarked air wings [41]. After more than 300 prior carrier manpower reduction efforts were reviewed to baseline the study, working groups collected technologies from industry and U.S./Allied Governments that could reduce manpower requirements aboard ship. Other working groups developed new organizational structures that could make ship and air wing operations more efficient.

A total of 122 organizational change and technology insertion candidates were evaluated for near- and far-term manpower reduction potential. Specific workload reduction and billet adjustments to the baseline CVN-68 Ship's Manpower Document (SMD) were calculated by the Navy Manpower and Analysis Center (NAVMAC). To quantify the risk and impact of manpower reduction initiatives, metrics were assessed for risk, feasibility, quality-of-life impact, and operational impact of each initiative. An optimization algorithm was applied to the reduction candidates to identify solution sets tailored to minimize impact on quality of life, mission capability, and other metrics. A top-down, billet-focused approach resulted in 44 solutions for reducing the ship/air wing team by 1,500 billets. (See figure 35.)

Mr. Hegland presented three recommendations: (1) OPNAV should incorporate CMRS results into manpower reduction goals for each CVN-21 hull, for legacy Nimitz fleet ships, and for other aviation ships, (2) the Navy should adopt an Enterprise Model and/or create a single manpower reduction advocate to execute force-wide manpower reduction efforts, and (3) DARPA should adopt high-potential advanced technology areas for primary support to CMRS.

Figure 35. Results: summary of billet reductions[a]

- **NAVMAC unable to validate all organizational initiatives due to time constraints**
  - -Primarily CVW consolidation initiatives
- **Several combinations result in greater than a 1500 personnel reduction from CVN / CVW manning**
  - - The reduction of 1511 shown in the notional SMD resulted from a run considered "Minimum Risk"
- **900 man ship achieved only by accepting some reduction in operational capability and some increased risk**
  - - 918 billet ship notional SMD required removal of catapults and arresting gear (STOVL only) and only one reactor
  - - Capabilities can be bought back by re-introduction of additional manpower and / or technology

	Initiative Type	Number of Initiatives	WBB Estimated Reduction	NAVMAC Validated Reduction
Technology Reductions	COTS	12	264	305
	Develop-mental	56	714	641
	Advanced	18	410	427
Tech Totals		86	1379	1373
Organization Reductions	Available	12	55	14
	Experimental	19	209	183
	Conceptual	5	533	115
Org Totals		36	797	312
All Candidates		122	2176	1685

a. Source: [41].

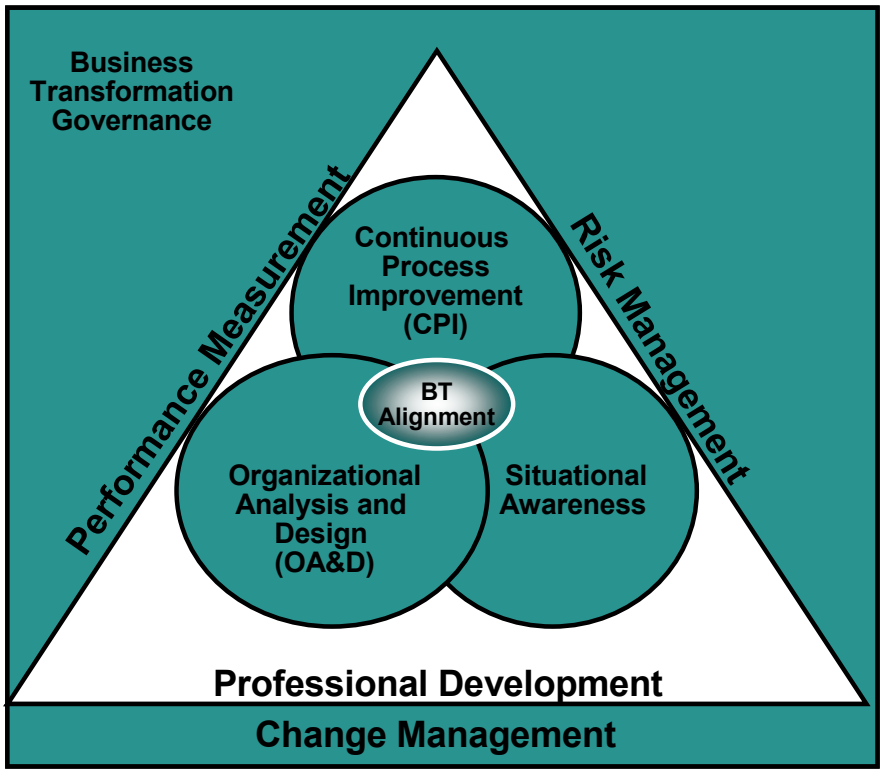
Army–Navy Workforce Planning Demonstration Symposium

Dr. Stuart H. Rakoff (Rakoff and Associates) presented an overview of the Sixth Annual Army–Navy Workforce Demonstration Symposium [42]. The symposium was organized to allow senior defense leaders to learn more about steps being pursued, to exchange best practices, and to establish cooperative programs for improving the workforce planning disciplines in all their organizations. The presentations included a discussion of the symposium's purposes, taking a look at the new challenges posed by budget pressures and the Quadrennial Defense Review (QDR). For example, DOD must leverage workforce tools to effectively optimize resources. It's realized that over half of the budget is allocated to personnel costs, and DOD must manage current and future workforce to achieve its total program objectives. Analysts discussed how the Army and Navy are cooperating to develop and implement workforce forecasting and management systems. Finally, symposium planners sought to (a) forecast skills and competencies that the workforce requires to perform the needed work, both now and in the future, (b) perform a gap analysis to document the

shortfalls between desired and expected capabilities, and (c) formulate and execute a strategy to close the gap.

Dr. Rakoff presented the key discussion points for the symposium. First of all, workforce planning and human capital strategy must be addressed in the context of total business transformation. It all starts with the work to be accomplished. Work is performed by organizations—hence, a careful analysis of organizational level and function is required, even before seeking process improvements. Also, tools have been developed and implemented in the Navy and the Army to help managers forecast and manage the workforce more successfully. Dr. Rakoff stated that, in a nutshell, this is HSI applied to industrial and business organizations and processes. (See figure 36.)

Figure 36. Business transformation focuses on people, process, and technology[a]



a. Source: [42].

Dr. Rakoff presented the principles and the features of Workload Performance Systems (WPS) and their applications to industrial settings of NAVSEA and private shipyards. He discussed the use and benefits of the Strategic Planning and Forecasting (SPF) tool and its role in workload and manpower planning in large organizations through the use of statistical modeling methods. NAVSEA uses WPS to model a skill-based available workforce in a specific region. SPF will also allow instant visualization and impact of workload adjustments. Navy Data Environment NDE-SPF Reports provide rollup capability to display summaries of public, private, nuclear, or total shipyards (all work), while integrated data allow for determining the impact of changes to workload across the entire enterprise. Dr. Rakoff also presented applications within nonindustrial settings, such as the Naval Sea Logistics Command (NSLC) process mapping, Enterprise Workload and Performance System (EWPS) project management, and workforce allocation / workload reports. Finally, he presented the Enterprise version of the Army Workload and Performance System (AWPS) application, which will integrate strategic and operational planning information to enable improved decision-making, tracking, and measurement.

In conclusion, Dr. Rakoff said that HSI and Workforce Planning have common challenges. Dynamic workload and workforce issues will continue to challenge DOD planners and managers. A comprehensive approach focusing on work and organization performance is key to successful human capital strategy and management. Furthermore, he said that the Army and the Navy are continuing to improve organizational analysis, workload forecasting, and resource management processes and that IT systems improvement will facilitate these efforts.

Multi-iteration Usability Testing of the U.S. Navy's Performance Management System

Ms. Kimberly Aspinwall (RTI International) discussed the Navy's new performance management system [43]. The second of two iterations of usability testing for the Human Performance Feedback and Development (HPFD) system, and the ePerformance Process system tested in Study I and Study II, have been completed. Tests involved 34 officer and enlisted supervisors and nonsupervisors at three Navy locations:

the Naval Meteorology and Oceanographic Center (NAVMETOC-CEN) in Norfolk, VA; USS *Howard* (DDG 83) in San Diego, CA; and the Bureau of Naval Personnel (BUPERS) in Arlington, VA. According to Ms. Aspinwall, the objective of the two studies was to assess the functionality and usability of the systems and to document their workflow. (See figure 37.)

Figure 37. Why conduct usability testing?[a]

- **What is usability testing?**
  - Testing assesses the behavior of users in their own environment through the collection of video, audio, and behavioral data
- **Factors in the "user" experience that are addressed by testing:**
  - Time it takes to complete tasks
  - Amount of self-editing required (i.e., erasures, re-entry of data, etc.)
  - Navigational problems
  - Emotional responses
  - Identifying "other" sources of burden to respondents
- **Automated tools often do not reduce user burden as intended**
  - Research has shown usability testing can help to adapt automated tools to make them more useful
- **DoD Instruction 5000.2 requires human systems integration in developing systems for military personnel**

a. Source: [43].

Incorporating both pretests and posttests, researchers analyzed users' behavior through the collection of video, audio, and behavioral data from simulated tasks that Navy personnel are likely to encounter in the performance appraisal process while on board Navy ships. This was done to simulate the "real-life" conditions under which Sailors would have to use these systems in the future. The surveys were also designed to obtain Sailors' subjective impressions of the HPFD and ePerformance systems. The first study took place in 2004; after an implementation of some modifications to both systems, the second study followed in 2005.

According to Ms. Aspinwall, referencing analyses comparing results from Iteration 1 (Schwerin et al., 2006 in press) and Iteration 2 (Dean et al., 2006), usability interview and survey data show an overall

reduction in user burden (e.g., fewer errors and less time to complete usability tasks) and increased user satisfaction (e.g., more satisfied with the professionalism, efficiency, and overall effectiveness) in using the Performance Appraisal System in Iteration 2. Recommendations that could lead to further measurable system and process enhancements include continuous monitoring of application server connection speeds to maintain system efficiency, implementing a Quick Reference Guide with detailed instructions for working with the performance management and appraisal documents, and conducting a full-scale pilot study of the HPFD and ePerformance systems to provide a more comprehensive evaluation of the system.

Qualitative Data from Human Performance Feedback and Development (HPFD) and ePerformance System Users

Dr. Michael Schwerin (RTI International) discussed usability testing and implementation recommendations for a pilot, web-based performance management system developed under a Task Force EXCEL initiative [44]. Dr. Schwerin reported that Sailors identified sources of error and opportunities for improvement with the Human Performance Feedback and Development and ePerformance systems. Sailors reported technical difficulties but stressed that process issues were their greatest concern. Technical problems included system connectivity, navigational problems, and the lack of electronic backup of the performance management documents. System users also noted concerns about the loss of face-to-face interaction between supervisors and their subordinates.

Dr. Schwerin's focus is on assessing Sailor's perceptions of recent improvements to the HPFD and ePerformance systems, where focus group interview data and group debriefings add qualitative data to the quantitative usability testing results. Focus group results for the current study were compared with focus group data gathered in a previous round of system testing. (See figure 38.) The latest data collection effort revealed Sailors' perceptions that technical difficulties had been addressed but that there were still process concerns. Sailors expressed concerns with identification and selection of the correct performance appraisal documents, and with the need to improve document routing so that second-level raters could view the first-level

raters' appraisals. Sailors were also concerned that the systems may not be comprehensive enough for an accurate performance appraisal. Based on these results, Dr. Schwerin and other researchers recommend a business process review to identify potential unintended consequences that could affect promotion selection boards. They also recommend hands-on training. Computer-based training would not be adequate for teaching a new performance appraisal system and ultimately shaping a performance appraisal culture.

Figure 38. Reasons for overall subjective ratings[a]

Reasons for Grade	Frequency	
	2004	2005
NMCI/connectivity concerns	12	0
Advantages over NAVFIT98	9	0
Clarity of instructions and procedures	5	0
System design and interface improvements necessary	5	6
Performance appraisal process concerns	3	12
Internet access	3	0
Administrative burden	2	0
More time using the system needed	0	7
Positive comments—general positive remarks	0	5

a. Source: [44].

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Policy and Legislative Initiatives

Policy and legislative initiatives within the Department of the Navy span a wide range of issues. As DON's strategic environment continues to change rapidly and profoundly in social, economic, and political dimensions, creation of a modern 21st-century workforce will require changes in laws, policies, and systems of management [45]. The following presentations review some of the ongoing initiatives for policy and legislative change involving DON budget constraints and spending pressures, workforce composition, alternative force structures, and manpower requirements.

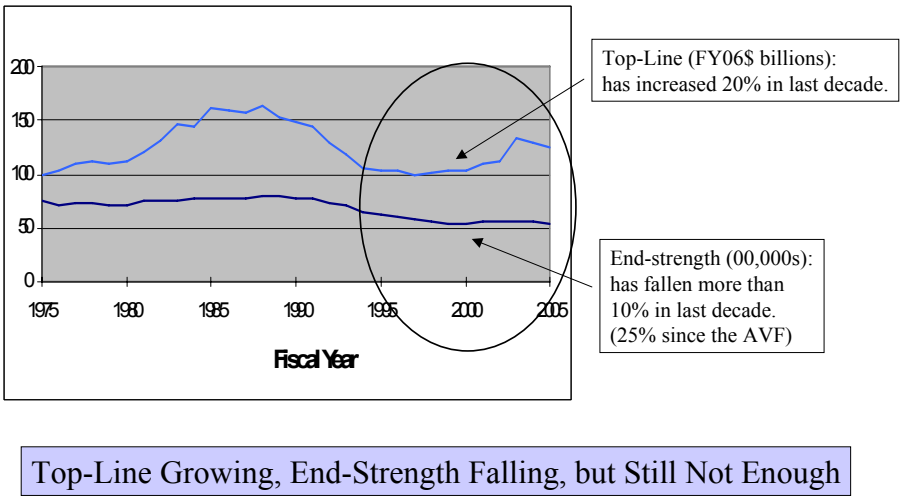
As pointed out in one presentation, the DON competes with other military services for DOD funds. As the top line of the DOD budget grows, endstrengths fall, and budgets tighten, policy questions are raised within the DON (e.g., concerning the actual savings realized from existing policies, such as endstrength reduction). Another presentation reviews the goals, tools, and realignment processes involved in the Navy's move toward compensation reform, and analysts make recommendations for enhancing such processes. An analysis of strategic force modeling presentation shows how the Navy can address spending pressures by making significant changes in the shape and composition of its enlisted and officer communities. Other presentations discuss perceived shortcomings in manpower requirements analyses and the resulting failures of not taking costs of military manpower resources into consideration when setting or validating their resource requirements.

Can Military Personnel Levels Close the Budget Gap?

Dr. Russell Beland (Manpower Analysis & Assessment) presented analysis of the last 30 years of budget and personnel data, which suggest that true savings from endstrength reductions are relatively modest and have been more than offset by increased RDT&E spending intended, in part, to reduce manpower requirements [46].

Dr. Beland shared that, while the DON's budget has grown over the last 30 years, in constant dollars, by more than 25 percent, active duty endstrength has fallen 25 percent. In the last decade, the top line has grown about 20 percent, while endstrength fell about 10 percent. (See figure 39.)

Figure 39. DON endstrength and top line[a]



Top-Line Growing, End-Strength Falling, but Still Not Enough

a. Source: [46].

Yet, despite these shifts, the Navy's ship construction budget remains well below what would be required to maintain a size and mix called for in Navy plans. The combination of a growing top line, falling end-strength, and continuing tight budgets has raised several policy questions: Do endstrength reductions save as much money as expected? If so, where do the savings go? If not, how much can be saved?

