WHITE PAPER

RAND

Maintaining the Army's "Smart Buyer" Capability in a Period of Downsizing

Kenneth Horn, Carolyn Wong,
Elliot Axelband, Paul Steinberg, Ike Chang

RAND white papers are authoritative publications that draw on a strong body of prior research to summarize key findings relevant to pending decisions or policy problems. White papers are reviewed by RAND's corporate management to assure that they adequately represent both RAND's best work in the subject as well as significant differences of opinion.

RAND is a nonprofit institution that helps improve policy and decisionmaking through research and analysis. RAND® is a registered trademark. RAND's publications do not necessarily reflect the opinions or policies of its research sponsors.

Published 1999 by RAND
1700 Main Street, P.O. Box 2138, Santa Monica, CA 90407-2138
1333 H St., N.W., Washington, D.C. 20005-4707
RAND URL: http://www.rand.org/
To order RAND documents or to obtain additional information, contact Distribution Services: Telephone: (310) 451-7002; Fax: (310) 451-6915; Internet: order@rand.org

PREFACE

This White Paper draws on RAND research examining how to help the Army maintain an adequate capability in science and technology (S&T)--sponsored by the Principal Deputy for Technology, Army Materiel Command (AMC) Headquarters--as well as on RAND research examining AMC's technology-generation function--sponsored by the Deputy Assistant Secretary for Plans, Programs, and Policy, Office of the Assistant Secretary of the Army for Acquisition, Logistics and Technology.

The research was conducted within the RAND Arroyo Center's Force Development and Technology Program. The Arroyo Center is a federally funded research and development center sponsored by the United States Army.

1. THE “SMART BUYER” PROBLEM FACING THE ARMY

Today, the Army possesses a competent “smart buyer” (SB) capability. But, unless corrective measures are taken shortly, the effect of downsizing the federal government workforce may undermine the Army’s SB capability in the future.

By SB capability, we mean that the Army has sufficient in-house technical expertise to stand up to its industry counterparts when dealing with technical issues of the conceptual design, research and development (R&D), and procurement of new military systems. Although the Army's SB capability involves the integrated efforts of many disciplines (including those with technological, engineering, legal, procurement, management and funding expertise), this paper focuses only on technical expertise. For the purposes of this paper, technical expertise encompasses technological, scientific, engineering, and mathematical skills. Unless otherwise noted, SB capability will be used as shorthand for *only* the technical element of an overall SB capability. Technical support to the SB function is provided mainly by the technical staff at the Army’s R&D organizations. Their technical support helps the Army’s concept and materiel developers conceive, formulate, and execute materiel programs. In the context of this paper, the term smart buyers (SBs) refers to in-house technical personnel who, by contributing their individual specialized expertise, collectively represent a smart buyer capability.

The Army must maintain a SB capability because technological superiority is a mainstay of its overall defense strategy. In fact, the Army is relying more and more on advanced technology to modernize its force structure. While the Army XXI force will evolve combat through enhanced battlefield awareness via information technology, the Army After Next (AAN) force will go farther and be a revolutionary, technology-driven future force. Planning for AAN is the major driver of future Army science and technology (S&T), and the Army needs knowledgeable government scientists and engineers (S&Es) who are closely

attuned to state-of-the-art developments if it is to fully exploit the technology advances that AAN will require.

The government has been keenly aware of the importance of the SB function for many years. The landmark 1991 Federal Advisory Commission[1] argues that the "mission of the defense laboratories is to provide the technical expertise to enable the services to be Smart Buyers and users of new and improved weapon systems and support capabilities." This quote is the first and most important of the fifteen principal study findings. A recent survey of acquisition workers within the Army and opinions collected from industry representatives both support the position that a capable SB function is vital and must be maintained.

The SB problem facing the Army in the future stems from a shrinking pool of civilian S&Es. Since the SB function is an inherently governmental function,[2] its capability is dictated by the size (and quality) of the government civilian workforce. Currently, there is a trend toward downsizing all government civilians, including S&Es. Civilian S&Es who help perform the SB function make up a large portion of the Army's civilian workforce. In 1991, the total number of S&Es in the Army was 16,600. By the end of 1998, the number had decreased to 14,330.[3] The projections for the future are for even lower levels[4]. These reductions are the result of mandated personnel caps, often

---

[1]*Federal Advisory Commission on Consolidation and Conversion of Defense Research and Development Laboratories*, Report to the Secretary of Defense, September 1991.

