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o average 1 hour per response, including the time for reviewing instructions, searching existing data sources, ring the collection of information. Send comments regarding this burden estimate or any other aspect of this n, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson t of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503.

1. AGENCY USE ONLY (Leave blank)	2. REPORT DATE 2 Oct 92	3. REPORT TYPE AND DATES COVERED FINAL 1 Aug 92 - 2 Oct 92

4. TITLE AND SUBTITLE	5. FUNDING NUMBERS
Department of Defense Information Systems Workforce: Education, Training, and Career Development	Task 1

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7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)	8. PERFORMING ORGANIZATION REPORT NUMBER
Executive Resources Task Force DDI, Off of Asst Secy Defense for C3I 3040 Defense Pentagon, Room 3E240 Washington, DC 20301-3040	

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)	10. SPONSORING/MONITORING AGENCY REPORT NUMBER
Director of Defense Information Office of the Assistant Secretary for Command, Control, Communications and Intelligence 3040 Defense Pentagon, Rm 3E240 Washington, DC 20301-3040	

DTIC ELECTE MAY 25 1993

11. SUPPLEMENTARY NOTES

12a. DISTRIBUTION/AVAILABILITY STATEMENT	12b. DISTRIBUTION CODE
APPROVED FOR PUBLIC RELEASE: DISTRIBUTION IS UNLIMITED	

13. ABSTRACT (Maximum 200 words)

Early in the formulation of the Defense information infrastructure under Defense Management Review Directive (DMRD) 918, top managers in DoD recognized that the performance and technical vitality of their information systems workforce were the critical factors for success in a Department-wide computer and communications infrastructure.

The Director of Defense Information formed the Executive Resources Task Force in August 1992 to identify the broad context, initial concepts, and starting strategy for implementing education, training, and professional development initiatives for the DoD information systems workforce.

The Task Force visited all major DoD components and selected private organizations, performed a literature search, and performed statistical analyses of workforce data from the Defense Manpower Data Center. Three information systems human resource goals were established: (1) improve the individual and team performance of the workforce, (2) rebalance the workforce towards more professional, technically rich, and diverse individuals, and (3) reduce the costs of the information systems human resource "life cycle."

The final report, issued in October 1992, contains a synopsis of research information and makes specific findings and recommendations.

14. SUBJECT TERMS		15. NUMBER OF PAGES 61
Information Systems Workforce; Information Infrastructure; DMRD 918; professional development; training; education; DoD		16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
Unclassified	Unclassified	Unclassified	SAR

NSN 7540-01-280-5500

Standard Form 298 (Rev. 2-89)
Prescribed by ANSI Std. Z39-18

Department of Defense Information Systems Workforce

Education, Training, and Career Development

Final Report
of the
Executive Resources Task Force

October 2, 1992

93-11442

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INTRODUCTION

The Executive Resources Task Force was formed by the Director of Defense Information, Office of the Assistant Secretary of Defense for Command, Control, Communications, and Intelligence (OASD(C3I)), in response to DMRD 918, Defense Information Infrastructure. The purpose of the task force was to develop a concept and implementation plan for the education, training, and career development of information systems (IS) individuals in the DoD. Early in the formulation of DMRD 918, the performance and technical vitality of the DoD's information systems workforce were recognized as one of the critical factors for the success of a Department-wide computer and telecommunications infrastructure.

This report presents the findings and recommendations of the Executive Resources Task Force based on its team effort from 3 August 1992 through 2 October 1992. The study identified the broad context, initial concepts, and a starting strategy for the implementation of education, training, and career development initiatives for the DoD information systems workforce. An initial report was presented to the Information Systems Technology Board (ITPB) on 16 September 1992. The Board approved the report. Changes recommended by the ITPB as well as those made by other DoD Components were incorporated into the final report.

The final report is divided into three sections.

a. The Executive Summary reviews the major findings and recommendations.

b. Chapters 1 through 4 detail the work and results of the two month study effort. Specifically, Chapter 1 discusses the background and force structure considerations. Chapter 2 establishes baseline statistics for the DoD IS workforce populations and the DoD IS schools and training activities. Chapter 3 documents the findings based on site visits and discussions, a review of pertinent documents, and statistical analyses. Chapter 4 presents recommendations.

c. The appendices provide supporting materials. Appendix A describes the methodlogy used by theTask Force in completing the two month study. Appendix B describes current DoD best practices in the IS world which can be considered as potential models for the DoD-wide IS education, training, and career development program. Appendix B lists materials reviewed, organizations and sites visited by the Task Force, and members of the Task Force.

EXECUTIVE SUMMARY

1.   Background.

The DoD employs approximately 369,500 military (Active and Reserve Components) and civilians to design, operate, and maintain its computer and telecommunications infrastructure. By the year 2002, the DoD will be reduced by at least 25 percent, yet the requirement to develop, integrate and operate highly technical information systems will increase. The effective performance of these systems will be critical to the mission of DoD -- preserving the peace and winning wars.

Early in the development of DMRD 918, it was recognized that one of the critical factors for the success of a Department-wide computer and telecommunications infrastructure is the performance and technical vitality of its IS workforce. For that reason, the Director of Defense Information established the Executive Resources Task Force to develop a concept and implementation plan for the education, training, and career development of information systems (IS) individuals in the DoD.

2.   Task Force Goals and Results.

During the Task Force's efforts from 3 August 1992 to 2 October 1992, **three goals were established: to improve individual and team performance; to rebalance the workforce towards more professional, technically rich, and diverse individuals; and to reduce the costs of the IS human resource life cycle.**

The Task Force identified the broad context, initial concepts, and a starting strategy for the implementation of education, training, and career development initiatives for the DoD IS workforce. An initial report was presented to and approved by the Information Systems Technology Board on 16 September 1992. This report presents the full findings and recommendations of the Executive Resources Task Force.

3.   Baseline.

Using data from the Defense Manpower Data Center, the DoD IS workforce population was estimated for Active and Reserve military and civilians world-wide. There are approximately 369,500 individuals in the DoD IS workforce; 170,350 Active Duty military, 126,000 Reserve Component military and 73,200 civilians for a 46/34/20 Active Duty/Reserve/civilian ratio. In the Active Duty, the military (which is composed primarily of enlisted personnel) to civilian ratio is 70/30. In the professional IS Active Duty workforce, the military to civilian ratio is 25/75 percent with computer specialist, GS-334, as the predominant civilian job series.

The Task Force identified the major DoD schools that provide IS training. These schools fall into three categories: **schools that train and/or educate primarily civilian audiences** (the Information Resources Management College, Defense Logistics Agency's (DLA's) Defense Systems Automation Center, the Army Management Engineering College, and Naval Computer and Telecommunication Stations); **schools that provide graduate degrees for primarily military officers** (the Naval Postgraduate School and the Air Force Institute of Technology); and **schools that provide primarily military occupation or skill training** (DoD Component MOS-awarding schools).

4.   Findings.

The Task Force developed numerous findings based on site visits and discussions, a review of pertinent documents, and statistical analyses. The major ones are listed below and are described in detail in Chapter 3.

a.   **There are no common DoD patterns in IS workforce education, training, and career development practices, military or civilian.** Currently, each Component separately determines both military and civilian DoD IS workforce education, training, and career development practices. Approaches range from highly centralized to totally decentralized.

b.   **There are no central policies, procedures, or organizational structure for IS career development.** No current DoD guidance exists today to address education, training, and career development for the DoD IS workforce. This lack of central management causes unequal career development paths and opportunities in terms of what training topics are emphasized and what training and education are funded.

c.   **DoD spends the equivalent of approximately one percent of its civilian personnel dollars on training. This is substantially below similar spending in the private sector.** DoD-wide estimates for training dollars spent average the equivalent of one percent of civilian payroll. In contrast, corporations in the private sector typically spend the equivalent of from three to five percent of payroll on training and development, with successful corporations spending from five to ten percent. In the IS arena, even the typical private industry ratios may not suffice and amounts spent on training exceeding the average may be necessary to deal with the rapid advance and obsolescence of technology.

d.   **There is a need for consistency and fairness in terms of policies and actions between the DMRD 918 centralized IS workforce and the IS workforce remaining in the DoD Components.** A significant portion of the existing IS workforce will be capitalized to DISA under DMRD 918. Consistent human resource policies and opportunities across all of DoD will allow the free flow of the "best talent" throughout the DoD to meet DoD mission needs.

e. **DoD is reevaluating how it approaches training and development, emphasizing a business environment for delivery of training.** DoD has recognized the need to change to a business environment for delivery of training using a fee-for-service basis. Fee for service encourages competition to deliver the best training and entail the recovery of costs to produce and provide training to a customer base.

f. **There is no oversight on IS education and training.** It is not known at present what IS courses and delivery capabilities DoD has, what are the required and spent IS education and training dollars, or what the value of the training is as measured against specific benchmarks such as employee performance and managerial expectations.

g. **Technical vitality of the IS workforce is critical to effectively deploy information systems in support of the DoD war fighting mission.** The need to provide recurring technical training to individuals, especially at mid-career and executive levels, was communicated throughout our meetings with services, agencies and private industry. This training is essential to avoid technological obsolescence of the IS workforce and to keep pace with the acquisition and deployment of more advanced computer and telecommunications systems.

h. **Streamlining training overhead will reduce costs. Maintaining currency and the initial implementation of high tech training methods will increase costs.** Through consolidation of training and education activities, services and/or resources, overhead involved in providing these opportunities can be minimized. Offsetting these cost savings, however, are the increased costs associated with funding training at higher levels to provide for technical vitality training and the initial costs of implementing more technologically advanced training delivery methods such as distance learning. Once in place, however, these methods can reduce the resources involved in course preparation, presentation, and maintenance.

i. **There is no central focus on IS SES management or succession planning.** There are no SES candidate development programs for SES positions in the IS workforce either on a DoD-wide basis or within the Components. This lack of focus on SES management must be reversed so that key executives have the critical technical and leadership skills to build, operate, and improve a central computer and telecommunications infrastructure.

j. **Certification programs can increase the professionalism and performance of the workforce.** Organizations with certification programs in place benefit from a higher percentage of the IS workforce having recent degrees or technical training and common standards and levels of proficiency for all individuals attaining a certain grade. Also, higher retention rates and improved performance usually accompany certification programs.