Dr. Beland's analysis reveals that based on the average effects from 1975 through 2005, the financial trail of endstrength cuts totaling costs of $62,000 indicates the following redistributions: 26 percent O&M, 13 percent Milpers, 38 percent Investment Accounts, and 23 percent to DON TOA. He presented two notional examples to show that Milpers endstrength reductions do not, in fact, "pay the bills."

According to Dr. Beland's analysis, higher savings per billet could potentially be achieved through reducing billets at higher grade levels and decreasing O&M replacement. It has been observed, however, that over the last 30 years the mission has declined. There have been major cuts in ships and facilities; easy billet cuts have been made, and future cuts are likely to be less efficient.

Estimating the Economic Cost of Alternative Force Structures

Mr. Pat Mackin (SAG, N144) presented several examples of modeling costs for alternative force structures [47]. Personnel models have traditionally focused on fitting the supply of personnel to some measure of mission requirements without considering costs. There are different ways to man the force and achieve a given mission. According to Mr. Mackin, strategic force modeling can allow the Navy to consider significant changes in the shape and composition of its enlisted and officer communities—using a more senior or a more junior force, for example. As resources have become scarcer, efficiency has become increasingly important. Costs vary across occupations and the best force mix is likely to vary as well.

Accurately estimating the costs of potential changes is a critical part of the evaluation process. The model presents methodological considerations and challenges of force costing. All costs are associated with stocks or flows of personnel. For example basic pay and allowances are applied to the stock of inventory, SRB is based on the flow of reenlistments, and accessions trigger recruiting costs and training costs. In addition, costs vary by YOS, grade, occupation, and location. The measures are not intended to be budget costs, but marginal costs of any changes relative to a baseline. Personnel cost elements include RMC, special and incentives pays, retired pay, training costs, recruiting costs, and other indirect costs.

Mr. Mackin provided examples of cost comparisons based on hypothetical changes in force structure. Examples using two alternatives were presented that seemed to indicate that a more experienced force should require fewer Sailors since improving retention reduces the need for "agricultural" billets. Such billet savings may only be recouped if there is no additional work demand for the personnel

serving in those billets (or if they may be replaced by less expensive civilians or contractors). (See figure 40.)

Figure 40. Cost comparison[a]

	Baseline	Constant Endstrength		Constant Zone A Continuation	
		Cost	Difference	Cost	Difference
RMC	3,178,716	3,304,287	125,571	2,962,168	-216,549
SRB	0	20,298	20,298	18,196	18,196
Retirement	108,371	121,640	13,269	109,046	675
Recruiting	20,000	16,963	-3,037	15,207	-4,793
Training	40,000	33,926	-6,074	30,414	-9,586
Total	**3,347,088**	**3,497,115**	**150,027**	**3,135,030**	**-212,057**

All costs expressed in $K

a. Source: [47].

Mr. Mackin proposed an approach for estimating marginal changes in economic costs. First, integrate cost into existing and future tools to provide full information about the impact of proposed changes. He also proposes collecting better cost data, particularly indirect cost data. He suggests dynamic modeling of incentive effects on sea-shore rotation / assignments. Mr. Mackin's proposed approach also involves providing feedback to the requirements determination process.

Military Compensation Reform in the Department of the Navy

Dr. Michael Hansen (CNA) and Dr. Martha Koopman (CNA) presented a study of the goals, tools, and realignment processes involved in the Navy's move toward compensation reform [48]. Starting with a review of the major compensation tools and existing literature, the analysts assessed the goals and guiding principles of the major tools and how they should either be altered or eliminated. They noted that a single compensation tool was not intended to meet all goals. Also, guiding principles can conflict. The main components of military compensation for FY05 include basic pay, Basic Allowance for Housing (BAH), Basic Allowance for Subsistence (BAS), retirement pay, health care, Special & Incentive (S&I) pays and miscellaneous pays. Dr. Hansen and Dr. Koopman presented a notional example of a

well-aligned compensation package based on their assessment of the literature, which included basic pay, flexible force-shaping tool, cafeteria-style benefits plan, flexible array of S&I pays, and miscellaneous pays.

Dr. Hansen and Dr. Koopman concluded that many of the suggested reforms might be too expensive without DOD cooperation; therefore, they made some alternative recommendations. Short-run recommendations include selective expansion of SRB, AIP, Enlistment Bonus, and sea pays. They suggest holding the line or pushing back on basic pay, BAH / military housing, health care, and retirement pay. They recommend the use of Thrift Savings Plan (TSP) matching and Voluntary Separation Pay (VSP). They also recommend rebalancing military compensation in cooperation with DOD and Congress. Long-run recommendations include reduced in-kind compensation / deferred benefits, improving the value of remaining benefits, and use of within cash pay (e.g., increased use of flexible, targeted pay).

LCC-20 Manning: Civilianization and the Navy of the Future

In September 2004, Dr. Albert Monroe (CNA) observed and later evaluated the partial civilianization of the USS *Mount Whitney* (LCC-20) command ship for the Navy's 6th Fleet in the Mediterranean [49]. During this experiment, civilian mariners (CIVMARs) from the Military Sealift Command (MSC) took over *Mount Whitney's* navigation, deck, engineering, laundry, and galley services. As a result, *Mount Whitney* saved about $45 million per year and, at the same time, managed to better fulfill its Supply, Deck, and Engineering Departments' missions. (See figure 41.)

In several ways, the partial civilianization of USS *Mount Whitney* increased the military and civilian crews' mission capabilities. Using CIVMARs exclusively for Supply Department tasks allowed military personnel to work more in their rating—that is, they incurred no skill loss by working on cleaning, laundry, or mess duties. Also, CIVMAR engineers are, on average, better trained, more qualified, and more experienced, leading to better engine reliability and lower maintenance costs for *Mount Whitney.* However, the use of CIVMARs on *Mount Whitney* makes it harder to add military missions. Also, damage control follows MSC processes.

Figure 41. Total manning, personnel, and maintenance savings[a]

- Manning cost savings = $27.5M
  - Difference in total yearly pay between previous crew and current crew
  - Includes pay and US allowances
- Overseas residency savings = $5M
  - Permanent Change of Station (PCS)
  - Command Sponsored Dependents
- Shore billet savings = $1.7M
  - Assumes that 30% of shore billets filled by Navy sailors cut
  - Remaining billets filled by civilians
- Maintenance savings = $10M
  - Includes intermediate and depot maintenance
- Total savings = $44.2M FY-07

a. Source: [49].

Based on these results, Dr. Monroe recommended that the Navy explore using CIVMARs for basic supply, food service, and ship's service (laundry, ship's store, and barbers) functions aboard surface ships. Converting basic supply, food service, and ship's service on all surface combatants would save about $750 million annually and reduce Navy endstrength by about 21,700. To be able to do this, however, Dr. Monroe points out that MSC would have to quadruple the number of CIVMARs under its command. Therefore, the use of civilian detachments on Navy warships would have to be phased in slowly.

A Deck Plate Analyst's View of the Navy's Workload & Manpower Requirements Development Process

Mr. Louie DeCourval (NAVSEA 05 DDG-M/HSI) gave a presentation on his analysis of the Navy's current workload assessment and manpower requirements determination processes [50]. For the last 10 years, Mr. DeCourval worked as an imbedded analyst conducting Workload & Manning Assessments/HSI analyses at the deck plate, during all phases of shipboard operations. During that time, Mr. DeCourval was a part of numerous case studies conducted aboard USS *Stout*, USS *McCampbell*, USS *Milius*, and USS *Mason*. In more than one case, he spent more than 3 years on board one ship.

Mr. DeCourval suggests that shortcomings in manpower analyses today stem from a lack of real-time and ongoing deck plate information on workload and manpower drivers, a weakness in the system's process to accurately define and determine manpower requirements, and apparent difficulties in maintaining continuity and consistency of fleet feedback on shipboard Human-Machine Interface (HMI). Mr. DeCourval stated that these processes are inadequate for collecting accurate manpower data and result in incorrect manning figures. As a consequence, he suggests that the collected manpower data have led to inaccurate billet assignments, increased difficulties in maintaining mission readiness, and potentially reduced Sailors' rating proficiency. (See figure 42.)

Figure 42. The results of inadequate processes[a]

- **Incomplete & Inaccurate Workload Figures has led to Inaccurate Billeting,**
- **Many of the new and emerging manpower drivers are currently not figured into sailors workload,**
- **Reports of Success on the Optimal Manning Experiment are overstated,**
- **Potential Risks to our Sailors,**
- **Increased difficulties in maintaining Mission Readiness,**
- **Rating mergers resulting in potentially reduced proficiency,**

a. Source: [50].

Mr. DeCourval recommends that, for existing processes to accurately assess and determine workload and manpower requirements, they need to account for workload and billeting on the ship's steaming condition, emerging workload, mission manning, technology issues, and distance support. He also proposes the creation of imbedded analyst positions, made up of former chief petty officers, in order to address a lack of real-time and ongoing deck plate information.

Fiscally Informed Requirements Determination

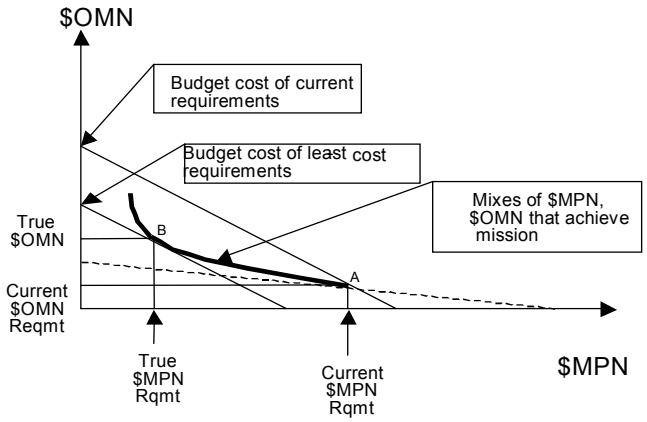
Dr. Omer Alper provided a summary of his ongoing study with Dr. Martha Koopman (both of CNA), on the Military Requirements Determination (MRD) process in the Navy [51]. The study was motivated by the observation that Budget Submitting Offices (BSOs) traditionally have failed to consider the costs of military manpower resources when setting or validating their resource requirements, resulting in a suboptimal allocation of resources. (See figure 43.) The authors suggest that this outcome is due to misalignments in responsibilities and incentives created by the current system. As a result of these misalignments, BSOs are often reluctant to propose military-civilian conversions to take advantage of the costs of these resources because they usually do not receive expected funds to hire civilians.

Dr. Alper and Dr. Koopman propose a decentralization of resource tradeoff opportunities toward the field level, perhaps initially at the BSO level. A decentralized resource tradeoff system would give each BSO a fungible budget for manpower, which would allow them to allocate among needed resources. This type of decentralization moves the decision and consequences of resource allocation to the information-holders, who, with a better understanding of costs associated with each type of resource, would be in a better position to optimally allocate among available resources.

Dr. Alper and Dr. Koopman also addressed the possible effects of the Single Resource Sponsor (SRS) reorganization, under which one resource sponsor, N1, controls all Milpers Total Obligation Authority (TOA). N1 as SRS has final authority over which billets get authorized (funded) as a result of the manpower POM process. By consolidating authority for all manpower requirements in one organization, that organization can have greater opportunities to innovate: more visibility into processes, better validation mechanisms, and a larger interactivity trade space. All these effects have the potential to facilitate any decentralization initiatives. Furthermore, placing all MilPers dollars under N1 control could streamline the PPBE process and allow N1 to focus on becoming an efficient centralized staffing organization that concentrates on recruiting, training, and pipeline distribution mechanisms and on estimating accurate prices for manpower.

Figure 43. Uninformed vs. Informed Requirements[a]

Requirements that do not consider trade-offs may achieve the mission, but at an unnecessarily high cost.



a. Source: [51].

Measurement Error in the Use of Validity Evidence To Support Cut-Score Decisions

Federal and professional guidelines articulate the minimum requirements for establishing the validity of an assessment tool (EEOC, 1978; SIOP, 2003). According to Dr. Phillip M. Mangos (NAVAIR), however, little guidance exists (a) to support the setting of an assessment's cut-score once its validity has been demonstrated or (b) for the use of validity evidence in cut-score specification [52].

Cut scores establish the minimum score on a predictor at which a candidate is considered for selection or further training. In training contexts, they are used to assign people to specific training curricula. In selection settings, cut scores are used to select applicants and classify new hires into specific jobs or career paths. The ability of a test to predict job performance is reduced if a cut score is set too high or too low. If set too high, people who otherwise would have been selected and potentially good performers are eliminated. If a cut score is set too low, people who are unlikely to be good performers are retained.

Dr. Mangos highlights one issue related to the use of validity evidence in cut-score specification—the role of measurement error. He argues that misspecification of the validity model representing a predictor-criterion relationship can have a profound influence on the range of predictor scores reflecting minimally acceptable performance.

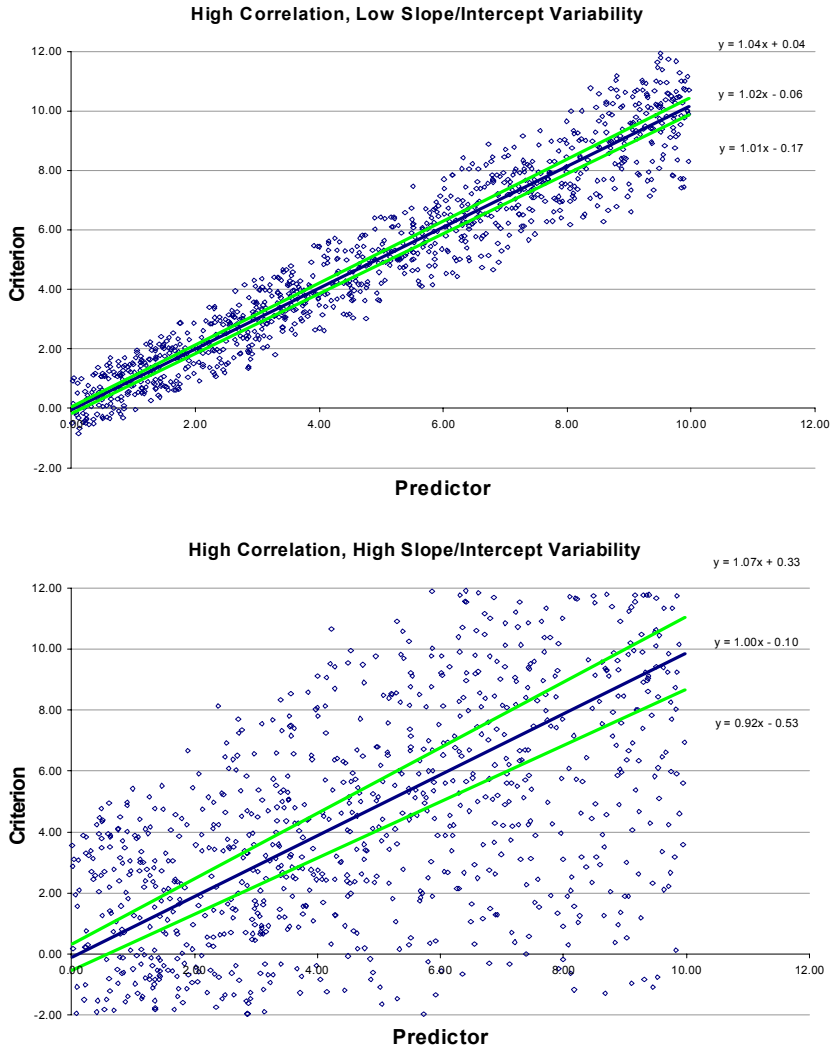
Dr. Mangos addressed two issues related to validity evidence through the use of Monte Carlo simulations: effects of predictor and criterion range restriction and effects of misspecification of the validity regression model on the range of predictor scores reflecting minimally acceptable performance and, consequently, on cut scores based on the relevant validity data.