[2]For a variety of reasons, the SB function should not be outsourced. For example, it would create conflicts of interest, result in a loss of user understanding or institutional memory, result in torn loyalties between satisfying a contractor's financial goals and the government's materiel needs, or lead to proprietary concerns by other contactors.

[3]Career Program 16 (engineers and scientists in non-construction), data provided by Office, Deputy Assistant Secretary of the Army (Civilian Personnel Policy).

[4]For example, the S&Es at AMC are likely candidates for future cuts. The AMC response to the Defense Reform Initiative Directive #20 (DRID #20) has indicated that 73 percent of the S&Es at AMC are listed as "subject to review," meaning that their jobs could be replaced with contracted workers. For consistency across major commands, the AMC position was changed by the Department of the Army to 15 percent, however, the Office of the Secretary of Defense may change this percentage again to achieve leveling across the services.

dictated by decisions made outside the Army's jurisdiction. These personnel cuts run counter to maintaining an adequate SB capability because workforce reductions result in personnel turbulence, leading to a possible loss of technical expertise or critical mass in technology areas, poor staff morale, and fragmented work. Unfortunately, the Army has to assume these cuts will continue in the future.

This White Paper draws on current and ongoing RAND research to identify what is needed to counteract the effect of personnel downsizing through changes/efficiencies in the SB capability and workforce; it then makes some recommendations to improve the current situation.

2. WHAT IS NEEDED TO MAINTAIN AND STRENGTHEN SB CAPABILITY?

Before we can recommend specific corrective actions, we need to discuss what is needed to maintain and strengthen the Army's SB capability. Based on our SB research over the last several years, we have found that three ingredients are required to provide a good SB capability:

- A collaborative research environment;
- Communications with users;
- A cadre of talented and trained technical staff.

In this section, we will summarize our research findings on each of these ingredients and discuss their implications for the SB problem.

COLLABORATIVE RESEARCH ENVIRONMENT

The Army's S&Es must be knowledgeable about all aspects of their rapidly changing technological field. This means knowing what is happening in their own laboratory as well as in those of other service/government agencies, academia, and industry. A collaborative research environment essentially forces the S&Es to be aware of what is going on outside their own organization.

Support for this important observation is provided by studies on performing collaborative research with nontraditional military suppliers and on other forms of collaborating and partnering.[5] This point is also acknowledged in government studies of military laboratories. A good example is the recent assessment of the Army Research Laboratory (ARL)

---

[5]Horn, Kenneth et al., *Performing Collaborative Research with Nontraditional Military Suppliers*, RAND, MR-830-A, 1997 (abridged version published in *Army RD&A*, Nov-Dec 1997, pp. 39-41); Wong, Carolyn, *An Analysis of Collaborative Research Opportunities for the Army*, RAND, MR-675-A, 1998 (also published in *Acquisition Review Quarterly*, Vol. 5, No. 4, Fall 1998, pp. 339-356); Chang, Ike et al., *Use of Public-Private Partnerships to Meet Future Army Needs*, RAND, MR-997-A, 1999.

by the National Research Council.[6] It notes that to perform its mission, ARL must have professional staff members aware of research outside its organization. Insularity from the outside hurts its ability to support the Army with state-of-the-art technical expertise.

All the studies are in general agreement that wide exposure to the development of technologies outside one's own organization is a key ingredient for keeping current about technological advances and honing one's SB tools. This outside exposure can be obtained by conducting collaborative efforts with other government laboratories, academic institutions, and private industry.

Although the Army is currently performing some valuable collaborative efforts with industry through Cooperative Research and Development Agreements (CRADAs) and the ARL's Federated Laboratory, more opportunities exist for joint service/government agency collaborations and collaborations with industry. We believe the key to forming these new collaborations lies in exploiting acquisition reform initiatives. These initiatives include establishing joint ventures with industry, using "Other Transaction" (OT) contractual instruments, establishing recoupment arrangements when spin-off commercial entities are formed, requiring cost-sharing with industry, and exploiting revenue-generation opportunities using their infrastructure and intellectual property assets.