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k. IS career development is trending towards multidisciplined professionals for cost and performance reasons. Both private industry and the DoD are turning to the concept of multidisciplined IS professionals to provide flexibility and professional broadening in work assignments, facilitate matrix or team management, and provide highly developed technical and leadership skill levels in downsized workforce conditions. Typically, a job cluster approach is used, improving individual and team performance while reducing workforce costs.

5. Recommendations.

The Task Force developed broad based recommendations proposing new concepts, policies, and management structures for IS human resources. Recommendations follow and are described in detail in Chapter 4.

a. Codify initial policies and doctrine for information systems education, training, and civilian career development with ASD(C3I) as central manager.

Major areas for policy development are: IS education, training, and career development doctrine, review and approval of IS curricula and budgets, policies and doctrine to place needed IS education and training in DoD schools, and a DoD-wide IS career development structure. The first three policy areas will establish the foundation for IS training, education, and career development in order to transition today's DoD IS workforce to the technically rich, multidisciplined workforce needed in the future. The management structure proposed is a small, focused office headed by a Deputy Director in the Office of the Director of Defense Information with DoD policy level responsibilities. It also contains a support element to perform career development, training, and education line functions.

b. Commit the equivalent of five percent of IS civilian payroll dollars to civilian training and development.

Currently, the DoD commits the equivalent of approximately one percent of its civilian payroll to training and development. In contrast, private industry spends the equivalent of from three to ten percent on training and development. To assure the technical vitality of the IS workforce and provide training for the required organic DoD IS capabilities (process reengineering, systems integration, and development and maintenance of information systems), five percent should be a minimum target. This increased training will provide improved acquisition, development, and maintenance of deployed information systems supporting the DoD war fighting mission.

c. Develop standards and implementation strategies for the education, training, and career development of the entire DoD IS workforce.

After DMRD 918 implementation plans baseline the workforce, the DoD must identify core competencies and job clusters, evaluate the current workforce for those competencies,

and create training and developmental plans to address both shortfalls and opportunities. DMRD 918 emphasizes an organic systems integration capability, and the development and maintenance of DoD migration and future information systems. Related functional DMRDs seek to restructure the Department's processes in areas such as logistics and finance. Accordingly, the initial focus will be on the education, training, and career development for process reengineers, systems integrators, and systems developers.

d. Initiate a DoD-wide IS civilian career development program.

A DoD-wide career development program includes: career paths, central management and filling of key positions, multiple source accession options, certification programs, tuition support, and a central DoD-wide IS career development and referral system. Consistent with this centralized approach, we propose centralized funding of interns, core training, and rotational assignments. This DoD-wide career development program will assure fairness and consistency for the entire DoD IS workforce.

e. Evaluate IS training and education activities for consolidation and increased efficiency in accordance with DMRD 918.

A survey of existing training activities can eliminate unnecessary duplications, identify overhead savings, and explore alternate methods of course delivery. The goals are to consolidate appropriate activities and/or resources to reduce costs and improve the delivery of education and training.

f. Develop an IS Executive Resources Program.

The successful operation of DoD's IS infrastructure will involve the correct number, ratio, and skills mix of SES and flag officer billets. The DoD should design a strategy to identify, develop, and deploy this executive talent. In addition, the DoD should pursue succession planning to ensure that a ready candidate pool of multidisciplined, experienced individuals is available. This is especially important in FYs 94 and 95, when a larger than usual percentage of senior executives is expected to retire.

g. Within the framework of the Information Technology Policy Board (ITPB), establish a high level IS Skills and Education Working Group.

An IS Skills and Education Working Group will be formed as a standing ITPB working group to study workforce (military and civilian) skills, career paths, education, and training and provide recommendations to the ITPB for executive level review. Through this arrangement, the ITPB would serve as a forum for infusing senior Component leadership into the career field and ensuring consistency of concept and application of policies across the DoD.

6. Summary.

The recommendations of this report propose new concepts, policies, and management structures for IS human resources. They will enable the DoD to transition to a consolidated, more productive, and modernized computer and telecommunications infrastructure. These broad-based recommendations factor in new skills, innovative career development paths, state-of-the-art training, and DoD-wide policy to bring about the improvements in human performance needed to support DMRD 918. Implementation of these recommendations will provide the DoD with a technically rich, professionally diverse IS workforce for the 21st century.

Chapter 1 - BACKGROUND

1. Background.

I ne DoD employs approximately 369,500 military, Active and Reserve, and civilian individuals to design, operate, and maintain its computer and telecommunications infrastructure. In the year 2002, the DoD will be at least 25 percent smaller in terms of force structure and resources. However, the requirement to develop, integrate, and operate highly technical information systems will increase. The performance of these systems is paramount in defending the peace and winning wars.

There are three converging factors that require that attention be placed on the human resources associated with the Department's information systems.

First, the Command and Control Functional Analysis and Consolidation Review Panel Report (FACRP), dated 30 October 1991, identifies specific military, political, and economic changes that will affect the DoD's command and control environment. It then makes recommendations that emphasize a more streamlined, mobile, standards-based, and rapidly deployable command and control information infrastructure.

Second, DMRD 918 states the high costs and technical problems associated with the inability of the DoD systems to interoperate with one another. The DMRD recommends strategies in systems and network management, infrastructure operations, information security, acquisition, and training and career development to remedy these deficiencies.

Third, changing US demographics and workforce expectations will influence the quality of the information systems professionals which DoD hires and retains. These include: a shrinking entry labor pool; more women and minorities in entry and mid-level jobs; the competition between the government and the private sector for skilled individuals; declining technology enrollments in the colleges and universities; the need for professional contribution and recognition; and the desire for flexibility between work and non-work activities.

To meet the requirements of all three of these factors, new skills, innovative career development, and state-of-the art education and training, in terms of both content and delivery, need to be developed. For example, knowledge of systems integration, process reengineering, multilevel security, data management, architecture, and standards, and artificial intelligence are just some of the new skills in which our workforce will need to be trained. Career development must weave in leadership, business management, and customer focus education as well as technical skills training. The DoD needs to emphasize rotational assignments, certification, and work-study programs. Whereas traditional classroom training certainly has

its benefits in many situations, the DoD needs to pursue other ways of delivering training and education such as distance learning, computer-based instruction, and intensive "boot camps" for specific technical skills.

In a future world in which the DoD will have fewer resources, fewer managers, and flatter organizational structures, the DoD will be well served by developing a technically vital, multiskilled, and professionally motivated information systems workforce. To achieve this future, we have established three information systems human resource goals:

    a.   Improve the individual and team performance of the workforce.

    b.   Rebalance the workforce towards more professional, technically rich, and diverse individuals.

    c.   Reduce the costs of the information systems human resource "life cycle."

2.   The Human Resource Dynamic.

In achieving these goals, the DoD must refocus IS workforce performance towards results and outputs, customers, and relational systems thinking to solve problems and manage a more technically sophisticated computer and telecommunications infrastructure. Doing so will involve all elements of human resource management in concert with the external environment and organizational culture. Figure 1-1 depicts this system of interactions with an Information Systems Human Resource Dynamic model.

Human performance is at the heart of the model to focus attention on the desired results -- changed performance. Surrounding the heart are the human resource management elements that energize human performance. DoD mission changes directly affect the workforce structure in terms of the mix of military (Active and Reserve), civilian, and contractor employees. The DoD needs to identify and estimate this mix for the future to determine skills, and education and training requirements. Recruitment and selection address the need to place the right people in the right jobs. Performance and appraisals highlight the need to change performance expectations to meet the future demands placed on the IS workforce. Training and development are the cornerstones of transforming the single dimensioned IS workforce of today into the multidisciplined professionals of tomorrow. Rewards and recognition provide tangible notice of employee accomplishment. Finally, the DoD must factor in workforce goals to balance employee needs and expectations with mission requirements.

The external environment in which DoD operates affects these performance and human resource management elements. Issues associated with the acquisition of information systems and services, the Planning, Programming, and Budgeting System, contractors, the Congress, and the US labor pool ultimately impact what the DoD chooses to do in educating, training, and developing its information systems workforce. Spanning the area between what the DoD

can control and what the external environment presents is the organizational culture or underlying assumptions, beliefs, values, and attitudes shared by of the DoD information systems community. The future IS organizational culture needs to encompass systems thinking and integration; a strong customer focus in all functional areas; accountability and reliability in infrastructure operations; business knowledge and a marketing orientation; and benchmarking as a means to attain world class systems and services.

Finally, there is a need for automated information systems to support elements of the human resource dynamic due to the large information systems workforce population. Initially, automated information systems will provide the day-to-day administrative support. Ultimately, they will provide decision making mechanisms to capture, report, and analyze the IS workforce in terms of skills, referrals, training, performance evaluation and force structure to effect future human resource strategic planning.

This Task Force report identifies, in broad scope, the multiple elements and interactions of the Human Resource Dynamic model and concentrates on the education, training and career development ones. The DoD should address the additional elements and interactions as follow on initiatives stemming from the Task Force to ensure that the entire Human Resource Dynamic model achieves its goals for the information systems workforce.