He developed simulated data in which he manipulated the following: (1) the ratio of criterion to predictor variability (to model the effects of different patterns of predictor and criterion range restriction), and (2) the Standard Error (SE) of the regression model in which significant relationships (i.e., independent direct effects of two predictors, interaction between two predictors, and curvilinear predictor-criterion relationship) were present but not included in the specified regression model.

Dr. Mangos' results indicate that a high validity coefficient is the most useful for setting cut scores. In addition, he found that a high criterion-to-predictor Standard Deviation (SD) ratio (i.e., predictor range restriction) can increase the slope of the regression line, resulting in an underestimate of cut scores and an increase in the Standard Error. (See figure 44.)

This could cause the range of cut scores to be too wide to be useful. Consequently, those who would be low performers are included in the selection pool. In addition, Dr. Mangos found that a low criterion-to-predictor SD ratio (i.e., criterion range restriction) can cause an artificial decrease in the slope of the regression line. This could cause an overestimation of cut scores and a decrease in the SE. The resulting range of cut scores would be deceptively narrow, which means that potentially high performing people who should have been selected would be eliminated.

Figure 44. Variability of predictor and criterion scores[a]



a. Source: [52].

According to Dr. Mangos, these results have important implications for the setting of cut scores in modern personnel selection and training contexts, which often involve the development of a battery of assessments, measurement of multiple criteria, and adoption of a multivariate validity model in which multiple predictor-criterion relationships are hypothesized and assessed. In addition, the results suggest that failure to correctly specify the form of such relationships could result in suboptimal hiring decisions and training assignments.

Officer Promotion Flow Point Calculation Model

Mr. Rodney S. Myers (NPRST/Pers-11) discussed promotion flow points—promotion based on a Navy phasing policy during each month of a fiscal year—using a 12-month average of the total active commissioned service for an in-zone officer population [53]. Flow point calculations, which are required by DOD/Navy policy, are included in the annual promotion plan. (See figure 45.)

Figure 45. Plans for opportunity and flow point[a]

Grade	LAW (Title 10 §623)		DOD (DODINST 1320.13)		Navy (SECNAVINST 1420.1B)	
	OPP	FLOW	OPP	FLOW	OPP	FLOW
CAPT	"Relatively similar opportunity for promotion in each of the next five years"		50%	21-23 yrs	40-60%	21-23 yrs
CDR			70%	15-17 yrs	60-80%	15-17 yrs
LCDR			80%	9-11 yrs	70-90%	9-11 yrs
LT			AFQ	3.5 yrs	AFQ	4 yrs
LTJG			AFQ	1.5 yrs	AFQ	2 yrs

a. Source: [53].

The annual promotion plan covers 5 years—the execution year and a forecast for each of the succeeding 4 years. Budget and long-range personnel policy decisions are developed based on these promotion flow point calculations, so calculations must be accurate. The Navy Officer Plans and Policy Branch, N132, expressed a need to accurately calculate active-duty promotion flow points for the Navy's 21 officer competitive categories.

NPRST department, in conjunction with N132's Promotion Division, has created the Officer Promotion Flow Point Calculation Model (OPFPCM), used by promotion planners and officer community managers to automatically calculate officer flow points for the annual promotion plan. The tool, developed in Microsoft Access, pulls

officer personnel data from the Officer Master File. An alpha version of the tool was delivered at the end of fiscal year 2005. OPFPCM was used to develop promotion plans for fiscal years 2007 through 2011.

The three fundamentals of promotion are (1) opportunity, or the in-zone "possibility" of selection, (2) selection rate, or the percentage of all officers selected for promotion, and (3) flow point, or the average years of service until an officer is promoted (paid) to the next grade. The promotion plan "promotes to vacancies." First, the number of vacancies/potential promotions is determined. Next, zones of possibility for selection are established based on promotion opportunity and lineal seniority, independent of year groups. Finally, a flow point check is used to constrain promotion opportunity.

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Workforce Planning

Navy workforce planning is about optimizing resources to accomplish current and future missions. Through the development and implementation of policies, processes, and models, strategic human capital management goals are supported. Workforce planning is focused on understanding the requirements necessary for mission success, knowing and building on the skills and competencies of the workers, and assigning people with the right level of skills and experiences to the right job [2].

The presentations in this section examine various aspects of workforce planning and offer recommendations for improving the planning processes. Analysts examine the rules and processes for inventory and requirements, addressing such issues as the degree to which officer inventories fail to match requirements and how to handle shortfalls. Analyses are also being done to "create a culture of readiness" while shaping the workforce through creative assignment and distribution practices. Optimization simulators and models are being used to decide Sailors' future billet locations based on their skills, capabilities, and experience. Other initiatives analyze the performance of Sailors in multitasking environments providing measurements and predictions of success across various Navy jobs. Analytical methods and sustainment modeling are being used to target force shaping for specific personnel to avoid critical shortages. A final study examines the need for careful planning around the experience-productivity relationship and its implications for recruiter force efficiency.

An Evaluation of URL Officer Accessions Programs

Dr. Ann Parcell (CNA) presented a study that examines the manpower system for unrestricted line (URL) officers—documenting the degree to which officer inventories did not match requirements and identifying options for addressing shortfalls [54]. She noted that

some want a "best value accession source" rule or process that determines the number of URL officer accessions (by community) that should come from each source. She stated that there may not be a rule per se, but there may be a set of tradeoffs across accession sources (by community) that can be clarified for the Navy.

Dr. Parcell's analysis in the fall of 2005 compared *by source* the net marginal costs and benefits of a small increase in URL officer accessions, by community. She specifically looked for the biggest drivers of pre-commissioning marginal costs. The analytic approach treated Medicare-eligible retiree health care accrual equitably across accession sources. One example provided the marginal cost per accession for a pilot. Cumulative continuation rates were used in the community (pilots, NFOs, submariners, SWOs), including prior-service and non-prior-service personnel. This analysis was done by years of commissioned service taking the average of FY 1996–2003 cumulative continuation rates. A comparison was made of U.S. Naval Academy (USNA) and Officer Candidate School (OCS) inventories to years of commissioned service (YCS) 20 (pilots). According to Dr. Parcell, the biggest drivers of post-commissioning costs included compensation costs and early post-commissioning training costs. (See figure 46.)

Figure 46. Biggest drivers of pre-commissioning marginal costs[a]

	Primary cost	Secondary cost	Key ratios/assumptions
USNA	Midshipman stipend; Faculty and support staff compensation	Other support costs; Attrition costs (must carry 4.2 additional brigade members for every additional officer accession)	8:1 student-faculty ratio 4:1 support staff to faculty ratio
NROTC	Tuition and fees	Midshipman stipend	Attrition costs effectively zero (use non-scholarship students to replace scholarship attrites)
OCS	Student pay and allowances (P&A) at OCS; student P&A in BDCP program, student P&A in NUPOC program		Marginal cost of recruiting and of additional OCS instructors effectively zero because of excess qualified candidates and excess capacity at OCS*

*Alternative scenario relaxes these assumptions

a. Source: [54].

Another example involved a pilot marginal inventory comparison. She compared the costs and benefits of accessing pilots through OCS, NROTC, and USNA, holding endstrength constant. The first phase of Dr. Parcell's analysis revealed that the marginal cost/benefit result does not clearly indicate choice of the accession source, while holding endstrength constant to 20 YCS. She found, however, that the marginal cost/benefit result of accessing to the same number of URL officers at YCS 11, using a weighted average of all URL communities, favors OCS. The next phase included an examination of demographic diversity by accession source, and tech/non-tech majors by accession source. Furthermore, there are differences by accession source for due course officers, early promotion to O-4, screening for command at sea, and selection for major command.

Dr. Parcell discussed the types of diversity by accession source. She found that the majority of URL women come through USNA + NROTC. The majority of Black and Hispanic male SWOs come through USNA + NROTC, and there is more variation in source for Black and Hispanic male aviators. Some considerations for changing the size of the accession source include looking at seat demands and excess capacity at each source. Other cost/benefit modeling considerations include expanding cost benefit efforts through cost estimations and restructuring costs to "pre-fleet" status.

Marine Corps Officers: Inventories and Requirements

Dr. Cathleen McHugh and Ms. Holly Potter (both of CNA) presented research on critically short Primary Military Occupational Specialties (PMOSs) in the Marine Corps [55]. In addition to taking inventories and examining the magnitude and duration of PMOSs, they looked at such factors as the effects of promotion systems on shortages and the effectiveness of skill-shortage precepts at promotion boards. According to Dr. McHugh and Ms. Potter, planners and executors define shortages differently. Planners seek to build the right Officer Corps, while executors aim to fill current billets with the appropriate Marines. Although these issues are still being worked out, executors tend to see fewer shortages than planners.

Planners and executors use different measures. Planners measure Inventory vs. Grade Adjusted Recapitulation (GAR) requirements.

They address requirements for A- and B-billets and patients, prisoners, trainees, and transients (P2T2) and look at critical shortages where the inventory is less than 85 percent of GAR. Executors measure inventory vs. Authorized Strength Requirement (ASR), which is the requirement for A-billets only. (See figure 47.)

Figure 47. GAR recent critical shortages[a]

Grade	PMOS	Detail
O3	AV-8	Critically short since FY00
	C-130	Critically short since FY03
	EA-6A/B	Critically short five years since FY00
	FA-18	Critically short four years since FY00
	MAGTF Intel	Below 50 percent GAR since FY02
	UH-1 and AH-1	Critically short and falling since FY03
O4	Adjutant	Critically short since FY96
	Air C2	Critically short in FY04 and FY05, falling since FY00
	Aviation Supply	Critically short since FY97
	Comms	Critically short since FY94
	Finance	Critically short FY95-FY03, surplus FY04-FY05
	MAGTF Intel	Critically short since FY96
	Military Police	Falling since FY03, critical FY04 and FY05
O5	Adjutant	Critically short since FY02
	Aviation Maint	Critically short five years since FY00
	C-130	Critically short since FY94
	Comms	Critically short four years since FY00
	Engineer	Critically short since FY93
	Finance	Critically short since FY99
	MAGTF Intel	Critically short since FY96
	Public Affairs	Critically short since FY91

Planners' shortage measure

a. Source: [55].

Dr. McHugh and Ms. Potter also examined the USMC Manpower System and discussed it in terms of any support it offers to officer structure requirements, any shortages as a result of differences in promotion rates, and whether including PMOSs in the skill-shortage guidance from the promotion board precepts has any effect on shortages. Using the model for estimating differences in promotion rates, the analysts performed logistic regression on the probability of promotion to O4, to O5, and O6 using data from FY95–FY06 promotion boards. They found statistically significant, marginal effects of PMOS

indicators on the probability of promotion. For example, Infantry Officers are 8 percentage points more likely to be promoted to Major than the average in-zone Marine. Another issue was how much control exists for officer “quality” in promotion estimates. The analysts examined whether some PMOSs have higher promotion rates because they have higher quality Marines. A proxy for quality was established by using The Basic School (TBS) class standing: top third of class, middle third of class, and bottom third of class. Dr. McHugh and Ms. Potter noted that, while controlling for quality, short PMOSs are not promoted at a lower rate than other PMOSs.

The USMC currently uses skill-shortage precepts to address PMOS shortages. Short PMOSs are listed in skill-shortage precepts to promotion boards. The analysts used the model to determine whether promotion is more likely when the PMOS is listed in precepts. They found that skill-shortage precepts affect promotion rates. When a PMOS is listed as short in the precepts, the probability of promotion for officers in that PMOS rose. Results are relative to promotion probability when the PMOS is not in precepts.

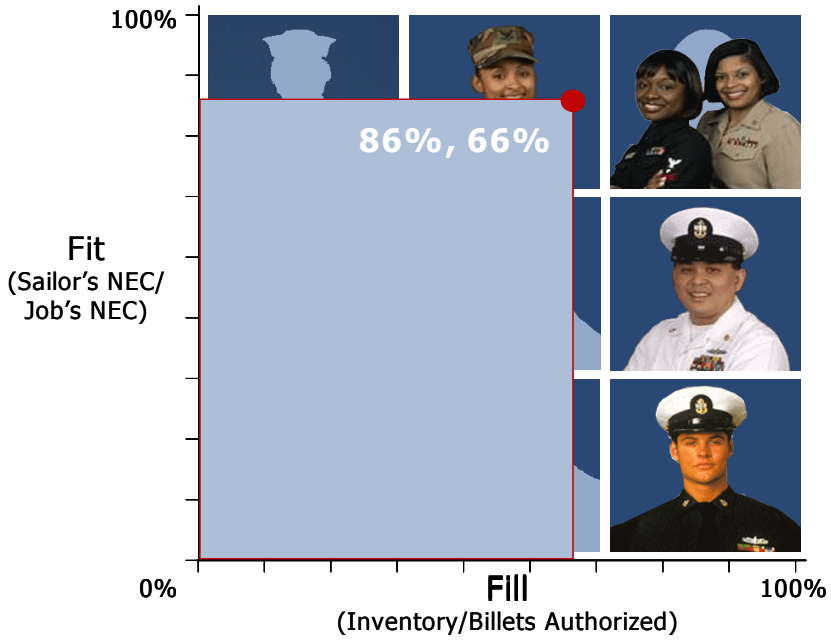
Finally, according to Dr. McHugh and Ms. Potter, there are limitations to addressing shortages using skill-shortage precepts. First of all, skill-shortage precepts only address shortages in the existing grade. In addition, skill-shortage precepts cannot address the pool of officers eligible for promotion. With respect to the pool of eligible officers, analysis was done looking at the relationship between final separations and being passed over for promotion at least once between FY95 and FY04. For non-retirement-eligible Marines, most separations are not related to being passed over for promotion.

Optimized Slating Window

Mr. Rodney S. Myers (NPRST/Pers-11) stated that the CNO has approved CFFC's Fleet Response Plan (FRP) and that Navy Personnel Command (PERS 4) is ready to move ahead to "create a culture of readiness" while "shaping the workforce of the 21st century" through evolving and innovative assignment and distribution practices [56]. Some analysts believe that shaping the workforce through these new practices will increase leadership qualities among Sailors. While the optimal case is to have a qualified person to fill every billet, the

current reality is that 66 percent of billets are filled with an 86-percent fit or vice versa. There is often uncertainty about which fill/fit ratio is most desirable. (See figure 48.)

Figure 48. Fit/fill reality[a]



a. Source: [56].

According to Mr. Myers, the new approach will require a responsive personnel system capable of proactive functions vice consistently reactive functions. Minimization of personnel gaps is essential to the higher level of readiness required to sustain a substantial surge force and is integral to training and maintenance processes. Modifying "the cyclical manning processes of the past" is key to maintaining our naval force at a higher level of readiness for extended periods.

Currently, a Sailor's rotation schedule is based on a fairly static month for the Planned Rotation Date (PRD), with a window of time (-3/+4 months) around the PRD in which the Sailor can be moved. When the PRD window is used, the Sailor is most typically moved early from his shore tour to meet an at-sea requirement, or late from his sea tour

to a shore tour (usually to minimize a gap at sea). Both are acceptable within the PRD window, but less desirable from the Sailor's perspective because he might not derive the benefit of the timing in his next job selection. The objective is to determine improvements in readiness that are gained from expanding and executing rotations within a flexible PRD window.