Our research has shown that industry is willing to partner with the government if a collaborative atmosphere is maintained. A major obstacle to collaboration with industry seems to be the Army's reluctance to embrace these new acquisition reform initiatives. Cultural barriers in the Army need to be removed that inhibit exploiting these collaboration opportunities. Education and training must be provided to all laboratory personnel--S&Es, legal counsel, contracting, and management. The Army must educate its workforce about the benefits of the acquisition reform initiatives much in the way it has handled

---

[6]*1997 Assessment of the Army Research Laboratory*, Army Research Laboratory Technical Assessment Board, Commission on Physical Sciences, Mathematics, and Applications, National Research Council, National Academy Press, 1998 (also summarized in *Defense Week*, February 23, 1998, p. 15).

military specifications and integrated product teams (IPTs). In particular, it must discuss the various initiatives currently available and show how they can be used to form collaborative research efforts.

COMMUNICATIONS WITH USERS

The Army's concept and materiel developers must have access to the SBs. It does not do any good for the Army to have the brightest and most knowledgeable SBs in the government if their talents are not used by the combat and materiel developers. To be effectively used, the SBs must be closely coupled to the Army users with two-way communications in place.[7]

The Army laboratories need to provide the SB function to both the concept developers and the materiel developers. While generally effective today, in some cases the SB communication channels pass across different command structures (e.g., going up one command ladder, across to another, and down to the SBs). In these cases, more direct communication channels are desirable. However, this does not necessarily imply that physical proximity is needed. Although proximity is usually desirable, what is more important is directness of the reporting channels.

The usefulness of the SB information is not determined solely by whether direct communications channels exist or not. Equally important is how effectively they are being used. Effectiveness is dictated by many factors, including the organizational relationships between the SBs and the users, the goals and objectives of the laboratory management, and the users' specific needs.

Our research has addressed organizational reorganizations that enhance communication channels and effective information exchange. In some cases, new organizational reporting chains are needed, while in other cases, streamlined communication channels appear sufficient.

---

[7]This finding is a fundamental tenet of communications theory. It is summarized in a quote from Kenneth Burke's classic, *A Rhetoric of Motives*, University of California Press, 1969, "Only those voices from without are effective which can speak in the language of a voice within" (p. 39). We have addressed some of the associated issues in Chang, Ike et al., *Use of Public-Private Partnerships to Meet Future Army Needs*, RAND, MR-997-A, 1999.

CADRE OF TALENTED TECHNICAL STAFF

The third ingredient to providing a good SB capability involves people. The Army must have a talented technical staff of S&Es available to maintain a competent SB capability. This means the Army needs to acquire, sustain, and train/develop technically competent S&Es and also be able to separate less-productive staff. In the past, the Civil Service system has been a hindrance to achieving some of these goals. Maintaining a SB capability in a period of downsizing poses an even greater challenge.

Because the civilian S&E personnel issues facing the Army are multifaceted, we will first discuss some of the underlying problems and then describe the analyses we have performed to help better understand them. Since these findings have not yet been published, we will devote more attention to them than we did in previous sections referencing RAND publications.[8]

The civilian personnel issues facing the Army are numerous, as illustrated by the staffing statistics of S&Es at two Army laboratories. As shown in Figure 1, at ARL, the population of S&Es is bimodal in age distribution. The first peak occurs around age 36, with very few staff members under 30. This suggests that few new S&Es are being hired after college graduation, which means there is a small "feeder group." Also, as the figure indicates, the distribution of grade levels at ARL has bunched at GS grade 13. Finally, as shown in the bottom of the figure, approximately 65 percent of the ARL separations in the period FY93-FY97 were voluntary (including retirements), while only 8 percent were involuntary (the result of individual removals or reductions-in-force). This suggests that many of ARL's voluntary departures may have included highly qualified and talented S&Es.

---

[8]The results of these analyses are being documented in a forthcoming report on "Maintaining Army Capability in Science and Technology."