Figure 1-1

Information Systems Human Resource Dynamic

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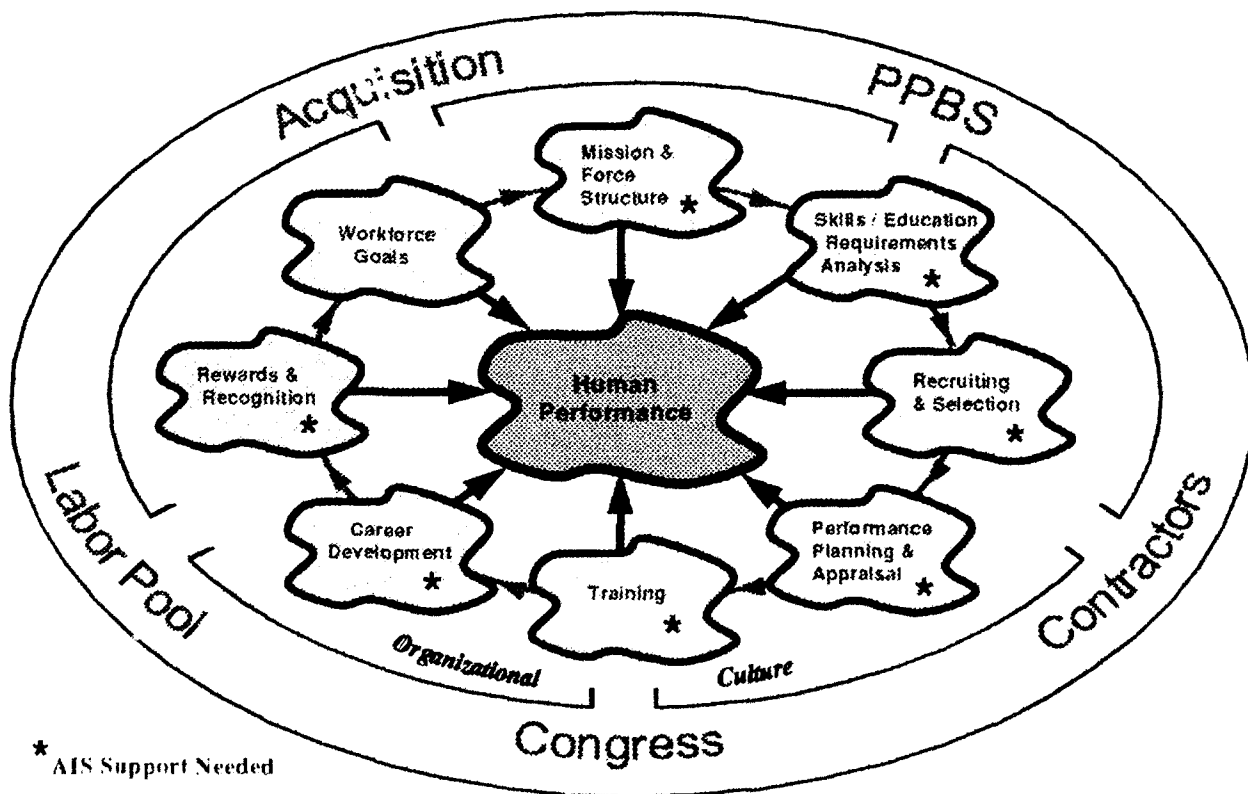
3.   Force Structure Considerations.

There are over 369,500 military, Active and Reserve, and civilian information systems individuals in the DoD. They perform the full spectrum of responsibilities from computer operators and telephone repairers through systems developers and network integrators to the top executives who oversee the entire C4 function. In addition, DoD spends, at a minimum, approximately $2.8 billion dollars for information systems contractor support annually, according to the FY 93 DoD Information Technology Budget. These contractors perform many of the same operational functions as does the DoD workforce.

As mentioned earlier, the information systems environment in DoD is changing. The Department is downsizing by at least 25 percent. The information technology components of command and control are becoming more mobile, standards-based, rapidly deployable, and locally managed. DMRD 918, through consolidations and computer and telecommunications efficiencies, will improve the technical capabilities and interoperability of DoD's information infrastructure. Workforce demographics and expectations are changing. The current mix of military (Active and Reserve), civilian, and contractor personnel will undoubtedly be different in the future due to DMRD 918 decisions and force structure considerations. A sampling of these is as follows:

a.   Systems integration will be an organic DoD capability. At present, contractors perform much of DoD's systems integration tasks. Not only are the costs of this high, but the fact that systems integration is a determining element of military prowess requires that this capability be viewed and institutionalized as an integral war fighting capability as are intelligence and command and control.

b.   Outsourcing (contractors) will be the basis for the "reconstitution" of the DoD information systems infrastructure. DoD cannot afford the resources to maintain a warm industrial base, internally, for its information systems infrastructure. Contractors have the people, facilities, and equipment to provide the DoD with the necessary surge capacity in event of a major conflict.

c.   There are numerous economic and technology trends that affect the information systems infrastructure and its workforce composition. These trends include: facility consolidations; consolidation of acquisition and standards activities; the decreasing costs of hardware; the ability to obtain economies in acquisition cost, if using a single central source; the use of CASE software tools; and network hardware and software reconfiguration and maintenance via network control systems. The net results of these trends will be to eliminate many current civilian and military positions in infrastructure operations.

d.   Process reengineering is the key to meeting the DMRD cost reduction and management efficiency targets in the functional areas through 1999. The DoD needs an

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organic cadre of process engineers to restructure and reduce the costs of both C2 and business systems. In addition, the DoD must educate process reengineers to be skilled in business and marketing concepts and applications in order to successfully strategize and implement fee-for-service financial operations of the information systems infrastructure.

e. Through modernization, process reengineering, and the automation of clerical computer and telecommunications functions, numerous tactical and business systems operations and maintenance tasks can be eliminated. In addition, the DoD can contract out many of such tasks that remain for business systems while retaining in-house similar tasks for C2 functions due to the deployability of the force.

f. Flexible deployability requires an "information systems capable" military (not only technical personnel but a basic computer and telecommunications literacy on the part of the entire force) in the first deployments, with a mix of military, civilian, and contractor individuals in subsequent deployments. An aspect of military training and career development is the need to develop a more balanced perspective between telecommunications and computer skills. At present, the military information systems workforce trains and promotes it members who are highly proficient in telecommunications skills. Computers and telecommunications are equally important in war fighting. The DoD should change this focus so that military personnel are educated, trained, and rewarded equally (through promotions and career development opportunities) in both disciplines.

g. The role of the Reserve Components in the C4 arena needs to be reviewed. Of the 369,500 individuals in the DoD information systems workforce, approximately 296,350 or 80 percent are military. Of the military, 57 percent are Active Duty and 43 percent are Reserve component military. Clearly, the DoD needs to determine the best mix of Active and Reserve military to perform strategic, tactical, and sustaining base infrastructure operations. From an education, training, and career development perspective, the DoD needs to provide all members of the information systems workforce the same standards in skills training, corporate concepts, and direction in information systems.

h. All of the above force structure considerations argue for an emphasis on new information infrastructure skills such as systems integration, process reengineering, and network management and for educating the DoD information systems workforce in multiple technical skills and management concepts and applications. The DoD must introduce and reinforce these education and training needs throughout the individuals' careers.

Chapter 2 - BASELINE

1.   Statistics.

Statistics were gathered from the Defense Manpower Data Center to determine IS workforce composition in terms of civilian and Active Duty/Reserve military populations. Where all members of a job series or military specialty were not part of the IS workforce, weighting factors were devised and extrapolations made to approximate the IS workforce population. Views of the data generated include: grade distribution, education levels, male to female ratios, minority to nonminority ratios, and geographic concentrations. A statistical summary is below.

From the most inclusive viewpoint, there are 369,443 individuals in the civilian and military (Active and Reserve component) IS workforce. There are 73,163 civilians, 170,350 Active Duty military, and 125,930 Reserve component military. Refer to Figures 2-1 and 2-2.

Figure 2-1

DoD Information Systems Workforce		
Civilian and Military)		
Civilians (Two grade intervals):	55,899	
Civilians (One grade intervals):	17,264	
Civilian Total:		73,163
Active Duty Officers:	18,386	
Active Duty Enlisted:	151,964	
Active Military Total:		170,350
Reserve Component Officers:	11,103	
Reserve Component Enlisted:	114,827	
Reserve Military Total:		125,930
Total DoD IS Workforce:		369,443

Figure 2-2

DoD IS Workforce

Military (Active & Reserve Components) and Civilians

Civilian
73,163
20%

Active
170,350
46%

Reserve
125,930
34%

Total Population: 369,443
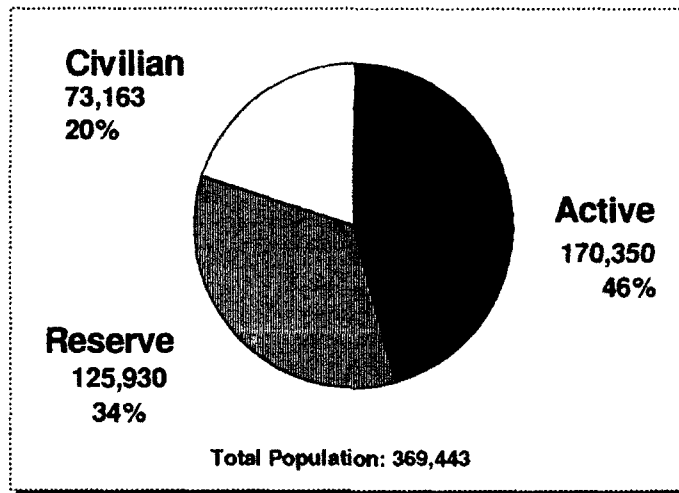
In the civilian and Active Duty military IS workforce there are 243,513 individuals. Of this total population, 73,163 are civilian and 170,350 are military (officer and enlisted). This is a 30 to 70 split of civilian to military. Refer to Figure 2-3.