A simulation environment best serves to manage our objective owing to the sheer size and complexity of the personnel system that composes the naval force. One method is to perform an optimization at the beginning, the halfway point, and at the end of the assignment period. By using decision checkpoints in the process to optimize the simulation, it may be possible to determine how best to fill the billets. If the demand for fill rate is found to be high priority, then sacrifice fit and vice versa. Policy decisions that influence job rotation, including the PRD and detailing windows, are parameterized as inputs within the simulation framework. Although the detailing process is both essential and complex, within the simplified context of a simulation, an optimization model is best suited to perform this function. Owing to the adjudicative nature of the detailing process, the optimization model is also parameterized with such inputs as importance placed on the size of personnel gaps and overlap, proximity of rotation to PRD, skill-requirement fit, and priority of the billet as it relates to overall readiness. This approach brings together optimization and simulation with the optimization model as the subelement in contrast to more mainstream techniques in which a simulation model is an element of an objective function. Results have shown that the severity of tradeoff is the same for low-, medium-, and high-priority fill rates. In the future, computers may decide a Sailor’s future billet location based on his/her skills, capabilities, and past experiences.

Individual Sailor Assignment Model (I-SAM)

Mr. David Hegland (Whitney, Bradley and Brown, Inc.) described a modeling effort to assess the impact of alternative sea/shore rotation schemes on a Sailor’s professional development, career progression, and quality of life [57]. The impact of ship deployment cycles, crewing alternatives and different sea/shore rotation schemes continue to be examined for their operational and manpower impact.

Using the ship's weekly schedule, formal training school schedules, and Skill Objects from the Five Vector Model, a Microsoft Access-based model calculated 33 metrics associated with a Sailor's workload, operational tempo (OPTEMPO), quality of life, and career development. The model was designed to be adaptable to different ship types (e.g., LCS, CVN-21), different enlisted ratings (to include hybrid or composite ratings), and different rotational schemes (such as Blue/Gold, Multiple Crewing, or On-deck Circle). Mr. Hegland indicated that the model is also readily adaptable to any manning alternative under consideration by Navy leadership. Commander, Naval Surface Forces selected a 130-percent manning model for beta testing.

Initial testing was conducted by simulating a 9-year period using two ship types (DDG and LHD) and several enlisted ratings to compare the impact of a 4-3-4 sea-shore-sea rotation scheme with the 130-percent manning concept. (See figure 49.) Results suggest that Sailors under a 130-percent manning concept will have less shore duty and more time away from homeport, will attain more formal training, and will have a higher average individual personnel tempo (ITEMPO). Results have demonstrated that Sailors under either rotation scheme would have comparable workload and advancement and could earn an AA degree over a 9-year period.

Figure 49. Summary of overmanning rotations[a]

Sailor under Over-manning rotation experienced...

- 42% more underway days
- 40% less shore duty
- 48% more time away from homeport
- Higher average ITEMPO (but did not exceed 200 days)
- 18% fewer college credits (however did earn a AA degree)
- Overall 12% longer to make rates but made E6 slightly faster
- 30% more training time
- 33% more formal school attendance (95% of all available schools)
- Comparable leave and holidays

Bottom Line:

- **When compared to 4-3-4 rotation, Over-manning concept resulted in a sailor that spent more time at sea, attended more formal schools, had less time for off duty college and initially advanced somewhat slower.**

	Work Week		Sea/Shore Ratio			Quality of Life						Training & Career Progression					
Metrics	Cum hrs on duty	Avg wkly hrs on duty	Cum days SEA DUTY	Cum days SHORE DUTY	Sea Shore Ratio	Cum underway days	Cum days Out of homeport	Cum off-duty hours	Avg wkly hrs off duty	Holidays off	Leave days taken	Cum Formal Training	Pct schools attended	Cum training hrs avail	College Credits	Weeks w/20 credits	Weel with A degr
Baseline	20034	42.8	1981	1295	1.5	735	1302	15446	33.0	72	224	98	72.1%	1903	114	361	10
ver-manning	20136	43.0	2520	756	3.3	1043	1932	13728	29.3	71	245	127	93.4%	3178	94	375	16

a. Source: [57].

Innovations in Service Member Assignment Processes

Over the last several years, the U.S. Navy has devoted significant effort to improving the billet assignment process for enlisted Sailors. Dr. Pete Coughlin (NPS) discussed the mechanisms for assigning Sailors to billets and for promoting them [58]. The efforts have centered on two complementary initiatives: auction-based Assignment Incentive Pay (AIP) to increase the attractiveness of less desirable billets, and matching algorithms to improve the quality of the assignment process. The basic premise holds that Navy enlisted detailing involves unique characteristics that limit the predictive power of existing work on either auction or assignment mechanism design (see figure 50).

Figure 50. The need for Assignment Incentive Pay[a]

- Difficulties with Navy's traditional assignment system
  - Assignments based on sailor preferences and Navy needs
  - Sailors paid largely according to rank, not assignment
  - Certain top-priority assignments naturally less attractive
- Consequences
  - Top-priority hard-to-fill assignments may go unfilled
  - Such assignments may be filled involuntarily
  - Navy readiness and Sailor morale jeopardized
- Solution: Assignment Incentive Pay
  - Additional pay for top-priority hard-to-fill assignments
  - BUT what mechanism should be used?
    - To assign sailors to top-priority hard-to-fill assignments
    - To set appropriate level of incentive pay for each billet

a. Source: [58].

During AIP auctions, the winning bid is not determined by the bid alone, and participants may place bids for several positions but can only win one. The optimal auction design incorporates the following elements. First, the design should be simple to administer. Next, incentive is set by higher wages and the correct price must be known.

The auction mechanism operates in reverse—that is, bidders are sellers not buyers. Sailors bid for locations, and the most popular places cost less. Buyers will prefer the most qualified Sailors. Care must be taken in the design not to create incentive for manipulation.

Dr. Coughlin stated that a new mechanism could be carefully adapted from an existing one. It should include one-to-one matching, two-sided preferences, non-manipulable transactions, forward operation, open-bidding, and one-sided matching. Using a two-sided fixed price matching mechanism, there is still opportunity for manipulation, but perhaps in reality it's very low. The old process can be adapted to this problem—forward mechanism to reverse problem. The bidders become buyers and vice versa. Bid takers announce the maximum they are willing to pay, and bidders write down the minimum they are willing to accept. Bid takers can also announce the maximum they are willing to pay and the minimum qualifications. It is advantageous for the bidder to admit the minimum he's willing to accept.

Dr. Coughlin's results indicated that the new mechanism could not be manipulated. Each Sailor was matched with a favorite billet and given prices. Price setting was endogenous, and the mechanism determined the correct price for each billet. The matching mechanism explicitly handled the one-to-one matching problem. In addition, the mechanism was two-sided, incorporating both Sailor and employer preferences, and was relatively simple to administer. There was a one-time job specification for each billet and a single sealed-bid from each bidder. Calculation and matching of prices was automated.

Dr. Coughlin noted that future research agendas would address the optimal settings for minimum qualifications. For example, the threshold can be set above "true" minimum standard. Setting higher standards for positions will make them more difficult to fill, but participants will have higher qualifications. Setting lower standards will make it easier to fill positions, but participants' qualifications will be lower. Another way to address optimal settings for minimum qualifications is to observe mechanism performance in laboratory settings. Analysts can evaluate bidder behavior and preferences and then compare performance with alternative mechanisms, such as total Navy wage cost, total Navy utility, Sailor satisfaction, and total efficiency.

Understanding and Predicting Sailors' Performance in a Multitasking Environment: The SYRUS Project

Dr. Frederick Oswald (Michigan State University) presented findings from "The SYRUS Project" that analyzed the performance of Sailors in a multitasking environment [59]. He noted that Sailors continue to face jobs with increased responsibilities, tighter time frames, and greater integration into real and virtual team-based environments. As a result, the term *multitasking* has gained a strong foothold in technical reports and general discussions concerning future performance for individuals and teams in the Navy. His presentation outlined a conceptual framework for multitasking that addresses situational characteristics (e.g., time pressure, task demands, task interruption) and individual characteristics (e.g., anxiety, motivation, working memory, task knowledge) that relate to multitasking performance. College students were recruited to take part in a computerized multitasking paradigm that contains four tasks running simultaneously: addition, letter memory, tone discrimination, and visual monitoring. The goal is to maintain a high overall score, performing each task successfully while not ignoring any one task for too long. Participants were measured on personality and memory (stable traits) as well as anxiety, goal orientation, and interest in the task (variable traits) during multitasking. Both sets of traits predict general multitasking and change in multitasking performance over time. Preliminary results indicate that, under routine multitasking procedures, successful performers tended to be higher in ability, lower in neuroticism—and therefore lower in anxiety. (See figure 51.)

Under emergency multitasking procedures, successful performers tended to be higher in ability, somewhat higher in openness, and lower in conscientiousness. The ongoing research within this study will focus on answering whether physiological measures predict performance, and whether self-reported anxiety correlates with physiological measurements. According to Dr. Oswald, the empirical results inform the overall conceptual framework, as well as future research plans, as SYRUS transitions into the measurement and prediction of Sailor multitasking at the individual level. This, in turn, will lead to work at the team level across various Navy jobs.

Figure 51. Predicting performance changes in meaningful ways[a]

	g	N	E	O	A	C
Routine	**.25**	**-.21**	.01	.13	.01	.00
Emergency	**.36**	-.03	.02	.17	-.08	**-.24**

Under routine multitasking, successful performers tended to be higher in ability, lower in neuroticism (and therefore anxiety); conscientiousness was not predictive.

Under emergency multitasking, successful performers tended to be higher in ability, somewhat higher in openness, and they tended to be lower in conscientiousness (higher reactivity); neuroticism was not predictive.

a. Source: [59].

Challenges in Identifying Navy Information Professionals

LCDR Star Rhodes and Mr. Ray Brown (both of OPNAV N6) presented the challenges the Navy faces in identifying information technology professionals [60]. According to Mr. Brown, the Assistant Chief of Naval Operations (Information Technology) (ACNO (IT)) is responsible for leading a federated approach to information management/technology (IM/IT) governance within the Navy. While serving as the Navy lead for IT strategies and activities, ACNO (IT) must ensure that IM/IT workforce training, certification, education, and management requirements for the Navy IM/IT workforce are met. In addition, ACNO (IT) must champion Navy-unique military or civilian IT training and career management requirements. To do this effectively, the Navy must have an accurate and consistent method to identify and relate information professionals to their actual job roles.

LCDR Rhodes stated that the plan aims to help in training, manpower planning, and management processes, as well as certification programs of the Information Assurance (IA) workforce. The plan also sets baseline requirements for military and civilian personnel who need an appropriate level of IM/IT competence. However, the implementation of this plan is difficult because of inaccurate, dated, or missing records identifying the personnel as a part of the IA community. The fact that this community is made up of military, civilian,

and contractor employees who are not accounted for in the system further complicates the plan. (See figure 52.)

Figure 52. Where are we today (users and core IT professionals)?[a]

	All Navy Personnel	Navy CAC Card's Issued	Delta All Navy and CAC's Issued	Inventory IT-Specialist	IT / NSS Budget	Delta Inventory and IT / NSS Budget
Active Duty	356,258 52,132 Officers 299,792 Enlisted (from DMDC)	332,674 (from DEERS)	23,584 (6%)	13,142 852 Officers 12,290 Enlisted (from PERS-4 Dashboard)	5,458 MPN	7,684
Reserve Component	72,315 SELRES 135,501Total 63,186 IRR (from DMDC)	78,592 (from DEERS)	6,277 (9%)	5,735 387 Officers 5,348 Enlisted (from DMDC)	145 RPN	5,590
Navy Civilian	175,476 (from DMDC)	169,900 (from DEERS)	5,576 (3%)	12,334 (2210, 0332, 039x, 1550, 0854)	5,638? OMN	6,696?
Contractors	200,000 (from JUL 2005 FISMA report)	65,119 (from DEERS)	134,881 (67%)	?	?	?
Totals	804,049	646,285	170,318 (21%)	31,211?	11,241?	19,970?

a. Source: [60].

LCDR Rhodes' presentation identifies the necessary steps to alleviate this situation. For military personnel, commands should ensure accuracy of designator, rating, subspecialty codes, and NECs during their routine personnel reviews. They also should update and prioritize Navy Officer Billet Classifications (NOBCs), subspecialty codes, and NECs assigned to billets. Finally, they should make sure that these updates are reflected in the Total Force Manpower Management System (TFMMS) and the Total Force Authorizations and Requirements System (TFARS).

According to Mr. Brown, ACNO (IT) is using existing career management tools to identify all personnel who work in Navy IM/IT-related fields. Workforce identifiers include designators (military officers), series codes and parenthetical titles (civilians), and ratings (enlisted personnel). Various databases list these identifiers with differing degrees of accuracy and currency. One IM/IT group that is almost

invisible to the formal system is contractor personnel. There is neither a database nor a code that can be used to accurately identify IT contractor personnel or their skill sets. Work to specify the competencies expected of all Navy IT professionals is ongoing.

Mr. Brown reported that one of the significant challenges is to directly relate Human Capital (CIV/MIL/KTR) investments with, and to, the work they actually perform on a daily basis. He notes, for instance, that there are many civilian and military personnel who have IT "ratings," but it is difficult to determine whether they are actually directly involved in the day-to-day operation/maintenance/management of IT assets/resources, and at what percentage of their time. Further, while the civilian IT ratings are adequately defined, they are poorly applied in the real world. For example, while System Admin, DBA, Internet, Security, Customer Support, and Policy & Planning personnel may be "coded" as such, they may or may not actually be performing those functions. Furthermore, he notes that many civilian personnel are merely generically IT coded (with no subspecialty) or are not IT coded in any way yet work exclusively on IT systems/programs. Contractors represent an even greater challenge since their contractual job titles and actual work/job roles are very difficult to associate/link.

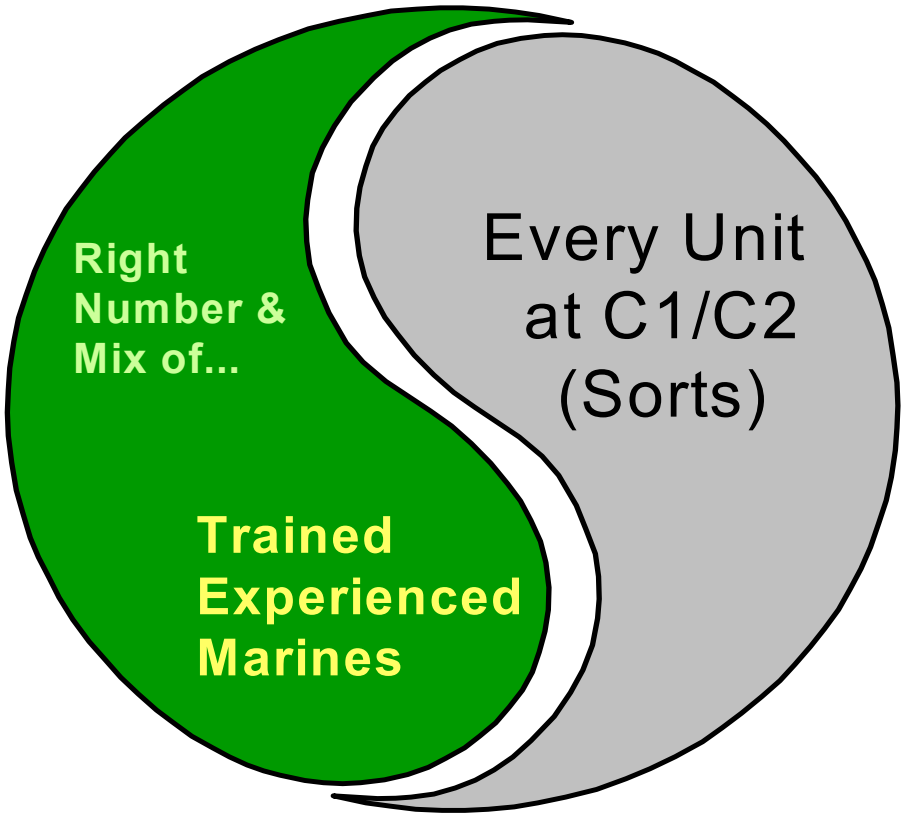
Mr. Brown concludes that the Navy is currently not able to accurately identify all personnel who are working as IM/IT professionals. Findings show that the identifiers for people and positions are not used consistently, and the identifiers attached to people and positions are many times out of date. He suggests that the Navy must establish rigor in relating workforce attributes/identifiers to actual job roles to be able to better manage the career development, training and certification, and effective utilization of the IT workforce.