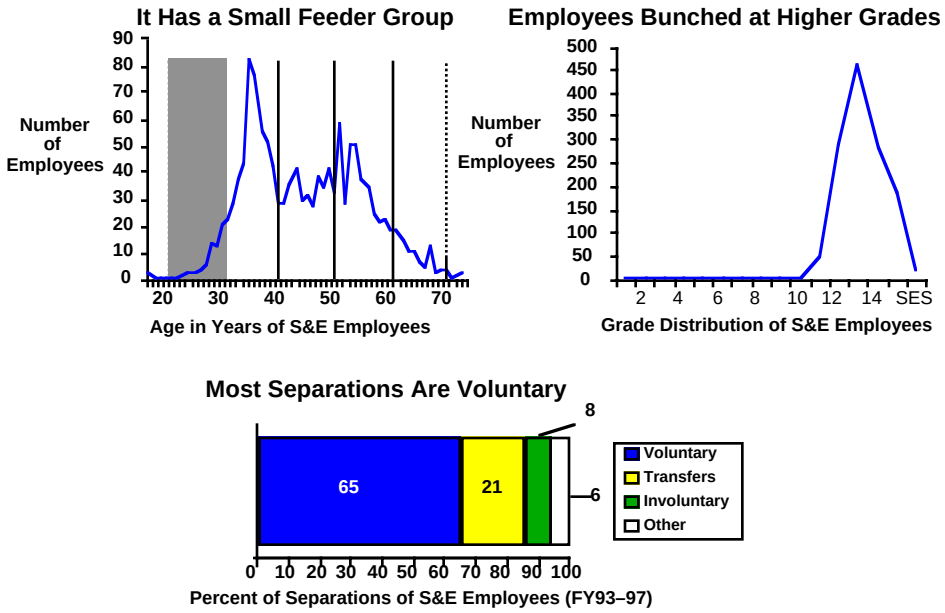

Figure 1--ARL Is Facing Serious Personnel Problems

The Army Research, Development and Engineering Centers (RDECs) are facing their own unique personnel problems. Data for the Tank-Automotive RDEC (TARDEC) are shown in Figure 2.

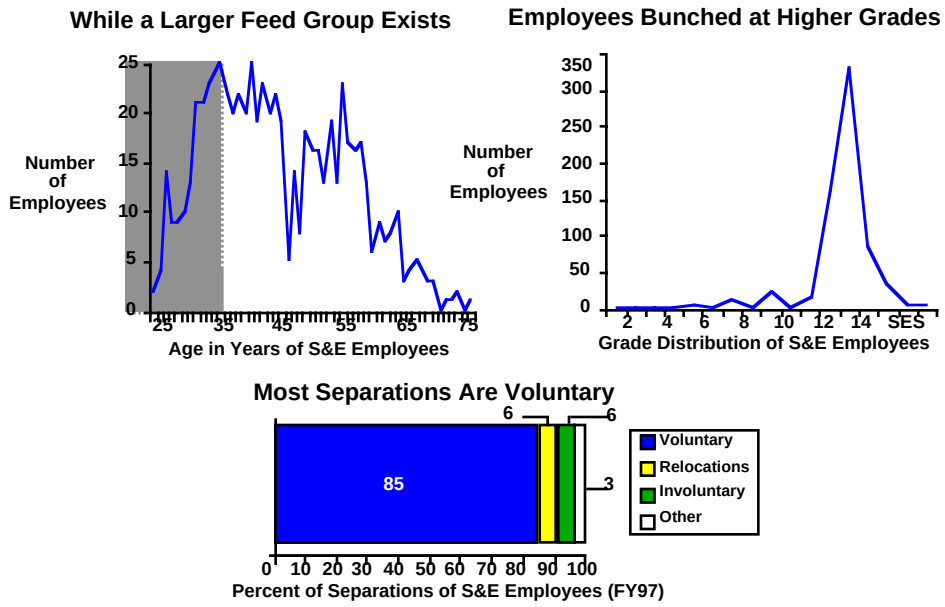

Figure 2--RDECs Like TARDEC Face Related Problems

While the S&Es at the TARDEC and ARL have different age distributions, both laboratories are experiencing a bunching of GS grade levels, and most separations are voluntary. The age distribution of S&Es at the TARDEC shows a similar bimodal shape, although the distribution is not as pronounced as ARL's. In addition, unlike at ARL, at TARDEC many of the S&Es are young enough that a reasonably sized feeder group (S&Es in the 21-34 age group) exists. This is partly because of TARDEC's successful cooperative program and the TARDEC University. However, like ARL, there is a bunching at the GS-13 level, and the number of voluntary separations is very large. Personnel outbriefs at the TARDEC suggest that many S&Es are leaving because positions with greater responsibility and higher salaries are currently available in industry.