There are 74,285 individuals, Active Duty military and civilian, in the main realm of professional IS activities: communications-computer systems design, programming, engineering, planning, testing, operations and maintenance, and integration (data, networks, and systems).

Figure 2-3

DoD IS Workforce

Military (Active Duty) and Civilians

Civilian
73,163
30%

Military
170,350
70%

Total Population: 243,513

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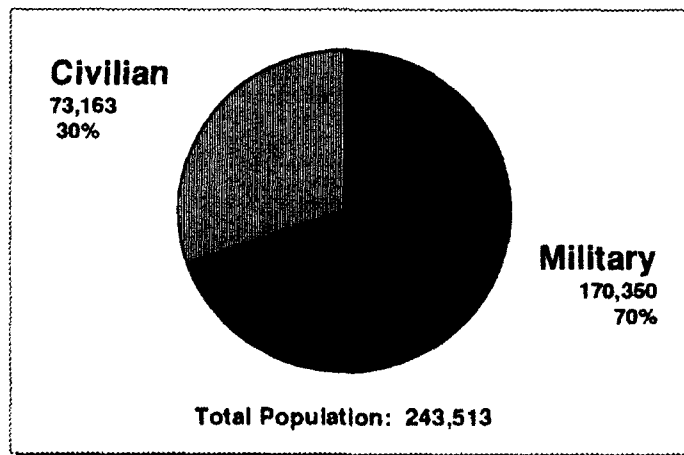
a.   Approximately 75 percent of this subset of the workforce is civilians, and 25 percent is military officers. Refer to Figure 2-4 for the military to civilian breakout.

Figure 2-4

DoD IS Workforce
(Civilians in Series Shown below and Military Officer Equivalents)

Military
18,386
25%

Civilian
55,899
75%

Total Population: 74,285
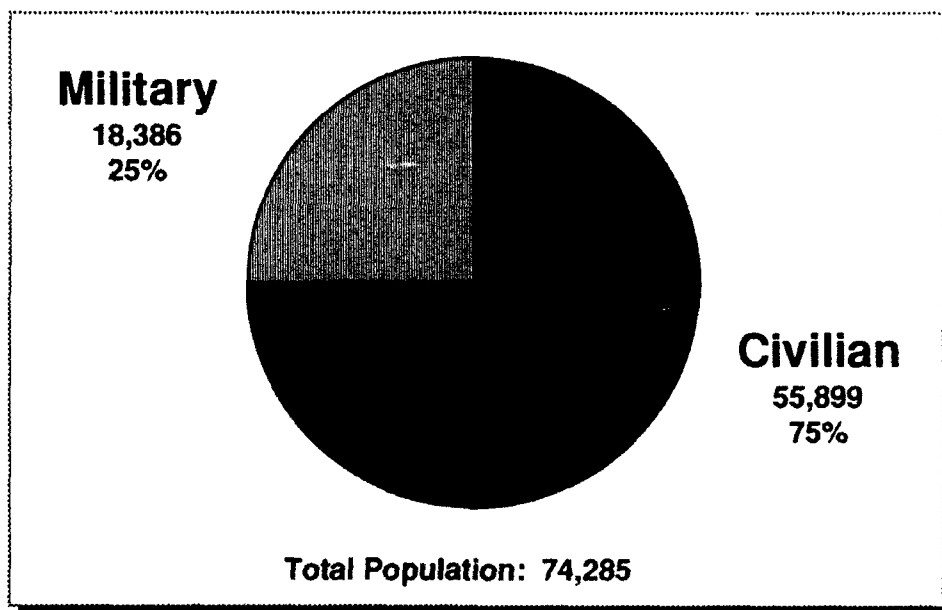
Series 301, 334, 343/345, 391/393, 801, 854, 855, 896, 1001/1071/1084, 1410, 1515, 1520, 1550

b. The civilians in this subset of the workforce are in the two-grade interval job series. The predominant civilian job series is GS-334, computer specialist, followed by 855, electronic engineer. Refer to Figure 2-5 below for the civilian breakout by job series.

Figure 2-5

DoD Information Systems Civilian Workforce
(Series Shown)

Series: Number - Title

- 301: 2,921 Info Systems Mgt Sp
- 334: 25,848 Computer Specialist
- 343 / 345: 3,825 Program / Mgt Analyst
- 391 / 393: 3,222 Communications Sp
- 801: 584 General Engineer
- 854: 918 Computer Engineer
- 855: 11,184 Electronics Engineer
- 896: 52 Industrial Engineer
- 1001 / 1071 / 1084: 1,880 Visual Information Specialist
- 1410: 983 Librarian
- 1515: 791 Operations Research Analyst
- 1520: 1,215 Mathematician
- 1550: 2,476 Computer Scientist
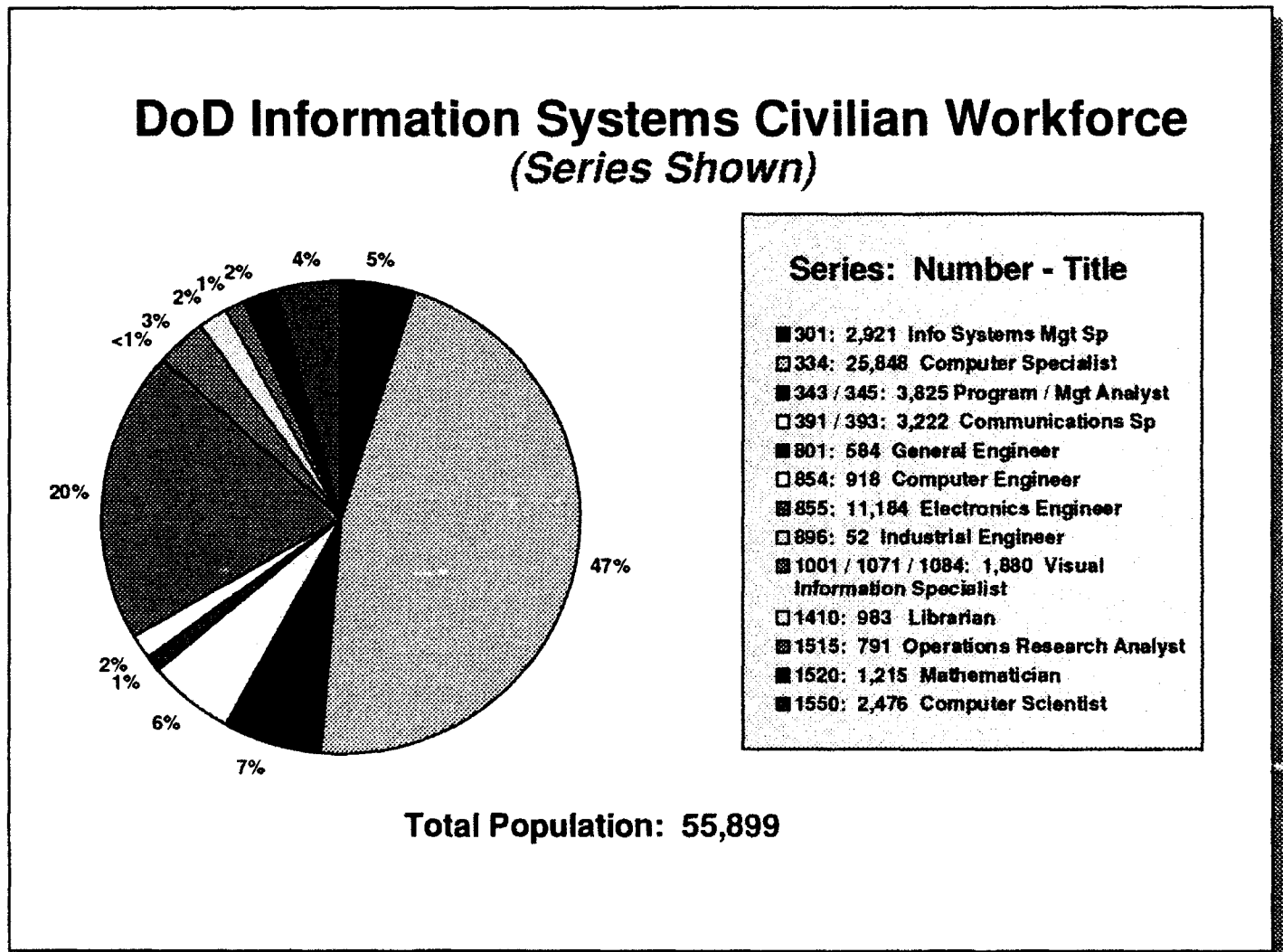
Total Population: 55,899

Figure 2-6

c. Education levels for this subset of the IS workforce were identified. As a group, a total of 66 percent has a baccalaureate degree or higher. For civilians, only a 57 percent has a baccalaureate degree or higher. For military officers, 92 percent has a baccalaureate degree or higher. Refer to Figure 2-6.