Modeling the USMC Enlisted Manpower System as a Markov Process

Captain Shaun Doheney (Headquarters, Marine Corps (HQMC)) gave an overview of how HQMC Manpower and Reserve Affairs (M&RA) models its future manpower needs and requirements [61]. Historically, the Marine Corps has an inventory of 175,000 Marines, of which approximately 145,000 are assignable to fill 155,000 requirements, leaving an average deficit of 10,000 structure requirements

each year. The primary mission of HQMC (M&RA) is to provide commanders with the right Marines, with the right skills, at the right place, at the right time, despite this inventory shortfall. (See figure 53.) According to Captain Doheney, in order to accomplish this mission, M&RA must accurately build accession and classification plans to meet manpower requirements, assign Marines according to unit requirements and prioritizations, provide continuous oversight and leadership for career path options, and provide force sustainment that directly contributes to readiness. Guiding principles within M&RA are to be responsible stewards of Marine Corps manpower resources and to seek continual improvement for the Total Force.

Figure 53. Marine Corps manpower objective[a]



a. Source: [61].

Captain Doheney stated that the USMC Enlisted Manpower Markov Model provides capabilities for analyzing accession policies, retention policies, promotion policies, and the ideal distribution of the Total Force. The model can simulate inventory forecasts, assess steady-state behavior of an MOS or an occupational field, or optimize accession distribution for a particular category. When modeling these situations, the model accounts for such constraints as congressional mandates specifying USMC endstrength, proportion of unassignable (P2T2) personnel, and budget or regulatory constraints. The Marine Corps model provides timely and relevant analysis in support of these tasks, modeling the USMC enlisted manpower system as a discrete-time stochastic process known as an Absorbing Markov Chain. The model has provided fairly accurate predictions of the Marine Corps' endstrength for enlisted personnel with errors of 4 percent in FY89, 2.5 percent in FY03, and .5 percent in FY04.

Captain Doheney concluded that modeling the Marine Corps enlisted manpower system as a Markov process provides manpower planners the ability to conduct accurate forecast analysis and steady-state analysis of the enlisted inventory. In fact, enlisted manpower planners can use this model to analyze effects on promotion, retention, and accession plans.

Simulation as a Tool in Aligning the Workforce with Shifting Staffing Demands

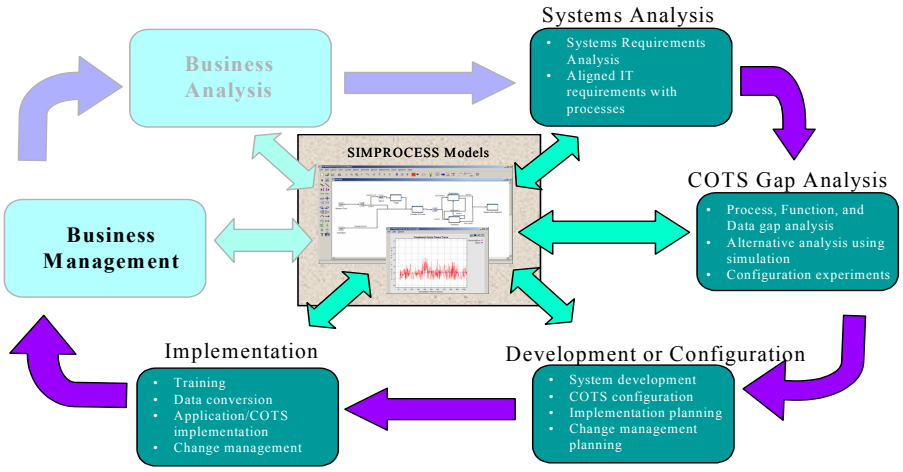
The presentation by Mr. Ed Stephan (CACI) focused on the ability to align size and composition of the workforce with models, even with a constantly shifting demand for highly skilled staff [62]. Historically, a common practice was to translate changes in overall workforce demand into specific recruitment objectives, but today there are a variety of specific tools and techniques available for various workforce management scenarios. Among them are tools that enable the manager to collect metrics from diverse databases and use this up-to-the-minute data to envision future operations, such as spreadsheets, Markov process, linear programming, discrete-event simulation, and Predictive Business Activity Monitoring (pBAM).

According to Mr. Stephan, with such a wide variety of tools and new types of data, computer-based modeling could provide the manager

with insight into the organization's success by matching the workforce to demands. A rudimentary application of modeling enables managers to examine the possible performance outcomes for several validated process alternatives. (See figure 54.)

Once the computer-based model is in place, it can be enhanced to provide added value to the manager. Managers can use such tools and data resources for a wider variety of “what if” simulations, or a pBAM, which in turn allows for easier application of business process analysis and redesign. Another enhancement is the use of both historical data and context-sensitive process models to predict most likely outcomes. Mr. Stephan stated in conclusion that results from modeling can provide managers with insight on the organization’s success in matching its workforce to demands. In addition, managers also have the ability to continuously simulate ahead "on demand" based on established triggers (such as thresholds or degradation in key measurements).

Figure 54. Application of simulation models[a]



a. Source: [62].

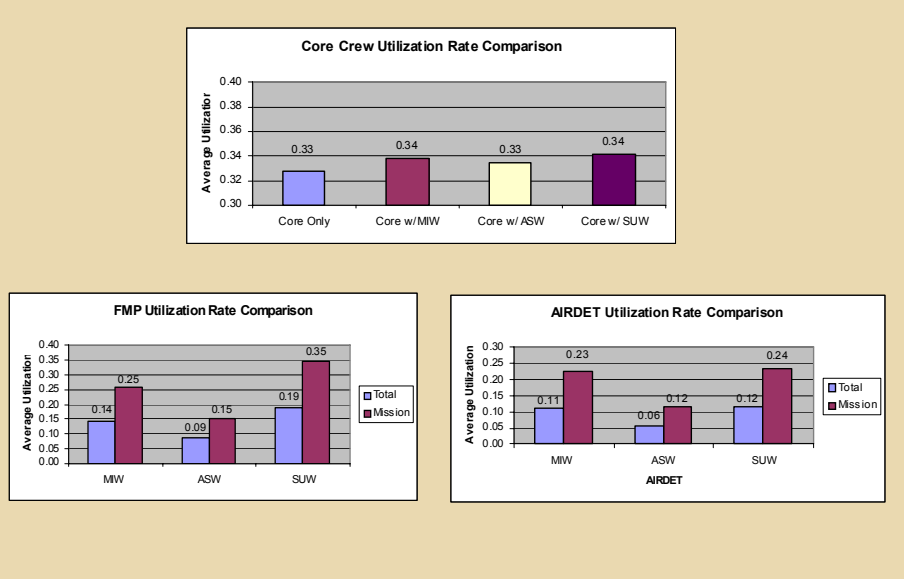
Resource Modeling: Generating Flexible Platforms To Evaluate Surface Combatant Operational Capabilities Associated with Alternate Crew Structures

Mr. Tom Reynolds (Serco Group) evaluated the impact of alternate crew structures on the surface combatant operational capabilities of the LCS [63]. Serco developed a total ship model for the LCS to determine whether a 75-member crew would be capable of fulfilling LCS inherent and focused mission requirements. The goal was to apply discrete-event simulation modeling, using the Arena simulation system, to the identification of LCS crew structure requirements. Arena is a computer simulation tool that applies statistical evaluations, queuing theory, and lean engineering to the analysis of models representing real-world systems. The evaluation included identification of crew requirements, validation of its workload estimates, and identification of the impact that task simultaneity and Sailor availability have on mission performance. The Serco Group developed four models, each focusing on different ship capability configurations: core only, core with mine warfare (MIW), core with anti-submarine warfare (ASW), and core with surface warfare (SUW) modules. The modeling process begins by (a) validating LCS functions, tasks, and associated subtasks, (b) developing Sailor and system resource databases and task flow charts, and (c) assigning Sailors, systems, mission inter-arrival times, and estimated processing times within the task structure of the modeling environment.

Mr. Reynolds explained that four model simulations were consolidated to assess the total ship crew capability to fulfill inherent missions (such as transiting and navigation) and the focused mission capabilities of mine detection, avoidance, and neutralization, as well as anti-air warfare, anti-surface warfare, and anti-subsurface warfare. For each model, crew utilization rates are below the acceptable workload threshold of 42 percent, which represents 70 hours (Navy Standard Work Week) out of a weekly total of 168 hours. Results indicated that a 75-member crew could fulfill LCS inherent and focused mission requirements. Furthermore, core utilization rates suggest that a 40-member crew can accomplish required tasks. Similarly, MIW, ASW, and SUW model results show that a 15-member Fleet Modernization Program (FMP) crew can fulfill mission requirements and that a

20-member Air Detachment crew can execute MIW, ASW, and SUW operations. (See figure 55.) According to Mr. Reynolds, the LCS models provide flexible platforms to evaluate operational capabilities and tradeoffs associated with alternate crew structures and can be applied to other surface combatants to determine the impact of mission requirements and technology insertion.

Figure 55. Core with FMP model results[a]



a. Source: [63].

A Simulation Model for the U.S. Marine Corps Enlisted Manpower Process

Captain Chad Seagren (HQMC) described how U.S. Marine Corps Manpower and Reserve Affairs estimates the effects of various inputs on promotion timing [64]. Analysts have developed a simulation model that seeks to capture the salient features of the enlisted manpower process for the U.S. Marine Corps. The model was developed using Java and the Recursive Porous Agent Simulation Toolkit (REPAST). REPAST is an agent-based simulation framework originally developed for social science applications that provides distinctive analytic capability and valuable flexibility appropriate for this

application. Some of the inputs include authorized grade levels, continuation behavior, and promotion policy.

According to Captain Seagren, the model incorporates these inputs into its calculations through a semi-Markov process, in which continuation probabilities are constant and state dependent, promotion probabilities are endogenous and partially state dependent, and authorized grade levels are shaped by adjustable targets. This ensures that Marines have the right amount of experience, and no service limit controls or regulatory and budgetary constraints are violated. (See figure 56.) The REPAST architecture features an intuitive interactive agent display, allows for dynamic modification of model parameters, and facilitates a simulation design that exploits its massively parallel processing capability that vastly reduces computation time.

Figure 56. Components of the model[a]

- "Marine" Objects
  - Flow through the virtual manpower process
  - Fill vacancies
  - Instance Variables:
    - Time in service
    - Time in grade
    - Grade
    - psuedo SSN
- "Monitor" Objects
  - One for each Grade
  - One for each YOS
  - Collect statistics
  - Facilitate algorithms
- Agents
  - Correspond to Grade/YOS combinations
  - Maintain "lists" of Marine objects
  - Conduct the manpower processes:
    - Age
    - Attrite
    - Promote
  - Instance Variables
    - ArrayList of Marine Objects
    - Continuation rate
    - Random generator for attrition purposes.

a. Source: [64].

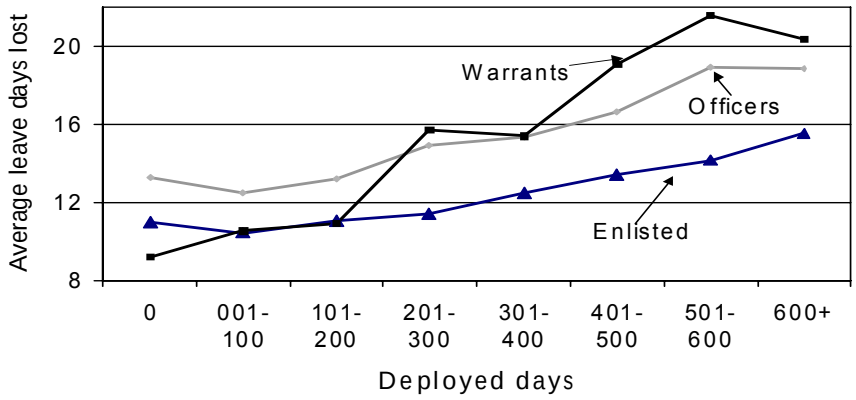
The model's simulation projects how Marines progress through the ranks with each passing year by adjusting their year-of-service numbers, by removing those who have reached their service limits, by accounting for attrition (the rate of which varies with different states), and finally by filling in vacancies created by attrition with

Marines who got promoted. At completion of each one of these cycles, the model collects time-in-service and time-in-grade statistics for both those who were promoted and those who attrited.

Deployment Tempo and the Retention of Marines

The Global War on Terrorism has put considerable stress on the Marine Corps. Dr. Aline Quester (CNA) described three measures of stress: the inability to take leave, family separations, and the high numbers of deployed days [65]. At end of each fiscal year, leave balances are reduced to 60 days for each active duty Marine. More Marines losing leave means more stress on the force overall. The number of Marines losing leave continued to rise from 1999 to 2004. The number of Marines losing leave each year, before accounting for any leave restoration, rose from 16,000 to 21,000. In addition, lost leave increases with the number of days deployed. (See figure 57.)

Figure 57. Lost leave increases with deployed time[a]



a. Source: [65].

Dr. Quester also stated that, because E-3/E-4s are too junior to lose leave, she and her colleagues analyzed leave accumulations. Since 1999, the leave balances of junior Marines have increased steadily.

Marines with dependents are eligible for Family Separation Allowance (FSA) if they are forced to separate for more than 30 consecutive days. The percentage of eligible officers and enlisted Marines receiving FSA peaked in FY 2003 during OIF. Current numbers are considerably higher than levels in the 1990s, but they are below the 2003 levels. In the last 2 years, over 6,000 Marines were deployed 400+ days; of the E-3s and E-4s, over 1,200 0311s (riflemen) were deployed 400+ days.

Finally, Dr. Quester discussed first-term reenlistment rates. Marines without dependents reenlist at substantially lower rates than Marines with dependents. In analyses of the relationship between heavy deployments and reenlistments, Dr. Quester found that first-term Marines without dependents are more deterred from reenlisting than are Marines with dependents. First-term FY05 reenlistment rates declined as deployments to crisis areas increased. Again, the effect was larger for Marines without dependents. Retention rates remained high for both retirement-eligible and non-retirement-eligible officers and for career Marines that are deployed to a crisis area. In fact, enlisted careerists and officers are more likely to reenlist if they are deployed to crisis areas.

In summary, Dr. Quester stated that first-term Marines are the only group deterred from reenlisting by deployments to crisis areas, but that the Marine Corps is still making all first-term reenlistment goals by PMOS. Enlisted careerists and officers are more likely to reenlist if they are deployed to crisis areas.