To gain a better understanding of the Army's S&E personnel situation, we have performed two types of analyses. First, we have assessed the potential of the various personnel reform initiatives currently being tested within the government that are designed to help

alleviate some of these civilian personnel problems. Some of these initiatives are part of the new personnel demonstrations authorized under the National Defense Authorization Act. Others are techniques/instruments that have already been approved but are infrequently used by laboratory managers (e.g., recruitment/relocation bonuses). New initiatives are also being examined as part of the DoD Acquisition Workforce Personnel Demonstration Project and the Army S&T Reinvention Laboratories demonstrations. In addition to these congressionally authorized demonstrations, other personnel programs have recently been approved. All in all, there are approximately 50 personnel reform initiatives in the hopper.

We assessed the effectiveness of these initiatives, grouping them into four generic force-shaping areas: acquire, sustain, train/develop, and separate. We then evaluated the initiatives by assessing how well they addressed specific concerns. For example, in the sustain area, we considered whether the various initiatives would: (1) stop voluntary departures of experienced personnel, (2) reduce industry pay gap, (3) stop GS grade-level bunching, (4) increase morale, or (5) improve flexibility/prioritization in work assignments.

Based on our analysis, we have found effective personnel reform initiatives in all four force-shaping areas. Some of the more important initiatives in each area relevant to civilian S&Es are shown in Table 1.

Table 1

IMPORTANT PERSONNEL REFORMS INITIATIVES

Force Shaping Area	**Initiative**
Acquire	Special pay scale Recruitment bonus Relocation bonus Co-op/intern programs
Sustain	Retention allowance Pay broadbanding
Train/Develop	Fellowship programs Post-doctoral studies
Separate	Voluntary separation incentives Voluntary early retirement Voluntary emeritus program

NOTE: Broadbanding refers to a situation where several GS grades are combined into a band with no steps, meaning that movement through a band is tied to performance, not just seniority.

The second analysis we performed specifically addressed the training of SBs--in particular, we sought to find out what Army S&Es must do to become a good SB. We performed this analysis by surveying Army acquisition staff members who either performed the SB function or used the SB products. Fifty-five staff members were surveyed from a half-dozen Army R&D organizations; they included program managers, ARL S&Es, and RDECs S&Es. Management selected these personnel as being examples of either good SBs or knowledgeable about what it takes to be a good one. The survey findings were supplemented with reviews of past studies, telephone interviews of selected staff from ARL and some RDECs, and transcripts from AMC-conducted interviews of selected acquisition personnel in the Army, the Office of the Secretary of the Defense, and industry that HQ AMC has recently used to create a video on SBs.[9]

One survey question asked the respondents, “Please rank the factors contributing to the quality in your smart-buyer personnel: (1) education, (2) recent experience as a performer of research, (3) general engineering experience, and (4) industrial experience.” Respondents were also offered an opportunity to list other factors, but none did. This indicates that all the important factors were considered in the survey.

The responses to this question are summarized in Figure 3. Surprisingly, no one factor clearly stood out as being the most important to maintaining one’s SB capability. A general engineering experience is the most important of the four factors, while industrial experience is the least important. Recent hands-on research and education fall somewhere in between.

---

[9]"Assuring Adequate Army Capability in Science and Technology," video format, Army Materiel Command, July 1998.

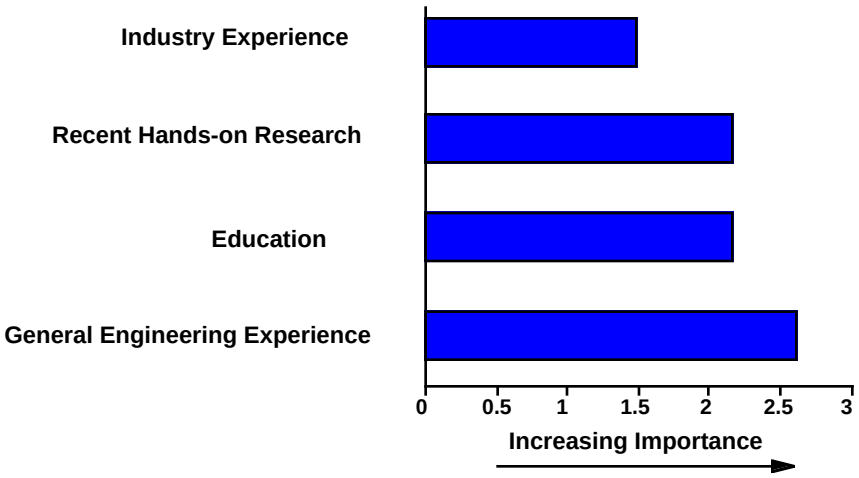

Figure 3--Relative Importance of Key Factors in Maintaining SB Capability

These results suggest that to train civilian S&Es to be good SBs, the Army laboratories must provide opportunities for staff members to engage in each activity. In some cases, changes in the way research is performed at a laboratory will help satisfy the SB training needs. For example, by performing more collaborative research (as discussed above), Army S&Es will be able to gain industrial experience through assignments with industrial teams, off-site exchange programs with industry, and exposure to industrial operations/research practices.