Education Levels

(Civilians in Series Shown Below and Military Officer Equivalents)

Military

8% 1%
52%
39%

Civilian

13% 1%
43%
43%

Total (Military and Civilian)

19% 1%
46%
34%

☐ < baccalaureate   ☐ masters
▨ baccalaureate   ■ doctorate

Series: 301, 334, 343/345, 391/393, 801, 854, 855,
896, 1001/1071/1084, 1410, 1515, 1520, 1550
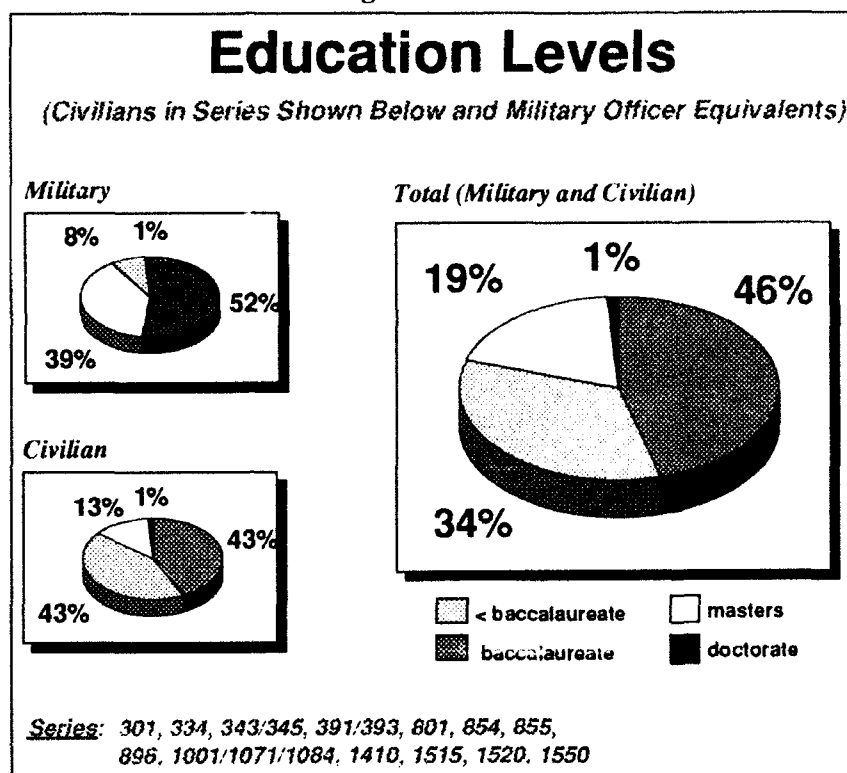
Civilian career fields which are composed of solely IS personnel include: 334 (computer specialist), 391/393 (communications specialist), 854 (computer engineer), and 1550 (computer scientists). Demographics have been determined for this group.

a. The overall male/female ratio for this group is 64/36. At the GS-12 and below level this ratio changes to 60 percent male and 40 percent female. At the GS-13 and above level this ratio changes to 79 percent male and 21 percent female.

b. The overall minority/nonminority ratios for this group is 19/81. At the GS-12 and below level this ratio changes to 21 percent minority and 79 percent nonminority. At the GS-13 and above level the ratio changes to 12 percent minority and 88 percent nonminority.

c. The grade distribution for this group has been identified. Approximately, 79 percent are at GS-12 or less level, and 21 percent are at GS-13 and above levels.

2. Top Ten Geographical Areas.

Workforce statistics reveal that the largest concentration of civilian information systems personnel is in the Washington, DC area. The largest concentration of military officers is overseas. The total number of military and civilian IS personnel in the DC area is over 20,000. The remaining top ten geographical areas of civilian employee population are in the following descending order:

Location	Population
Huntsville, AL	3380
San Diego, CA	3373
Oxnard-Simi Valley-Ventura, CA	2912
Philadelphia, PA	2864
Norfolk, VA	2817
Asbury Park, NJ	2749
St. Louis, MO	2576
San Antonio, TX	2303
Bakersfield, CA	2192

3. Schools.

DoD Schools that provide IS training fall into three categories. The first group includes those schools that provide education and training for a predominantly civilian audience. The second group of schools provides graduate degrees as part of military officer development. The third group of schools includes those that provide training for military skills development in military occupation or specialty areas.

a. **Civilian Training.** The schools that provide training for a predominantly civilian audience are the Information Resources Management College (IRM College), at Fort McNair, Washington, DC; the Defense Systems Automation Center (DSAC) Training Center, at Columbus, Ohio; the Army Management Engineering College (AMEC) at Rock Island, IL; and the Naval Computer and Telecommunications Stations (NCTSs) in various locations.

- **Information Resources Management College**, Ft. McNair, Washington, DC, is a component of the National Defense University and the Defense Acquisition University. Students are DoD mid-level managers and executives, military and civilians. The flagship course is the Advanced Management Program (AMP) -- a 16-week course targeted towards senior IS managers. The program's multidisciplinary curriculum includes the study of current policy issues, regulatory and ethical standards, strategy development and implementation, and decision making and problem solving options and alternatives. The AMP program is accredited for 19-23 graduate credit hours.

Other courses taught by the IRM College include IRM Policies & Issues; Strategic Planning for Information Resources (CIM); Information Engineering; AIS Functional Requirements; IRM Program Planning & Control; AIS Oversight & Control; AIS Security Strategies; Major Automated Information System Review Council (MAISRC) Planning & Preparation; AIS Procurement Strategies; Decision Making: Understanding New Applications. The College also provides technical assistance and consulting related to IRM policy.

- **Defense Systems Automation Center (DSAC) Training Center**, Columbus, OH is a component of the Defense Logistics Agency (DLA). Students are DLA telecommunications and computer interns and other journeyman level professionals covered by the DLA computer and telecommunications career development programs. DSAC has a training advisory council that reviews the school curriculum and oversees delivery of services. DSAC personnel receive forty percent of the Center's training; customers outside the DSAC receive the other sixty percent. Courses offered include MVS/COBOL, UNIX, C, and information engineering. Students may receive continuing education credits. Classes are both resident and on-site. In addition to the classroom training, DSAC supports a Computer Based Training (CBT) library of over 100 courses available to anyone on the DLANET of 50,000 terminals. The CBT courses deal with information systems topics, standard business and management skills, and CBT authoring courses. CBT courses are available to external organizations via the Defense communications network. DSAC also manages contractor/vendor training for DSAC to supplement in house curricula.

- **Army Management Engineering College** (AMEC), Rock Island, IL is a component of the Army Material Command and the Defense Acquisition University. AMEC provides training in over 150 different courses covering a wide variety of subjects and techniques. Students are predominantly mid-level DoD civilians (90 percent), with some military and foreign students. Over 40 of the courses are accredited by the Academic Council on Education. AMEC has an intensive Information Systems (IS) training program which includes the Army's civilian software engineering intern program run in coordination with Ft. Monmouth College, NJ. This intern program is DoD's only major internal source providing civilians with masters degrees in software engineering. The faculty at AMEC performs research and consulting to DoD activities for the expressed purpose of taking theory to the field and continued field experience to the classroom.

- **Naval Computer and Telecommunications Stations (NCTSs)** are components of the Naval Computer and Telecommunications Command (NCTC). The NCTSs are in Washington, DC, Newport, RI, Pearl Harbor, HI, Norfolk, VA, New Orleans, LA, San Francisco, CA, San Diego, CA, Pensacola, FL, and Jacksonville, FL. Not all sites provide training. Students are customers of the NCTS community who need the training in order to use specific software applications. Training is offered on a fee-for-service basis. Typically, the courses offered are office automation topics for the most commonly used application packages. The NCTSs also offer computer security accreditation training and consulting services in IS areas.

b. **Graduate Education in Computers, Engineering, and Communications Technology.** The Air Force Institute of Technology, Wright Patterson Air Force Base, OH, and the Naval Postgraduate School, Monterey, CA, are sources for this type education. Students are predominantly military officers who are pursuing a specialty or subspecialty IS education as part of their military career development.

- **Naval Postgraduate School (NPS)**, Monterey, CA. Students are military officers pursuing graduate and postgraduate education as part of their career development in a subspecialty. IS curricula include Master of Science with a specialty in computer science or information technology; a Doctor of Philosophy in computer science or computer engineering; and a Doctor of Engineering in computer engineering. NPS produces many other non-IS degrees. The NPS is accredited by the Accrediting Commission for Senior Colleges and Universities of the Western Association of Schools and Colleges. The Administrative Sciences curricula are accredited by the National Association of Schools of Public Affairs and Administration. The educational programs meet specific Navy requirements and generally have both a resource and functional sponsor. The functional sponsor generally serves as academic advisor.

- **Air Force Institute of Technology (AFIT)**, Wright Patterson Air Force Base, OH is a component of Air University. Students are predominantly military officers and professional civilian personnel. Curricula include both undergraduate and graduate programs. AFIT provides qualified enlisted members the opportunity to complete BS degree requirements in engineering and computer science. Officer training school follows program completion and results in commission as a second lieutenant, USAF Reserve. Prerequisites for this program include 45 semester hours of college credit. AFIT also offers graduate education and specialized education with and without degrees. The School of Engineering graduate program includes courses in teleprocessing, software, systems management, computer technology, electronics, etc. AFIT has approximly 'ely 479 regular graduate education students of which 30-40 percent are information technology students. AFIT also teaches non-degree resident and on-site courses.

c. **Military Skills Development.** Most of the IS schools in the Department of Defense fall into the military skills development category. They are the Army, Marine Corps, Navy and Air Force schools that are specifically in business to provide the occupational specialty training for military officer and enlisted personnel. They typically will take a handful of civilian employees as students on a space available basis. These schools are at Fort Gordon, GA; Quantico, VA; San Diego, CA; and Keesler AFB, MS.