Recruiting NAVETs and OSVETs

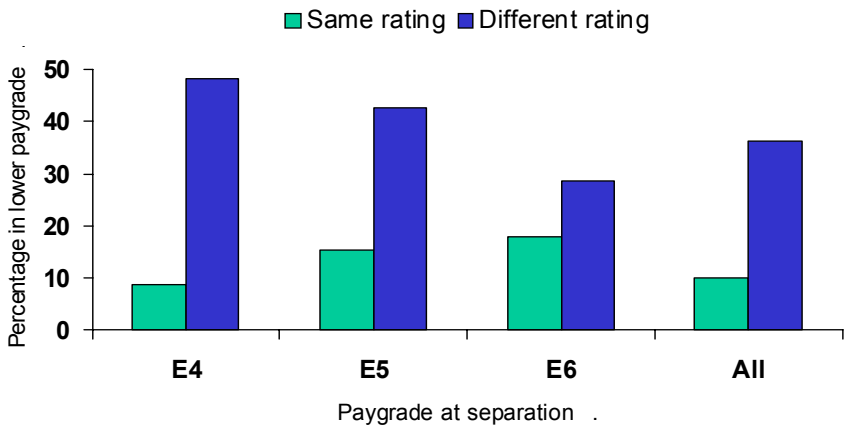
Early in the 21st century, the U.S. Navy launched Sea Power 21, a strategy to organize, integrate, and transform the Navy to take advantage of changing technology and to meet emerging challenges and threats. Dr. Peggy Golfin (CNA) discussed an important part of that vision—a reduction in the enlisted workforce, with those remaining being more experienced, better educated, more skilled, and higher performers than ever before [66]. According to Dr. Golfin, this effort will require a fundamental shift in the Navy's billet requirements, away from the current, hierarchical paygrade structure to one that has increased requirements for highly skilled technicians at middle

paygrades, and fewer requirements for both unskilled laborers and senior leaders. Efforts to reshape the workforce must be accompanied by a substantial rethinking of Navy manpower. At the very least, it will require major modifications to the way the Navy recruits, trains, pays, retains, and promotes Sailors. Integral to this new human capital strategy is the creation of a more flexible manpower system in which gaps are filled quickly, emerging needs are rapidly addressed, and the transformation of the skill mix is accomplished smoothly.

Dr. Golfin discussed one option for enhancing flexibility—lateral entry (namely, the recruitment of personnel with prior service (PS))—looking at historical trends in PS recruits, Navy policies dictating the recruitment of PS personnel, and the performance of PS recruits, especially Navy veterans (NAVETs). Dr. Golfin pointed out some obvious benefits to recruiting prior service personnel. They don't require boot camp, they are familiar with military culture and specific equipment, and they can get to the fleet faster. Thus far, the Navy uses few PS entrants; in fact, they have been less than 5 percent of accessions since 1995. The Navy tends to recruit more non-high-school-degree (NHSDG) personnel. The Navy does place restrictions on PS accessions, such as maximum broken service (usually 5 years), maximum prior service, and age. Dr. Golfin found that the majority of Sailors return to their original rating and can quickly fill gaps in the fleet. In addition, she found that a quarter of E-4+ NAVETS were demoted when they return. (See figure 58.) The research shows that the probability of being demoted is affected by rating and other factors. Also, controlling for other factors, large differences in NAVET attrition remain, and NAVETs have slower career progression.

Dr. Golfin suggested that PS personnel could fill a number of the Navy's manning goals. First, PS is a potential source for lateral entry. Second, PS is related to the Continuum of Service efforts to "develop and implement personnel management options to facilitate personnel movement and transitions across service status categories." Finally, PS may help since many of the current policies do not provide seamless integration, and the Navy needs to clearly display how it values civilian experience and deals with cultural barriers.

Figure 58. NAVET demotions upon return[a]



Varies by rating, LOS, months of separation and FY of reentry

a. Source: [66].

Analytical Support to Force Shaping

Captain Jim Markham (AF/A1PF) discussed analytical support to what is considered the Air Force's most significant personnel dilemma since the drawdown of the early- to mid-1990s [67]. By the end of 2003, the Air Force found itself 15,000 in excess of authorized endstrength, and it was projecting a 7-percent surplus of 24,000 Airmen by the end of 2005. A significant drawdown in endstrength was required in an 18-month period.

Captain Markham noted that it was imperative that force-shaping targets be derived using sound analytical methods to restrict damage to pockets of the force that were already critically short. The methods employed relied on sustainment modeling, an objective personnel inventory target for each year of service, which takes into account historic retention, historic crossflow behavior, and authorized manpower levels.

According to Captain Markham, the force-shaping effort was constrained by a desire to maximize the use of voluntary measures, by lack of legal authority for monetary separation incentives, and by a desire to maintain consistent accessions. For voluntary force-shaping programs, sustainment methodology was applied to develop a

decision tool, known as the force-shaping matrix, for use by personnel managers receiving applications from Airman volunteers. (See figure 59.) The force-shaping matrix identified personnel surpluses in a systematic way for all occupational specialty and experience level combinations. In future work, AF21 downsizing will prompt fundamental change in Force Management, such as reduction of about 40,000 full-time equivalents in FY11 authorizations from previously planned FYDP levels. Also, surgical reduction of inventory will be necessary to meet the requirements for a smaller force while maintaining operational capability.

Figure 59. The force-shaping matrix methodology[a]

- **Same methodology for both officer and enlisted**
  - **Officer matrix uses year group instead of CYOS**
  - **Enlisted matrix uses sustainment mapped to skill level**
- **4 step process for developing by CYOS/skill level targets:**
  - **Compute sustainment line (and map enlisted line to skill level)**
  - **Pull current inventory**
  - **Subtract current inventory from sustainment**
  - **Allow overage groups to fill nearby shortage groups**
    - **"2 up 3 down" rule for officers**
    - **"1 down" rule for enlisted**

a. Source: [67].

Captain Markham explained that, due to the challenge of meeting aggressive downsizing targets, some limited involuntary measures were reactivated, including the career job reservation (CJR) program and the involuntary noncommissioned officer (NCO) retraining program. A similar analysis was conducted to identify quotas for enlisted Air Force Specialty Codes (AFSCs) constrained under the CJR and NCO retraining programs.

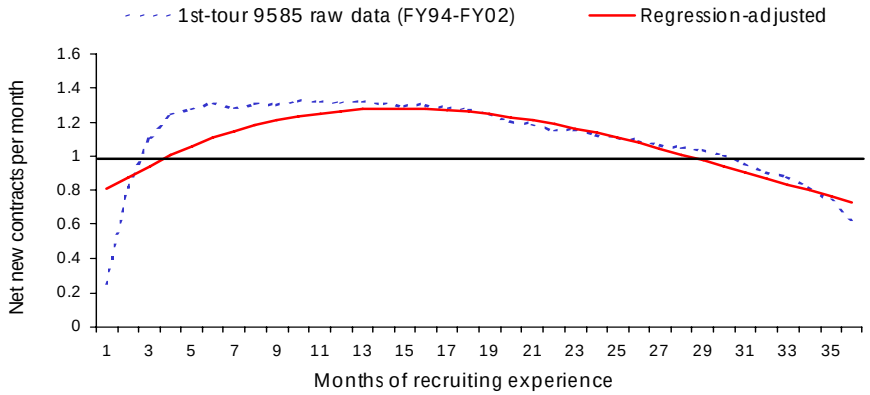
Productivity Effects of Changes in the Size of the Enlisted Recruiter Force

Dr. Dana Samuelson (CNA) and Dr. Amanda Kraus (CNA) began the discussion with research findings from the 1970s, which implied that changes in the number of recruiters can change recruiting efficiency via changes in the distribution of recruiter experience. The findings show that the experience-productivity profile of the average Navy enlisted recruiter was characterized by an inverted-U [68]. If they are unanticipated, these changes in efficiency could create scenarios in which there are too few or too many recruiters to achieve a given mission.

Dr. Samuelson and Dr. Kraus revisited the experience-productivity relationship with modern data and considered the implications for recruiter force efficiency. They began with two facts: recruiter productivity varies with recruiter experience, and changes in force size will change the experience distribution of recruiters in the force. Therefore, all else equal, changes in force size should cause changes in force efficiency. Using an individual-level linear regression model to estimate the experience-productivity relationship, holding other factors constant, they found that the inverted-U still holds for today's recruiters and identified three productivity phases in a typical tour: learning, high productivity, and helping/transition. (See figure 60.)

Total contract production was estimated as a function of the same controls used in the individual-level model and the number of recruiters in each of the three productivity phases. According to Dr. Samuelson and colleagues, the results indicate that recruiters in the high-productivity phase have significantly larger effects on production than those in the learning and helping/transition phases. Changes in force size change the experience distribution, and with it total force efficiency will change. Dr. Samuelson concludes that recommendations depend on the interpretation of the inverted-U. If the inverted-U is desirable, one must manage around it. Specifically, the planning process should take into account that junior and senior recruiters have different marginal productivities. Furthermore, if changes in force size are necessary, consider extending recruiting tours during an upsizing and cutting tours short during a downsizing.

Figure 60. Inverted-U shape of experience-productivity profile remains[a]



→ Experience-productivity profile still has inverted-U shape after controlling for other factors, including recruiter heterogeneity

a. Source: [68].

If the inverted-U is undesirable, it should be eliminated. In this case, additional studies are needed to determine the extent to which the mid-tour peaks in productivity are the result of recruiter management techniques and to compare the costs and benefits of creating a non-rotating professional recruiter force.

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Information Systems

The DON is modernizing in the area of IT, initiating the development, acquisition and implementation of various integrated human capital management information systems. These IT initiatives are utilizing data, protocol and process standards, based on strategic and operational requirements [2]. IT systems will be used, for example, to administer screening instruments to improve the selection and classification of Navy recruits, in efforts to curb early attrition. A system called the ECM Digital Dashboard produces automated, standardized community health metrics to enhance personnel inventory management decisions. A web-based tool, the Human Capital Digital Dashboard (HCDD), arms NAVSEA's leadership and technical authorities with the ability to quickly locate activated engineers on ship, assess their leadership abilities, mission capability, and technical documentation to map capabilities and long-term metrics.

IT modeling tools provide a low-cost, low-risk method of exploring and studying the effects of various changes involving, for example, a system's mission performance, equipment design alternatives, human workloads and preferences, and system integration. There are assignment systems that utilize auctions to elicit a Sailor's minimum additional compensation required to induce him or her to volunteer for a hard-to-fill assignment. Using information from the auction, a mathematical optimization algorithm can identify the optimal set of assignments for a particular Sailor. SKIPPER is a web-based model that can manage a variety of manpower processes and conduct "what if" analysis. Another next-generation requirements model can forecast readiness moves across the POM, Budget, and Execution year cycle. The IT systems, such as those discussed in the following presentations, will serve to enhance support to operational requirements and missions Service-wide.

NAMIS Screening Technology Development

Dr. Lisa Mills (Navy Selection, Classification & Surveys, N141) presented the Navy Applicant Management Information System (NAMIS) project, which was launched by N141 and CNRC in FY06 to develop new technology for Delayed Entry Program (DEP) screening [69]. This system will be used to administer screening instruments to improve the selection and classification of Navy recruits, as well as to decrease early attrition. (See figure 61.)

Figure 61. Delayed Entry Program screening[a]

a. Source: [69].

According to Dr. Mills, two pilot programs were selected to examine proof-of-concept for the NAMIS platform. Special Programs' screening was identified as a current Navy priority, particularly for reducing Recruit Training Center (RTC) attrition for SEAL, SWCC, EOD, Diver, and Air Rescue personnel. She noted that screening will also focus on seeking new candidates for Special Programs' recruitment within the DEP pool.

Dr. Mills stated that the second pilot for this project is DEP Personal Qualifications Standard (PQS). The goal of this effort is to build interactive activities to deliver PQS information into the DEP, as well as tracking mechanisms for recruiter monitoring of DEPer progress through the instruction modules. Facilitating and measuring active learning is a primary objective for this pilot, and data will be gathered to evaluate performance correlates of learning styles in basic training.

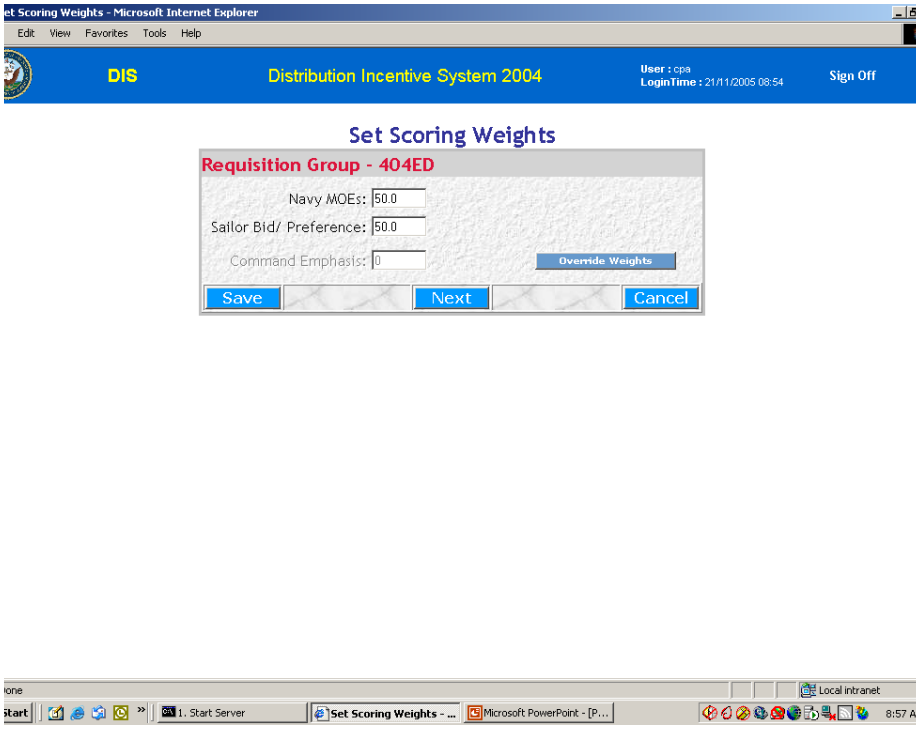
Dr. Mills concluded her talk by stating that the main product of NAMIS will be new DEP screening technology to improve Sailor job fit by pushing screening to the front. Better job matching promotes such positive outcomes as increased performance, job satisfaction, and reduced attrition. In addition, this study will yield preliminary findings on the validity of new tools for Special Programs' screening and DEP PQS instruction methodologies.

An Optimized Assignment Decision Support Tool

Mr. R. Wesley Nimon (NPRST) and Mr. Ricky Hall (NPRST) discussed the Distribution Incentive System (DIS), which is under way at the Navy Personnel Research Studies and Technology (NPRST) lab and continues to refine an assignment auction prototype [70]. This developing assignment system uses an auction to elicit each Sailor's minimum additional compensation required to induce him or her to volunteer for a hard-to-fill assignment.

Using information from the auction, the developed mathematical optimization algorithm identifies the optimal set of assignments. The optimization employs a weighted objective function that reflects a broad range of measures of effectiveness (MOE), such as PCS cost, gap / overlap, and the Sailor's AIP bid. By balancing the relative importance of the Sailors' preferences and AIP budget with the Navy MOEs, the Career Policy Administrator (CPA) must select the weight on Navy MOEs and Sailors' bids. (See figure 62.) In addition, decision support tools to ensure its efficient operation have been developed. For example, one decision support tool allows the Navy to intelligently set the weights on alternative MOEs based on the likely aggregate outcomes (e.g., average PCS cost for the assignment slate).