Army S&Es must also be given an opportunity to perform hands-on research experience. This affects the way research should be performed. While there is increased pressure today to outsource more and more government activities, including more of the Army's S&T, if carried too far, this practice could hurt the Army's SB capability. Already, the AMC outsources about two-thirds of its S&T budget. If outsourcing of S&T continues and is overdone or done unwisely, SB capability will likely degrade. For example, instead of keeping up with state-of-the-art technology developments, the government S&Es would be relegated to

the role of monitoring the contractor's work without retaining the technical capability to do so and performing other non-research-related administrative/oversight functions.

The importance of education means that efforts are needed to seek top-notch technical talent from ranking colleges and universities using all the available recruiting tools. Intern and co-op programs (as shown in Table 1) also provide a mechanism for obtaining qualified recruits from local or regional colleges.

With regard to general engineering experience, Army S&Es should be given the opportunity and the encouragement to obtain advanced degrees and take sabbaticals with other service/government agency laboratories, universities, and industry. Also, they should be given career-enhancing work assignments to expand their engineering experiences.

Another issue addressed in our survey was the recognition of outstanding SB performance. Based on the survey results, we believe the Army laboratories may inadvertently be sending conflicting messages about how they value SBs. While SB activities are recognized as important because they promote good relations with the customers and keep the laboratory recognized as relevant, it is not apparent that the SB efforts of the Army's S&Es are always adequately acknowledged. A cursory examination of achievement awards given out suggests that these awards are given for performing publishable experimental/theoretical research. For example, of the 27 Army R&D Achievement Awards for 1996, none were given for performing an outstanding job as an SB. Similarly, an assessment of the CECOM command awards for the same year show that none of the 13 awards were given for exceptional SB performance.

3. WHAT CAN BE DONE TO IMPROVE THE SITUATION?

Our discussion shows that a work environment that includes collaborative efforts with all segments of the government and industry fosters the awareness and exposure to technological advancements that Army S&Es need to maintain and develop their smart-buying skills. In addition, a working atmosphere that encourages open and direct communications among the Army's combat and materiel developers allows both SBs and developers to hone their skills and effectively use each other's talents to benefit the Army. While a collaborative work environment that encourages direct communications would be desirable under any circumstances, its existence is essential when personnel ceilings, recruiting difficulties, and fierce competition for S&Es from the private sector threaten to degrade the Army's SB capability.

The Army must establish a strategic approach to help mitigate the effects on its SB capability of government downsizing, recruiting impediments, and rivalry for S&Es. Based on our analysis and ongoing research in this area, we recommend that the Army's approach include the following elements.

ESTABLISH WORK ENVIRONMENTS THAT CONTAIN SUBSTANTIAL AMOUNTS OF COLLABORATIVE EFFORTS

Army R&D organizations should be encouraged to perform more collaborative research with other services, government agencies, and private industry. This will entail implementing new ways of doing business using acquisition reform initiatives that permit leveraging the other services and government agencies and partnering with industry. Collaborations will help guarantee that the Army's technical staff involved in the smart-buying process are aware of what is going on elsewhere in their technical fields. Such a collaborative atmosphere, along with techniques such as the use of postdoctoral scholars and Intergovernmental Personnel Act (IPA) employees, will allow the Army's SBs to increase technical competence and currency.

Several steps must be taken by the Army in order to effectively expand its collaborative research efforts with industry.[10] First, the Army must identify technology areas where collaborative efforts overlap with industry (e.g., align Army technological objectives with the company's strategic goals). Next, the Army must proactively seek industrial partners through aggressively "marketing" techniques that include understanding the company's market niche and strategic goals. Finally, the Army must be willing to be flexible in negotiating with the industrial partners (e.g., minimizing burdensome oversight and regulations).