- **Army Signal School (includes the Army Computer Science School)**, Fort Gordon, GA, is a component of the Army's Training and Doctrine Command. Students are predominantly Army military officer and enlisted (90 percent), with some civilian and other DoD military. Fort Gordon is the Army school that provides military skills training in

communications, computers, computer security and artificial intelligence. Courses offered include topics in artificial intelligence, information systems security, data communications and local area networks, software engineering, structured programming in Ada, object oriented analysis and design, UNIX fundamentals, and system administration. The Computer Science School also has courses in business reengineering, capability maturity model analysis and evaluation, UNIX system programming, and database programming.

- **Computer Science School and Communications Officer Schools,** Quantico, VA, are components of the Marine Corps Training Command, a component of the Marine Corps Combat Development Command. Students are military officer and enlisted personnel obtaining basic training in their military computer and communications occupational specialties. Courses include a basic curriculum for entry into the computer science and the communications fields in the Marine Corps. The **Communications and Electronics School,** located at 29 Palms, CA, also a component of the Marine Corps Combat Development Command, provides basic and advanced classes for military enlisted personnel in communications and electronics MOSs.

- **Naval Education and Training Center,** San Diego, is a component of the Chief Naval Education and Training, the Navy's organization for development, administration and management of Navy enlisted schools. Students are Navy enlisted personnel in specialties such as the data processing technician, data systems technician, radiomen, electronic technician, etc. Courses are those determined by the Navy to be necessary for training in the specialty rating. The Chief Naval Education and Training also administers the Navy Information Systems (IS) Career Management Program.

- **Keesler Training Center,** Keesler Air Force Base, MS is a component of the Air Training Command. Students are predominantly military personnel pursuing career development training in a specific specialty area such as electronics, computers, communications, etc. Courses include computer, communications, electronics, software languages, Ada, software quality assurance, information management and WWMCCS courses. Keesler AFB has mobile training teams. There are also IS courses currently at **Lowry Training Center** that is on the base closure list. These courses are being moved to Keesler AFB and the new Visual Information Center at Ft. Meade.

- **Visual Information Center,** Ft. Meade, MD (future site). This is a DoD Training Center that will consolidate all the Service's visual information training under one organization. Courses are geared to military specialty training. There may be some prerequisites that must be satisfied by a different site, e.g., TV maintenance requires a prerequisite in electronic principles that is satisfied through the **Keesler Training Center.**

4.   IRM College Training Survey.

On the basis of a request from the Director of Defense Information, the IRM College conducted a telephone survey of DoD trainers in April 1992 to determine training requirements for software engineering and Ada. The survey was limited to organic resources. As part of the survey, the IRM College reviewed the degrees provided by the Service schools. The survey revealed that the Service schools give a total of 378 degrees in computer science and software engineering. The software engineering degrees were provided by AMEC's School of Engineering & Logistics. The degrees provided are as follows:

Army

AMEC School Engr. & Logistics	Masters Degrees	37
US Military Academy	Bachelor Degrees	40

Navy/USMC

Navy Postgraduate School	Masters Degrees	165
US Naval Academy	Bachelor Degrees	40

Air Force

AF Institute of Technology	Masters Degrees	56
US Air Force Academy	Bachelor Degrees	40

Total   378

Chapter 3 - FINDINGS

1. Findings.

The Task Force developed a number of findings based on discussions with the DoD Components and private industry, a review of pertinent literature, and statistical analyses of the current information systems workforce. These findings highlight the current situations for education, training, and career development across the DoD IS workforce and identify successful practices found. Each of these findings is stated and explained below:

Policy Issues

Finding 1. There are no common DoD patterns in IS workforce education, training, and career development practices, military or civilian.

Currently, each Component separately determines both military and civilian DoD IS workforce education, training, and career development practices. Approaches range from highly centralized to totally decentralized. Additionally, there are major differences among the Components in terms of career development, certification requirements, tuition support, rotational assignments, central referral, training funds, etc. For example, information systems interns in the Air Force receive a three year training program; in the Navy, they receive a two to three year program, depending on the command they serve in; and in the Army, they receive from 18 months to two years, again depending on the command in which they serve. NSA and DIA have strong certification programs to maintain the technical vitality of their workforce; other DoD Components do not. The Army has placed a solid premium on educating its workforce in leader development as well as technical skills. The net result of these disparities is an uneven workforce proficiency.

Finding 2. There are no central policies, procedures, or organizational structure for IS career development.

No current DoD guidance exists today to address education, training, and career development for the DoD IS workforce. Differences in career development decisions are the prerogative of the individual Component. The lack of central management causes unequal career development paths and opportunities in terms of what topics are emphasized and what training and education are funded. As war fighting and infrastructure operations become more Joint in execution, all DoD IS personnel, both military and civilian, must have a standard high level of understanding and training in their professions.

Finding 3. DoD spends the equivalent of approximately one percent of its civilian personnel dollars on training. In contrast, per the Volcker Commission (1989), corporations in the private sector typically spend the equivalent of from three to five percent of their payroll on training and education, with successful corporations spending from five to ten percent. In the IS arena, the usual ratios may not apply and amounts spent on training may well exceed the average to deal with the rapid advance and obsolescence of technology.

DoD-wide estimates for training dollars spent average the equivalent of one percent of civilian payroll, much lower than private industry. For example, the Army estimates spending for civilian training is the equivalent of 1.5 percent of its civilian payroll. The Air Force estimates spending for centrally funded management development training is the equivalent of 3/4 of one percent of civilian payroll. Secretary of the Navy policy recommends spending the equivalent one percent of the annual operating budget be spent for civilian training. In contrast, per the Volcker Commission (1989), corporations in the private sector typically spend the equivalent of from three to five percent of their payroll on training and education, with successful corporations spending from five to ten percent. Due to the fast paced changes in the IS arena, even the typical private industry ratio of three to five percent may fall short of maintaining the technical vitality of the IS workforce.

Finding 4. There is a need for consistency and fairness in terms of policies and actions between the DMRD 918 centralized IS workforce and the IS workforce remaining in the DoD Components.

A significant portion of the existing IS workforce will be capitalized to DISA under DMRD 918. Consistent human resource policies and opportunities across all of DoD will allow the free flow of the "best talent" throughout the DoD to meet DoD mission needs, taking into account Component specific requirements for certification, training, rotational assignments, and referral. Additionally, for employees within the non-DISA workforce to successfully compete for training and promotion opportunities, they must be operating under similar Departmental rules and expectations. Our goal should be to seek the common high road not the separate lowest common denominator in IS education, training, and career development.

Finding 5. DoD is reevaluating how it approaches training and development, emphasizing a business environment for delivery of training.

In reevaluating how it approaches training and development, DoD is recognizing the need to change to a business environment for delivery of training using a fee-for-service basis. Fee for service could very well entail the full recovery of costs to produce and provide training to a customer base. It is believed that infusing a business orientation into the training function will result in better quality training products, better delivery of services, lower costs, better customer service, and best value in terms of delivering the right training to the right people at the right time.

Finding 6. The IS workforce must be linked and integrated with the DoD Acquisition Corps and other DoD-wide career fields.

There are overlaps between the DoD Acquisition Corps and the IS workforce, i.e., those acquisition personnel in the telecommunications-computer systems career field. These individuals must meet the qualification requirements for the acquisition portion of their jobs, but need the core training and developmental opportunities required by the IS workforce. The DoD must recognize and manage this overlap so that IS people are broadly skilled and competitive in both acquisition and IS subjects. Other overlaps will emerge as consolidation of similar activities and career fields continues on a DoD-wide basis.

Training Issues

Finding 7. There is no oversight on IS education and training.

It is not known at present what IS courses and delivery capabilities DoD has, what are the required and spent IS education and training dollars, or what the value of the training is as measured against such benchmarks as employee performance and managerial expectations. In addition, there are no mechanisms to identify IS education and training shortfalls and duplications.

Each DoD Component estimates requirements and dollars required for IS training, using its own internally generated analysis methods, ranging from top down to bottom up approaches. In the current era of DoD downsizing, these estimates have generally been overcome by budget cuts, sometimes to the point that training dollars, especially for the civilian IS workforce, are becoming increasingly scarce.

Tracking expenditures on training is also imprecise. DoD Component reports for training dollars spent reflect only those amounts that are either centrally controlled or acquired through a central course quota mechanism/reporting system. Courses funded out of O&M funds, such as unit funded local courses, are frequently not visible in current training expenditure reporting.

Both private industry and the DoD are grappling with how to measure the effectiveness of training and education. Current methods involve end of course critiques and follow on supervisor assessments of employee improvement. Development of metrics in this area is in its infancy but deemed essential to raising proficiency levels and cutting costs in training budgets.

There is no central repository on course availability, training requirements, or course effectiveness; therefore, there is no avenue to identify duplications, needed changes, and shortfalls. Also, there is no systematic way of addressing curricula parity and coordination among the DoD Components.

Finding 8. Technical vitality (recent IS degrees, publications, inventions, certifications, etc.) of the IS workforce is critical to effectively deploy information systems in support of the DoD war fighting mission.

Communicated throughout our meetings with services, agencies and private industry was the need to provide recurring technical training to individuals, especially at mid-career and executive levels. This training is essential to avoid technological obsolescence of the IS workforce and to keep pace with the acquisition and deployment of more advanced computer and telecommunications systems. Options to maintain technical vitality include short courses, tuition assistance, and/or certification.

Finding 9. Streamlining training overhead will reduce costs. Maintaining currency and the initial implementation of high tech training methods will increase costs.