Figure 62. Using the Distribution Incentive System to set scoring weights[a]



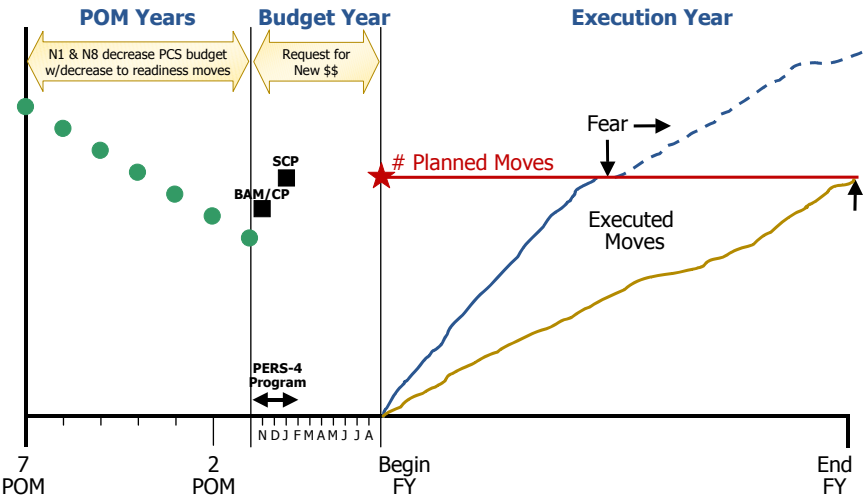
a. Source: [70].

Mr. Nimon's and Mr. Hall's presentation on DIS highlights some of the challenges of incorporating the complex detailing business rules into the automated system. For example, the presentation provided details on the development of the mathematical expressions needed to incorporate such MOEs as PCS cost, gap / overlap, and AIP bid into the optimization in such a way as to accurately reflect both Navy policies and the subtlety of detailer's discretion. Both are required to achieve equitable and efficient assignment outcomes. Mr. Nimon and Mr. Hall also discussed how possible application of elements of this research project is being explored by PERS-4 in order to minimize the impact of the substantial FY07 and FY08 reductions in the number of detailers.

Permanent-Change-of-Station (PCS) Move Requirements Model

Mrs. Kimberly Ann Crayton (NPRST) presented findings on a research effort in which the objective is to formulate a next-generation requirements model to forecast readiness moves across the Program Objective Memorandum (POM), Budget, and Execution year cycle [71]. (See figure 63.)

Figure 63. Problem: forecast and over-execution[a]



a. Source: [71].

The effort will adopt the recommendations outlined in the FY 2005 PCS model's verification, validation, and accreditation study.

Mrs. Crayton reported that the PCS program budget is about $850 million and must be reduced. It consists of both mandatory and readiness moves. Mandatory moves include accessions, separations, and unit moves. Readiness moves include operational, rotational, and training, referred to as ORT. Pers-4 manages the readiness portion of the process; it has the authority and responsibility to develop an unconstrained move requirements forecast, submit a readiness moves plan to N10 and N12, track execution year moves, defend budget year projections, and manage relevant policy change impacts through the

POM cycle. PCS processing stakeholders are Pers-454, Pers-4 Detailers, N13, PCSVC, N10 Programming, and N12 Budget. Stakeholders in the PCS process do not have a trusted model to forecast moves across the POM, Budget, and Execution Year cycle.

Mrs. Crayton explained that, in the past, two models were used to forecast readiness moves—neither one encompassing the accuracy, granularity, emergent policy drivers, tracking, plan guidance, or functionality to manage across the POM horizon. The current objective is to formulate a next-generation requirements model to forecast across the POM, Budget, and Execution year cycle. In addition, the process must provide for tracking, justification, and policy adjustments that change the move type or billet structure across fiscal years.

The approach is based on a methodology for combining billets and individual Sailor data for the extent of the planning horizon and continuing with historical data in an exploratory way to develop move forecasts. The technical approach involves the use of a *PCS model flowchart, elements to define move types* (e.g., starting Geo-location, ending Geo-location, move time (within fiscal year)), and *reason codes* and relation to move type for officer and enlisted. Various assumptions and business rules are also incorporated into the model.

Human Capital Digital Dashboard (HCDD): A Year Later

Mr. David Breslin (CIV SEA 10) discussed the Human Capital Digital Dashboard, a web-based tool that arms NAVSEA's leadership and technical authorities with the ability to quickly locate the engineers assigned to a given function or ship system and assess their leadership abilities, mission capability, and technical documentation health [72]. The tool was first introduced in early 2004 in NAVSEA's engineering and technical authority community.

The Independent Technical Authority (ITA) followed the SUBSAFE program, created by Admiral Rickover, which was extended to all ships and systems assigned to NAVSEA (see figure 64). ITA was implemented through NAVSEA’s engineering and technical authority and is composed of five levels. The top level is COMNAVSEA, the Warranting Officer. The second level is the Deputy Warranting Officers who are usually Deputy Commanders. The three remaining levels of the

"pyramid" are Technical Warrant Holders (TWHs), Engineering Managers (EMs), and Lead Engineers (LEs). The Technical Warrant Structure enables NAVSEA to retain a set of core competencies and technical capabilities in its people, and this tool helps characterize, describe, and summarize the delegation of responsibilities and accountability over specific systems, equipment, standards, tools, and processes.

Figure 64. About independent reviews[a]

- Conduct an independent review of the execution of engineering and technical authority by NAVSEA.
- What are the findings of the recent COLUMBIA disaster that pertain to NAVSEA?

  "NASA did not have clear, clean lines of technical authority, responsibility, and accountability. NASA did not have well-respected, technically deep and programmatically independent set of individuals vested with technical and safety authority for development and operations."
- Address people, policy, procedures, and organizational relationships and issues associated with the definition, establishment and sustainment of this independence.
- Identify needed corrective actions.

a. Source: [72].

Mr. Breslin's analytic team made the following recommendations: (1) continue, sustain, and strengthen the current system, (2) formalize maintenance technical standards and specifications, (3) increase the depth of technical talent, and (4) develop a set of performance metrics. The Human Capital Digital Dashboard can present a snapshot of the alignment of engineers, technical documentation, demographics, skills, health community metrics, problem areas, and long-term health actions—mapping the current state of NAVSEA's engineering capabilities and providing long-term metrics. Mr. Breslin reported the results of a survey done in January 2004, to provide feedback from users concerning the usability and facility of the tool. A significant number of users found the tool to be difficult and time-consuming. Since then, $300,000 worth of changes have been implemented. Also,

a lean value stream analysis was done on the HCDD to determine areas in which the tool can be improved and as well as how to obtain subsequent funding to implement the recommendations.

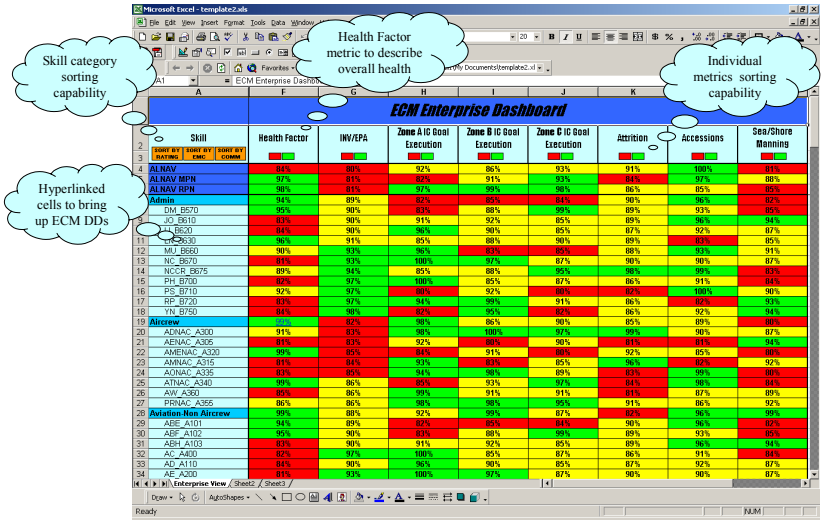
Enlisted Community Management Digital Dashboard

Mr. Ricky Hall (NPRST) began the discussion by noting that, as the Navy moves into a new era of constrained resources and increased demands for fleet readiness, the Enlisted Community Managers (ECMs) must be able to assess the performance of various segments of the human capital supply chain [73]. After performance assessments are completed, they must report performance to Navy leadership and recommend policy implementation to ensure community health over a long-range planning horizon. The ECM Digital Dashboard produces automated, standardized community health metrics to enhance personnel inventory management decisions.

One module in particular—the Inventory Continuation Tracker—refocuses separate efforts to track reenlistments and at-risk inventory into a single, integrated tool to determine current and future zone manning requirements (see figure 65). This new approach enhances community management accuracy and provides all levels of leadership with more meaningful metrics of overall rating health as it pertains to reenlistment and inventory continuation. This tool will provide more surgical management and execution of the Navy's $160-million-plus SRB program.

The ECM Digital Dashboard shifts valuable time and effort from data mining and entry to active community management, and provides the opportunity for managers to conduct more forward-leaning scenario planning in support of rapid policy change initiatives. This automated tool is currently operational and deployed, and it is expected to result in a cost avoidance of over 4,800 man-hours ($264,000) per year.

Figure 65. Notional roll-up view of ECM Digital Dashboard (DD) and the Inventory Continuation Tracker (ICT)[a]



a. Source: [73].

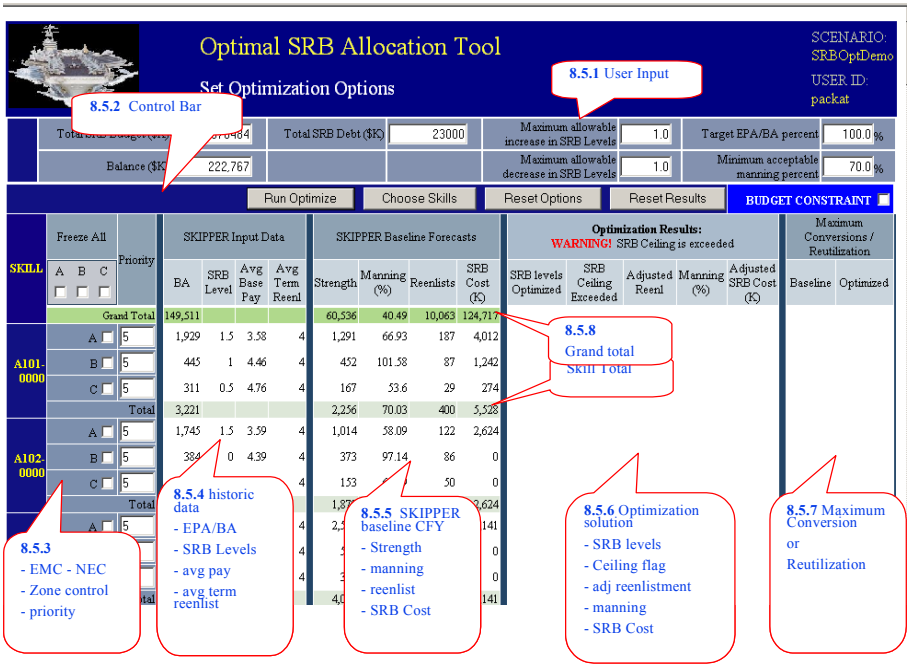
A Comparison of Manning and Compensation Metrics Under Various A-School and Retention Optimization Scenarios

Dr. Chariya Punyanitya (CSC), Dr. Colin Osterman (NPRST), Mr. Sanjay Nayar (CSC), and Mr. Richard Loffredo (CSC) presented an overview of current capabilities of the Skilled Personnel Projection for Enlisted Retention Model (SKIPPER) by comparing manpower inventories and compensation metrics under various optimization scenarios that SKIPPER is capable of supporting [74]. The challenges inherent in Navy Manpower Modeling were also presented and discussed. SKIPPER is a web-based model that can be used by the Navy for managing a variety of manpower processes, including multi-year inventory projections, Recruit/A-School optimization and conversion planning, ALNAV LOS force strength planning, advancement and Sea/Shore rotation modeling, SRB justification, C-School planning, and "what if" analysis.

In particular, Dr. Punyanitya and colleagues focused on three optimization approaches: accession, retention, and the SRB optimization tool. (See figure 66.) For accession optimization, the current model

provides inventory and manning by EMC and Source Rating. It uses Multi-year Linear Optimization, Targeting Total EPA or Zone A EPA. It also allows users to input percent deviation and School Limits and to freeze certain parameters by fiscal year. For retention optimization, the current model targets EPA by zone and allows users to select specific zones to target (A, B, and / or C). Here the optimization is based on linear approximation of optimized manning gaps and At-Risk Continuation Rate multipliers by zone. The current SRB optimization builds on final SKIPPER scenarios with SRB plans based on NPRST econometric (MODCOMP) studies / results. Here, the model provides more cost-effective SRB allocations in the context of projected reenlistment, manning ROI, and SRB budgets.

Figure 66. SRB optimization tool[a]



a. Source: [74].

A number of scenario comparisons produced under these optimization approaches were presented. The results revealed the following:

- For Accession Optimization targeting all EPA, the gaps between Inventory projection and EPA remained within 1 to 2 percent, while Zone A gaps were much larger (15 to 30 percent). This is due to the fact that the skill used in the run (AS A430) is heavily undermanned in Zone A. When targeting zone A EPA alone, however, although the total gaps were higher, (between 7 and 16 percent), the Zone A gaps in the projection fiscal years were almost always zero.
- The Retention Optimization targeting EPA Zone B and Zone C 4 years out (FY09) yielded a Zone A gap of 4 percent and Zone B and Zone C gaps of less than 1 percent.
- Coupling Zone A Accession Optimization with Retention Optimization improved the results further. Inventory gaps for Zones A, B, and C in FY09 were all less than 1 percent, while total inventory gaps were close to 0 percent in FY06 through FY10. However, the results became more inaccurate in FY11 and beyond due to the changes in A-School input required by Retention Optimization to meet the FY09 target in Zone B and Zone C. These A-School inputs, which usually start as Zone A population, continued to age into higher zones that were not optimized by Zone A Accession Optimization. If those higher zones had a target in the opposite direction, the inaccuracy would increase.

Dr. Punyanitya and colleagues concluded the presentation by summarizing possible future steps for SKIPPER. For accession optimization, CSC plans to target EPA/BA by LOS leveraging EPA by LOS from Objective Force Model (OFM). Similarly, CSC plans to refine computation of historic rates using appropriate statistical analysis and trending, offer skill rollups, and extend the batch process to allow arbitration among multiple EMCs. To address retention goals, CSC plans to leverage EPA by LOS Accession Optimization and allow users to choose the starting fiscal year for the Retention Goal (RG). Finally, for SRB optimization, CSC may refine the search algorithm to include Sailors' skill subsets, use BA by LOS supplied by OFM, and investigate a Branch and Bound search algorithm.

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Conclusion

The Sixth Annual Navy Workforce Research and Analysis Conference provided a valuable forum for presenting and discussing initiatives that support the Department of the Navy's goal to enhance the Navy's Workforce. Particular attention was given to total force integration, which spans the spectrums of human / technological interaction and human capital resources. The various research organizations offered significant insight into problems, initiatives, methodology, and analyses for future program development by incorporating policy strategies that improve competency and performance into the total force strategy framework. Through the exchange of ideas and information, conference participants worked together toward a common goal. In 2006, the Annual Navy Workforce Research and Analysis Conference succeeded once again in its efforts to support the Navy's workforce priorities for the near future and beyond.