ENSURE THAT THE WORK ENVIRONMENT ENCOURAGES DIRECT AND OPEN COMMUNICATIONS AMONG SBs, CONCEPT DEVELOPERS, AND MATERIEL DEVELOPERS

TRADOC and the program managers/program executive officers (PMs/PEOs), along with the Army R&D organizations, should work together to ensure open and direct communications channels. Such an effort might entail developing organizational realignments that provide close two-way SB communications. Emphasis should be placed on eliminating complicated mazes of reporting structures that hamper access.

MAINTAIN A CADRE OF TALENTED TECHNICAL STAFF

This entails doing three things. First, the Army should exploit the full range of recruiting tools to attract the most promising candidates. Personnel reform initiatives include a number of tools available for attracting these individuals. Intern programs--such as the Career Related Experience Science and Technology (CREST) program, which provides summer and/or part-time employment to undergraduate and graduate students, the Student Temporary Employment Program (STEP), and the Student Career Experience Program (SCEP)--appear to be successful and should be continued. Other tools, such as recruitment bonuses, have

[10]As a result of interviews with leading-edge information technology (IT) companies, we have gained insights as to what is required to attract nontraditional military suppliers, such as IT companies, to work for the government. (See Horn, Kenneth, et al., "Performing Collaborative Research with Nontraditional Military Suppliers," RAND, MR-830-A, 1997.)

rarely been tried, and some pilot trials with these tools will help establish their role in successful recruiting practices.

Second, the Army should implement career development opportunities to ensure that employees have the necessary skills to perform the SB function. This means providing all S&Es with opportunities to acquire the four proficiencies necessary to becoming a good SB. In particular, the Army must provide opportunities for S&Es to acquire industry experience, perhaps through industry exchange programs and well-designed collaborative projects. S&Es must also be able to devote a portion of their time to performing hands-on research. To ensure ample opportunities to gain this experience, the Army must devise criteria for determining what and how much R&D should be kept in-house and what can be outsourced. S&Es must be able to acquire the required level of education in their fields. The Army and its workers will mutually benefit if the Army encourages and supports education at the nation's top universities. Finally, S&Es need general engineering experience. The Army can ensure this requirement is met through a well-planned series of work assignments.

Third, the Army must create influences that will encourage talented and promising SBs to stay. The Army must ensure that career advancement opportunities are available to its S&Es. Reform initiatives such as pay broadbanding will help, but more innovations may be needed. In addition, the Army must ensure that tangible recognition of good smart buying reflects the importance the Army places on this capability. For example, criteria for salary increases, promotions, and awards may have to be defined, established, or revised to better tie outstanding performance of smart buying to these rewards.

If these actions are implemented, then the Army's SB capability will not only be maintained, but strengthened.

BIBLIOGRAPHY

Chang, Ike, Steve Galing, Carolyn Wong, Howell Yee, Elliot Axelband, Mark Onesi, Kenneth Horn, *Use of Public-Private Partnerships to Meet Future Army Needs,* RAND, MR-997-A, 1999.

Crawford, Mark, "NRC Identifies Weaknesses in Army Research Laboratory," *Defense Week*, February 23, 1998, p. 15.

Federal Advisory Commission on Consolidation and Conversion of Defense Research and Development Laboratories, Report to the Secretary of Defense, September 1991.

Horn, Kenneth, Elliot Axelband, Ike Chang, Richard Montgomery, Mark Onesi, Paul Steinberg, Carolyn Wong, "Maintaining Adequate Army Capability in Science and Technology (S&T)," RAND, unpublished research, May 1998.

Horn, Kenneth, Elliot Axelband, Ike Chang, Paul Steinberg, Carolyn Wong, Howell Yee, *Performing Collaborative Research with Nontraditional Military Suppliers*, RAND, MR-830-A, 1997. (Abridged version published in *Army RD&A*, Nov-Dec 1997, pp. 39-41.)

Secretary of Defense Report to Congress, "Actions to Accelerate the Movement to the New Workforce Vision," April 1998.

1997 Assessment of the Army Research Laboratory, Army Research Laboratory Technical Assessment Board, Commission on Physical Sciences, Mathematics and Applications, National Research Council, National Academy Press, 1998.

Wong, Carolyn, "An Analysis of Collaborative Research Opportunities for the Army," RAND, MR-675-A, 1998.

Wong, Carolyn, Elliot Axelband, Ken Horn, Paul Steinberg, "An Approach for Efficiently Managing DoD R&D Portfolios," *Acquisition Review Quarterly*, Vol. 5, No. 4, Fall 1998, pp. 339-356.