Through consolidation of training and education activities, services and/or resources, overhead involved in providing these opportunities can be minimized as evidenced by both DoD and private sector training consolidation endeavors. Offsetting these cost savings, however, are the increased costs associated with funding training at higher levels to provide for technical vitality training and education and the initial costs of implementing more technologically advanced training delivery methods, such as distance learning and computer-based training. Once in place, however, these methods can reduce the resources involved in course preparation, presentation, and maintenance.

Finding 10. Training conducted at the work site, which is interactive and just in time seems to "pay off" most in terms of individual motivation and retention.

A high return on investment from training requires individual motivation, employee retention of training, and on the job reinforcement of training. Employees are motivated to attend training if it improves their performance and if classes are easy to attend. For skills based training, employee retention is improved with interactive training methods instead of classroom training. Employee retention is also improved by on the job reinforcement of newly acquired skills soon after the training, emphasizing the need for just in time training. In several of our visits to both DoD and private sector organizations, we found that on site, during work time courses (typically accredited and from local colleges and universities) were extremely beneficial in terms of professionally motivating employees and improving productivity by directly linking work and study.

Finding 11. IS "boot camps" in the private sector are a possible means to quick-train new entrants and retrain mid-level IS individuals.

In private industry, "boot camps" are high intensity structured training programs where IS professionals get in-depth hands-on experiential learning on a particular aspect of their organization's work, such as systems engineering, network management, or activity based cost

accounting. These courses, typically three to four weeks in length but sometimes running three to four months depending on the subject matter, work the employees hard in realistic computer-communications situations, exposing them to typical situations and providing corporate approaches to work problems. Also, these boot camps serve to familiarize employees with the company's information systems direction and corporate value system.

Career Development Issues

Finding 12. There is no central focus on IS SES management or succession planning.

There are no SES candidate development programs for SES positions in the IS workforce either on a DoD-wide basis or within the Components. The Department of Defense must focus on SES management as DoD begins to build a central computer and telecommunications infrastructure to support the entire Department. A well educated (in terms of IS technical skills and leadership and business education) and statistically significant SES Corps is essential to DoD's future success in the information systems world. These SES must be role models, highly capable of executing the change agenda, and strongly skilled in coaching, facilitating, and motivating a high performance, diverse workforce.

Finding 13. Certification programs can increase the professionalism and performance of the workforce.

Organizations with certification programs in place such as NSA and DIA benefit from a higher percentage of the IS workforce having recent degrees or technical training, common standards and levels of proficiency for all individuals attaining a certain grade, and demonstrated ability to plan and conduct a work-related project of benefit to the organization. All of this is in addition to technically competent performance. Certification programs are usually accompanied by higher retention rates and improved performance.

Finding 14. Army, Navy, and DISA state that the specialties included in the "IRM/Paperwork Reduction Act" model (visual information, records management, library science, printing and publications as well as computers and communications) should be part of the IS workforce.

We agree. Inclusion of all specialties specified in the "IRM/Paperwork Reduction Act" will encompass the entire spectrum of the information systems individuals and reduce potential confusion by providing a common definition of the IS workforce. The inclusion of these individuals in the IS workforce involves the development and use of technical IS training standards and the opportunities for them to be part of the DoD-wide career referral and development programs for IS individuals.

Finding 15. IS career development is trending towards multidisciplined professionals for cost and performance reasons.

Both private industry and the DoD are turning to the concept of multidisciplined professionals in the IS workforce to provide flexibility and professional broadening in work assignments, facilitate matrix or team management, and provide highly developed technical and leadership skill levels in downsized workforce conditions. Process reengineering also highlights the need for a customer focus, a business approach to systems management, and cost awareness layered on a solid foundation of technical skills.

2.   Job Clusters and Career Pathing

The Task Force developed a concept of job clusters that it believes will form the foundation for career development for the DoD IS workforce. Job clusters represent sets of skills needed to be effective in given technical arenas. Career development is the road mapping of what an IS worker can expect to experience during the course of his or her career, in terms of skills levels, education, training, and assignments. In combination, these concepts form the basis for career development planning for the multidisciplined IS workforce of the future. The career development and job cluster concepts are stated and their interactions explained below.

Career development describes the lateral and upward movement anticipated for an IS individual throughout his or her career. As shown on the diagram, the process begins with the individual trained in the entry level skills of a specific job specialty, followed by movement through IS education, training, development experiences within a job cluster and across job clusters, and moving forward to the multidisciplined IS executive level. The IS education, training, and development opportunities span the spectrum of the IS work place, with training common to everyone in the IS workforce, training specific to the job clusters, and training specific to planned reutilization of existing workforce.

Common training intended for everyone in the IS workforce targets technical, leadership, and customer focus learning opportunities. Technical training provides the day-to-day hands-on skills needed to perform present taskings and to maintain technical vitality. Leadership training provides the critical skills of goal accomplishment through other persons via good leader and follower practices, team building, and interpersonal skills. Customer focus emphasizes customer needs consistent with total quality management, process reengineering, and good business practices. Finally, corporate culture training provides the big picture view of how an individual fits into the organization's mission and value system.

Specific to job clusters are training, education, and developmental or rotational assignments to provide tangible skills and experiential learning in the roles and responsibilities associated with the cluster. Finally, retraining for employee reutilization provides a means to "retool" workers with new skills when their existing jobs are being phased out.

Figure 3-1 is a visual representation of job cluster and career development concepts.

Figure 3-1

DoD Information Systems Workforce
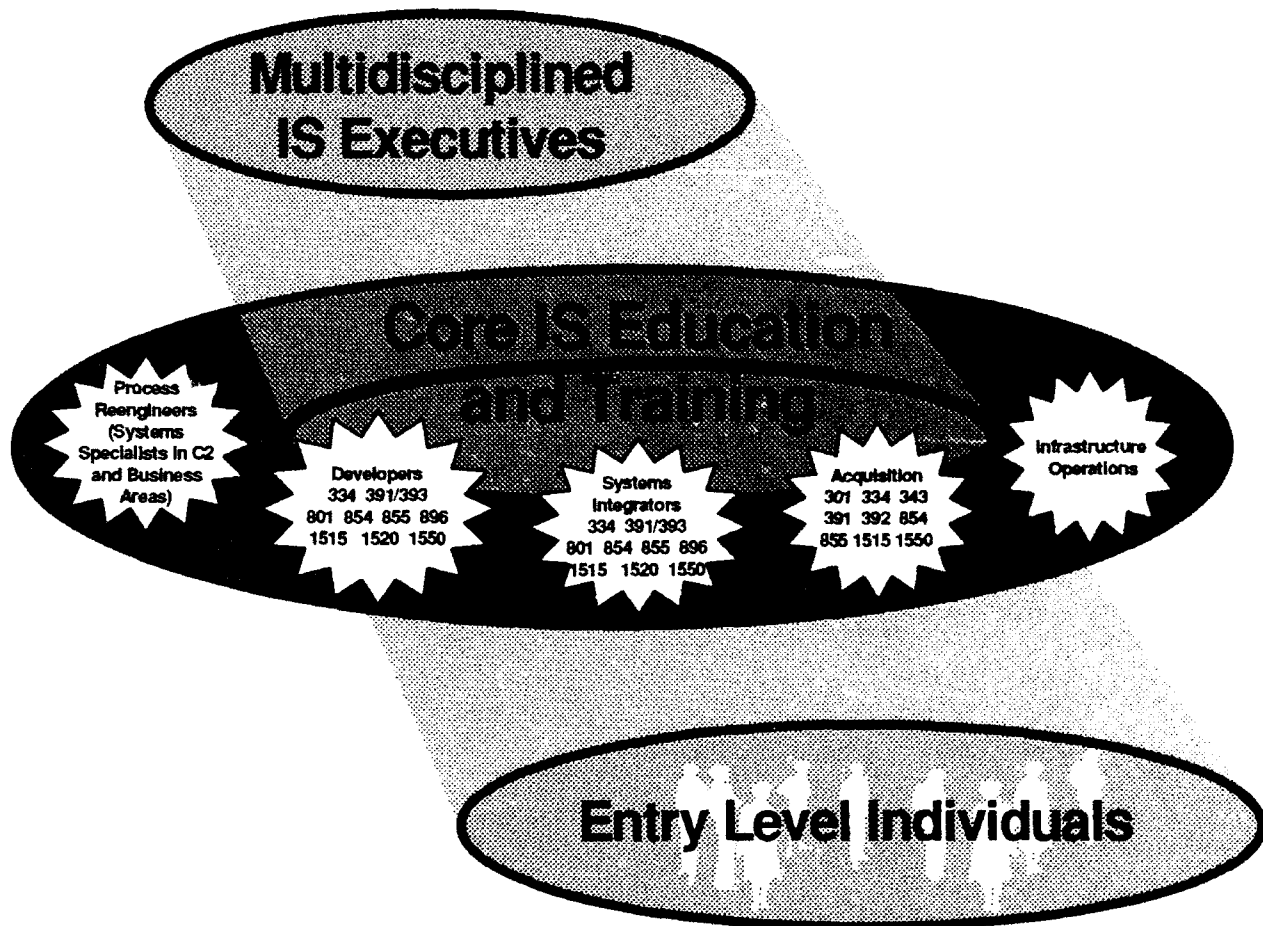
Each of the five job clusters represents a set of skills needed in specific technical areas and spans several job series. These skill groups represent the types of needed skills projected under the DoD IS workforce of the future consistent with DMRD 918. The proposed job clusters are: process reengineers, systems developers, systems integrators, acquisition, and infrastructure operators. For clusters where distinct job series are proposed, the job series typically involved in the activities or tasks of a job cluster are listed on Figure 3-1.