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References

[1] Mr. William A. Navas. "DON Total Force Structure," presentation at the Sixth Annual Navy Workforce Research and Analysis Conference, April 25, 2006

[2] Department of the Navy Force Management Oversight Council Strategic Plan for 2006-2009, February 9, 2006

[3] Dr. Kimberly Whittam. "Quality of Work Life in the Navy: Results of the 2005 Navy Personnel Survey," presentation at the Sixth Annual Navy Workforce Research and Analysis Conference, April 25, 2006

[4] Dr. Paul Rosenfeld, Ms. Zannette Uriell, and Dr. Rosemary Schultz. "Results of the 2005 Navy Morale, Welfare and Recreation (MWR) and 2005 Fleet and Family Service Center (FFSC) Surveys," presentation at the Sixth Annual Navy Workforce Research and Analysis Conference, April 25, 2006

[5] Dr. Michael J. Schwerin. "Validation of a Work/Non-Work Life Model of Quality of Life and Retention Among Navy Personnel," presentation at the Sixth Annual Navy Workforce Research and Analysis Conference, April 25, 2006

[6] Dr. Richard Fafara. "Results of the 2004/5 Survey of Army Families," presentation at the Sixth Annual Navy Workforce Research and Analysis Conference, April 25, 2006

[7] Capt Dave Longhorn. "The Selective Reenlistment Bonus (SRB) Program," presentation at the Sixth Annual Navy Workforce Research and Analysis Conference, April 25, 2006

[8] Dr. Margaret Harrell. "Special Operations Forces (SOF): Challenges in Manning the Force," presentation at the Sixth Annual Navy Workforce Research and Analysis Conference, April 26, 2006

[9] Dr. Diana Lien. "Effect of Bonuses on Participation in the Navy Selected Reserve," presentation at the Sixth Annual Navy Workforce Research and Analysis Conference, April 25, 2006

[10] Mr. Michael Welch. "Aviation Maintenance Training and Readiness Profiling: A Navy Web-Based Process," presentation at the Sixth Annual Navy Workforce Research and Analysis Conference, April 25, 2006

[11] Dr. Gerald Cox. "Linking Fleet Performance and Training & Education," presentation at the Sixth Annual Navy Workforce Research and Analysis Conference, April 25, 2006

[12] Dr. Christopher Paul and Dr. Harry J. Thie. "Implementing and Evaluating an Innovative Approach to Simulation Training Acquisitions: Training Capabilities Analysis of Alternatives (Alternative #4)," presentation at the Sixth Annual Navy Workforce Research and Analysis Conference, April 25, 2006

[13] Dr. Perry McDowell and Mr. Chris Clark. "Getting Past the Hype of Game Based Training," presentation at the Sixth Annual Navy Workforce Research and Analysis Conference, April 25, 2006

[14] Dr. David Alderton. "Navy Computer Adaptive Personality Scales (NCAPS): Initial Results From Response Distortion and Large-Scale Validation Studies," presentation at the Sixth Annual Navy Workforce Research and Analysis Conference, April 26, 2006

[15] Ms. Amy Griffin. "Validation of a Computer-Based Simulation To Teach Critical Thinking Skills," presentation at the Sixth Annual Navy Workforce Research and Analysis Conference, April 26, 2006

[16] Kimberly Rodgers. *Chief of Naval Reserve Gives Perspective on Active Reserve Integration*, Story Number: NNS040527-03, 5/27/2004

[17] Dr. Jacob Alex Klerman. "Activation and the Earnings of Reservists," presentation at the Sixth Annual Navy Workforce Research and Analysis Conference, April 25, 2006

[18] Ms. Anita Hattiangadi. "SelRes Attrition and the Selected Reserve Incentive Program in the Marine Corps Reserve," presentation at the Sixth Annual Navy Workforce Research and Analysis Conference, April 25, 2006

[19] Dr. Diana Lien and Dr. Michael Hansen. "Compensation and Voluntary Participation in a Continuum of Service," presentation at the Sixth Annual Navy Workforce Research and Analysis Conference, April 26, 2006

[20] Mr. David Breslin. "Workforce Diversity and Organizational Productivity," presentation at the Sixth Annual Navy Workforce Research and Analysis Conference, April 25, 2006

[21] Mr. Philip Romanelli. "Cross-Cultural Communications Between Americans and Iraqis, 2003-2004," presentation at the Sixth Annual Navy Workforce Research and Analysis Conference, April 26, 2006

[22] Dr. Cathleen McHugh and Dr. Aline Quester. "Female Bootcamp Attrition in the Marine Corps," presentation at the Sixth Annual Navy Workforce Research and Analysis Conference, April 26, 2006

[23] Dr. William Bowman and Dr. Steve Mehay. "The Role of Applicant Selection at the U.S. Naval Academy in Female Surface Warfare Officer Retention," presentation at the Sixth Annual Navy Workforce Research and Analysis Conference, April 26, 2006

[24] LT Teresa Ripley. "Female Recruiting and Retention in the Coast Guard," presentation at the Sixth Annual Navy Workforce Research and Analysis Conference, April 26, 2006

[25] Dr. Pete Stoloff. "Retention of Female Surface Officers," presentation at the Sixth Annual Navy Workforce Research and Analysis Conference, April 26, 2006

[26] CDR John Hefti and CAPT Patricia Cole. "Navy Diversity: An Update," presentation at the Sixth Annual Navy Workforce Research and Analysis Conference, April 26, 2006

[27] Ms. Carol Newell. "Results of the 2005 Navy Diversity Quick Poll," presentation at the Sixth Annual Navy Workforce Research and Analysis Conference, April 26, 2006

[28] Dr. Herbert F. Coard. "Diversity Workforce Development: Using the DEOMI Equal Opportunity Climate Survey (DEOCS)," presentation at the Sixth Annual Navy Workforce Research and Analysis Conference, April 26, 2006

[29] Dr. Paul Rosenfeld and Ms. Carol Newell. "Results of the 2004 Marine Corps Climate Surveys (MCCS)," presentation at the Sixth Annual Navy Workforce Research and Analysis Conference, April 26, 2006

[30] Vice Admiral Alfred G. Harms Jr., Vice Admiral Gerald L. Hoewing, and Vice Admiral John B. Totushek, U.S. Navy. “Sea Warrior: Maximizing Human Capital,” *Naval Institute Proceedings*, June 2003

[31] Dr. Andrew Jones. "Rating Identification Engine (RIDE) and Job Opportunities in the Navy (JOIN): Linking Qualification and Interest in the Classification Process," presentation at the Sixth Annual Navy Workforce Research and Analysis Conference, April 26, 2006

[32] Mr. Thomas A. Blanco. "Fleet RIDE: Operational Impact for Sailor Career Management and Navy Force Shaping," presentation at the Sixth Annual Navy Workforce Research and Analysis Conference, April 26, 2006

[33] Mr. Carl Morris, Ms. Linda Kelsey, and CAPT Harold Cronauer, USN (ret). "Uncovering the Potential of Rotational Crewing: Atlantic Fleet DDG Sea Swap Initiative," presentation at the Sixth Annual Navy Workforce Research and Analysis Conference, April 26, 2006

[34] Dr. Martha Koopman, "Alternative Sea Manning Concepts and Incentives," presentation at the Sixth Annual Navy Workforce Research and Analysis Conference, April 26, 2006

[35] Dr. Christopher Duquette. "*Fletcher/Higgins* Sea-Swap Experiment and Retention," presentation at the Sixth Annual Navy Workforce Research and Analysis Conference, April 26, 2006

[36] Mr. Daniel Steeples. "Civilian Mariner Pipeline Assessment," presentation at the Sixth Annual Navy Workforce Research and Analysis Conference, April 26, 2006

[37] Mr. John White, Mr. John Anthony, Mr. Jeff Miller, Mr. Shane Bowen, and Mr. Gerry Costello. "Total Ship System Integration Team (TSIT) in Support of a PMS 400F Effort: A Systematic and Coherent Approach to Developing and Optimizing Crew Manpower/Manning Profiles," presentation at the Sixth Annual Navy Workforce Research and Analysis Conference, April 26, 2006

[38] DoD Defense Acquisition Guidebook, Version 1.6, July 2006 (http://akss.dau.mil/DAG/Guidebook/Common_Interim Guidebook.asp)

[39] Mr. Ken Robinson. "HSI Tools to Promote Workload Optimization Within System Design," presentation at the Sixth Annual Navy Workforce Research and Analysis Conference, April 25, 2006

[40] Dr. Jennifer McGovern Narkevicius. "Human Systems Integration in Policy, Process, Practice," presentation at the Sixth Annual Navy Workforce Research and Analysis Conference, April 25, 2006

[41] Mr. David Hegland. "Carrier Manpower Reduction Study—Identifying and Assessing the Impact of Potential Reductions in Future Carrier Manpower," presentation at the Sixth Annual Navy Workforce Research and Analysis Conference, April 25, 2006

[42] Dr. Stuart Rakoff. "Report on Army-Navy Workforce Planning Demonstration Symposium," presentation at the Sixth Annual Navy Workforce Research and Analysis Conference, April 25, 2006

[43] Ms. Kimberly Aspinwall. "Multi-iteration Usability Testing of the U.S. Navy's Performance Management System," presentation at the Sixth Annual Navy Workforce Research and Analysis Conference, April 25, 2006

[44] Dr. Michael J. Schwerin. "Qualitative Data from Human Performance Feedback and Development (HPFD) and ePerformance System Users," presentation at the Sixth Annual Navy Workforce Research and Analysis Conference, April 25, 2006

[45] *Department of the Navy Human Capital Stategy*, June 2004

[46] Dr. Russell Beland. "Can Military Personnel Levels Close the Budget Gap?" presentation at the Sixth Annual Navy Workforce Research and Analysis Conference, April 25, 2006

[47] Mr. Pat Mackin and Mr. Steven Cylke. "Estimating the Economic Cost of Alternative Force Structures," presentation at the Sixth Annual Navy Workforce Research and Analysis Conference, April 25, 2006

[48] Dr. Michael Hansen and Dr. Martha Koopman. "Military Compensation Reform in the Department of the Navy," presentation at the Sixth Annual Navy Workforce Research and Analysis Conference, April 25, 2006

[49] Dr. Albert Monroe. "LCC-20 Manning: Civilianization and the Navy of the Future," presentation at the Sixth Annual Navy Workforce Research and Analysis Conference, April 26, 2006

[50] Mr. Louie DeCourval. "A Deckplate Analyst's View of the Navy's Workload & Manpower Requirements Development Process," presentation at the Sixth Annual Navy Workforce Research and Analysis Conference, April 26, 2006

[51] Dr. Omer Alper. "Fiscally Informed Requirements Determination," presentation at the Sixth Annual Navy Workforce Research and Analysis Conference, April 26, 2006

[52] Dr. Phillip M. Mangos. "Measurement Error in the Use of Validity Evidence To Support Cut-Score Decisions," presentation at the Sixth Annual Navy Workforce Research and Analysis Conference, April 26, 2006

[53] Mr. Rodney S. Myers. "Officer Promotion Flow Point Calculation Model," presentation at the Sixth Annual Navy Workforce Research and Analysis Conference, April 25, 2006

[54] Dr. Ann Parcell. "An Evaluation of URL Officer Accessions Programs," presentation at the Sixth Annual Navy Workforce Research and Analysis Conference, April 25, 2006

[55] Ms. Holly Potter and Dr. Cathleen McHugh. "Marine Corps Officers: Inventories and Requirements," presentation at the Sixth Annual Navy Workforce Research and Analysis Conference, April 25, 2006

[56] Mr. Rodney S. Myers, Mr. David Cashbaugh, and Dr. Colin Osterman. "Optimized Slating Window," presentation at the Sixth Annual Navy Workforce Research and Analysis Conference, April 25, 2006

[57] Mr. Dave Hegland. "Individual Sailor Assignment Model (I-SAM)," presentation at the Sixth Annual Navy Workforce Research and Analysis Conference, April 25, 2006

[58] Dr. Pete Coughlin. "Innovations in Service Member Assignment Processes," presentation at the Sixth Annual Navy Workforce Research and Analysis Conference, April 25, 2006

[59] Dr. Fred Oswald and Dr. Zach Hambrick. "Understanding and Predicting Sailors' Performance in a Multitasking Environment: The SYRUS Project," presentation at the Sixth Annual Navy Workforce Research and Analysis Conference, April 26, 2006

[60] LCDR Star Rhodes. "Challenges in Identifying Navy Information Professionals," presentation at the Sixth Annual Navy Workforce Research and Analysis Conference, April 25, 2006

[61] CAPT Shaun W. Doheney. "Modeling the United States Marine Corps Enlisted Manpower System as a Markov Process," presentation at the Sixth Annual Navy Workforce Research and Analysis Conference, April 26, 2006

[62] Ed Stephan. "Simulation as a Tool in Aligning the Workforce with Shifting Staffing Demands," presentation at the Sixth Annual Navy Workforce Research and Analysis Conference, April 26, 2006

[63] Mr. Tom Reynolds. "Resource Modeling: Generating Flexible Platforms To Evaluate Surface Combatant Operational Capabilities Associated With Alternate Crew Structures," presentation at the Sixth Annual Navy Workforce Research and Analysis Conference, April 26, 2006

[64] CAPT Chad W. Seagren. "A Simulation Model for the U.S. Marine Corps Enlisted Manpower Process," presentation at the Sixth Annual Navy Workforce Research and Analysis Conference, April 26, 2006

[65] Dr. Aline Quester, Ms. Anita Hattiangadi, and SgtMaj Gary Lee, USMC (ret). "Deployment Tempo and the Retention of Marines," presentation at the Sixth Annual Navy Workforce Research and Analysis Conference, April 26, 2006

[66] Dr. Peggy Golfin. "Recruiting NAVETs and OSVETs," presentation at the Sixth Annual Navy Workforce Research and Analysis Conference, April 26, 2006

[67] Capt Jim Markham. "Analytical Support to Force Shaping," presentation at the Sixth Annual Navy Workforce Research and Analysis Conference, April 26, 2006

[68] Dr. Dana Samuelson. "Productivity Effects of Changes in the Size of the Enlisted Recruiter Force," presentation at the Sixth Annual Navy Workforce Research and Analysis Conference, April 26, 2006

[69] Dr. Lisa J. Mills, Dr. Douglas Rosenthal, Dr. Teresa Russell, and Dr. Cheryl Paullin. "NAMIS Screening Technology Development," presentation at the Sixth Annual Navy Workforce Research and Analysis Conference, April 26, 2006

[70] Mr. Ricky Hall. "An Optimized Assignment Decision Support Tool," presentation at the Sixth Annual Navy Workforce Research and Analysis Conference, April 26, 2006

[71] Mrs. Kimberly Ann Crayton. "Permanent Change of Station (PCS) Move Requirements Model," presentation at the Sixth Annual Navy Workforce Research and Analysis Conference, April 26, 2006

[72] Mr. David Breslin. "Human Capital Digital Dashboard (HCDD): A Year Later," presentation at the Sixth Annual Navy Workforce Research and Analysis Conference, April 26, 2006

[73] Mr. Ricky Hall. "Enlisted Community Management Digital Dashboard," presentation at the Sixth Annual Navy Workforce Research and Analysis Conference, April 26, 2006

[74] Mr. Rick Loffredo, Mr. Sanjay Nayar, Dr. Chariya Punyanitya, and Dr. Colin Osterman. "A Comparison of Manning and Compensation Metrics Under Various A-School and Retention Optimization Scenarios," presentation at the Sixth Annual Navy Workforce Research and Analysis Conference, April 26, 2006

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