Process reengineers are information systems analysts who are trained first in a functional specialty, and then in computer and telecommunications skills. These persons are the hybrids or cross between a functional systems analyst and a computer specialist. They can translate the user community needs into requirements within the framework of functional (C2 or business) process reengineering. Process reengineering skills are paramount in achieving DMRD savings and transitioning DoD to single Departmental information systems.

Developers are the technical information systems people who design, code, implement, and maintain computer and telecommunications systems. These individuals apply technology to meet the customer requirements for information support. Essential are technical skills and experience in software, communications, networks and computer systems development and maintenance (including life cycle planning and project management).

Systems integrators provide data integration, systems integration, and network integration support, putting together government and contractor developed technical products and systems. These persons must be skilled in software engineering, systems development standards and tools, data administration, software repositories, systems development, reengineering, maintenance, and interconnectivity of data, systems, and networks. A systems approach, combined with telecommunications-computer systems experiences and strong problem solving skills are paramount.

Acquisition individuals are those telecommunications and computer systems people who are part of the DoD Acquisition Corps. These people are in the business of acquiring telecommunications and computer resources and services to meet the DoD mission needs. They must meet the mandated DoD Acquisition Corps education, training, and experience and yet meet the training and career development standards of the DoD IS workforce. Required are strong IS technology, education and skills layered onto telecommunications-computer systems acquisition training.

Infrastructure operations people provide the day-to-day administration, operation and management of the network control centers, data processing installations, and software development centers. These individuals are in the business of supporting customer needs through operation of telecommunications and computer systems resources. Telecommunications-computer system operations, resource management, and customer focus skills are paramount.

These five job clusters exist at various grade levels, with entry, mid and senior levels in each as appropriate for the responsibilities involved. Career development provides opportunities for entrants to gain depth of experience in one cluster, then move between clusters if desired at the mid-levels, and to seek out senior levels after gaining experience in more than one cluster. In sum, the career development paths depicted provide for both upward and lateral growth in terms of experience, training and developmental opportunities.

Chapter 4 - RECOMMENDATIONS

The Task Force developed a number of recommendations that it believes will build a foundation for the education, training, and career development of information systems individuals in the Department of Defense. The recommendations are broad based and relate directly to the information systems human resource goals that will help ensure the success of DMRD 918. Each of these recommendations is stated and explained below.

Recommendation 1. Codify initial policies and doctrine for information systems education, training, and civilian career development with ASD(C3I) as the central manager. As such, ASD(C3I) will:

a. Develop the education, training, and career development doctrine and policies for information systems professionals focusing first on process reengineering, systems integration, and systems development.

b. Establish policies and doctrine to place needed information systems education and training into the appropriate DoD schools.

c. Review and approve all DoD (military and civilian) information systems training

d. Program and budget for core information systems training and education.

e. Establish the DoD-wide management structure for information systems education, training, and civilian career development.

DMRD 918 specifically assigns the central management of education, training, and civilian career development to the ASD(C3I). This involves the policy, oversight, and resource management responsibilities for these programs. Because of the need to develop and maint.. the technical vitality of our information systems workforce, the DoD must establish initial policies and doctrine regarding skills training, management and leadership education, and career development. Two fundamental DMRD principles -- the creation of an organic DoD systems integration capability and the expectation that major dollar savings will accrue from the restructuring of functional processes prior to their being automated -- prompt us to recommend that the education, training, and career development of process reengineers, systems integrators, and systems developers be given first priority.

Information systems education and training outside the information systems community are sparse. The DoD must increase the "computer literacy" of military and civilian employees within the DoD from GS-3s and PFCs to the SES and flag officers. This becomes a critical skill as future military engagements will be quick, lethal, and "light" requiring minimum

equipment and expert knowledge on the part of the military individuals (who may not be systems technicians) who deploy. The DoD military and civilian schools, at all levels, are excellent places to interject computer and telecommunications training modules. In addition, the DoD needs to enhance and make available to all DoD SES and flag officers, Active and Reserve, executive level education in this area such as the Army's ARES (Army Executives for Software) course at the US Military Academy at West Point, the Air Force's Bold Stroke, and the Marine Corps' General Officer course at the Naval Post Graduate School. Our top executives need to be aware of and job wise conversant, at a minimum, in systems thinking; the criticality of computers and telecommunications during warfare; information systems: the concepts, costs, risks, and business principles; and future economic and technology trends.

The need for the ASD(C3I) to review and approve education and training curricula and budgets becomes imperative as the Department downsizes and seeks to rapidly improve the technical vitality of its information systems workforce. Courses must communicate state of the art technical skills as well as the common goals and directions of the Department. From a central vantage point, the DoD must also look at unnecessary course duplications or potential efficiencies that can accrue through consolidations to assure maximum cost savings and consistency in maintaining capabilities across the Department.

We discovered in our visits across the DoD and with several private corporations that education and training is funded from two sources -- direct corporate or "appropriations" funding and fee-for-service funding. Initially, it makes sense to fund certain critical core civilian skills such as process reengineering, systems integration, and leader development that are equivalent to military core or specialty training out of central funds. Other education and training would be paid for on a fee-for service basis. As fee for service in the training and education realm becomes a concrete policy, the central manager needs to establish the guidelines and rate structures for implementation in the information systems community.

The best management structure to oversee information systems education, training, and career development is a small, focused office headed by a Deputy Director in the Office of the Director of Defense Information. Major functions of this office would be DoD-wide policy formulation; liaison with Congress, OPM, industry, and academia; identification and defense of program resource requirements, budget and curricula review; linkage arrangements with other DoD-wide career programs and the OASD(FM&P); IS SES program management; and recognition and incentive programs. A support element directly supervised by the Deputy Director would perform career development, training, and education line functions. This organizational structure parallels that of the two other DoD-wide career development offices -- the Director, Acquisition Education, Training, and Career Development in the Under Secretary of Defense (Acquisition) office and the OSD (Comptroller) office responsible for career development and training. The concept of an executive agent to perform these operational line functions is not recommended for two reasons. First, an executive agent probably would not be viewed as an "honest broker" by the rest of the community, and, second, executive agency commitment and priorities could vary as the head of the executive agency changes.

Recommendation 2. Commit the equivalent of five percent of information systems civilian payroll dollars to training and development.

DoD annual reports state that we spend for training and development the equivalent of approximately 1.1 percent of payroll dollars. The latest figure for the entire Federal civilian workforce (excluding the US Postal Service) is .8 percent. However, within the Federal government, percentages vary widely. For example, the Internal Revenue Service which has a relatively extensive training and development program spends the equivalent of about 8 percent of payroll on training. In comparison, one estimate for all Fortune 500 firms places training expenditures at 3.3 percent equivalent of payroll, with many progressive and successful firms spending 5 to 10 percent equivalent of payroll on employee training and development.

The dramatically changing DoD information systems environment will require for its people new skills and career development strategies. The DoD must allocate a minimum of the equivalent 5 percent annually in FY 93 dollars for the civilian information systems workforce and keep it in a central fund. This provides $3,000 per year per individual for approximately 73,000 civilians. Until such time as training and development fall within the fee-for-service structure, there will be a requirement to provide a centrally funded account for information systems training and development in the budget.

Recommendation 3. Develop standards and implementation strategies for the education, training, and career development of the entire DoD IS workforce. The basic steps involved in doing this are:

a. Identify the baseline information systems workforce based on DMRD 918 implementation decisions (numbers, job series, locations, etc.).

b. Identify core competencies and job clusters relative to future organizational needs. Also estimate the future mix of military to civilian and government to contractor personnel in order to more specifically target training needs.

c. Develop assessment tools for individuals and managers to define current workforce competency levels.

d. Determine career development strategies for individuals to improve their job performance, become more technically proficient, and satisfy future organizational skills and leadership needs.

e. Develop two strategies for information systems education, training, and career development. The first is an immediate (FYs 93 and 94) transition plan for the IS workforce affected by DMRD 918. The second is a long term (10 year) strategy for the entire DoD IS workforce.

f. For both strategies, devise measurements to assure that training and education are effective and the performance of the DoD information systems workforce improves.

g. Develop, conduct, and centrally fund (in FY 93) "training for change" courses that will encompass DoD's DMRD 918 vision, common goals and directions, etc. Conduct these courses in an economical manner and apply them DoD-wide.

The DoD information systems workforce, which includes both military and civilian individuals, is a large and diverse mixture of over a dozen job specialties. The DoD Components manage them separately and differently. The immediate challenge is to accurately identify the critical components (numbers, skills, locations -- current inventory and future requirements) of the DoD IS workforce and develop a transition plan for FYs 93 and 94 that will link changing human resource requirements with the central infrastructure needs as stated in DMRD 918.

The FYs 93/94 transition plan will focus first on identifying and developing the process reengineers, systems integrators, and the systems developers. These are the key job clusters needed to restructure and redefine the Department's major functional processes to effect the savings targeted in a variety of DMRDs, to develop the organic DoD systems integration capability, and to develop and maintain the DoD migration and future information systems. In addition, the transition plan needs to state which specific core competencies, skills (both technical and managerial and business), and education and training the DoD IS workforce needs, to identify assessment tools for defining current competency levels, and to identify specific career development paths to transition from current to future skills levels. In addition, the required costs and available delivery services must be evaluated.

The ten year strategy plan will include a more rigorous analysis of the force structure considerations mentioned earlier. Issues such as the best military/civilian and government/ contractor mix of individuals and specialties should be analyzed and recommendations made. Fundamental concepts such as systems integration being an organic DoD capability and information systems individuals becoming more broadened technology leaders rather than stovepipe technicians will also influence the direction of the strategic plan. Funding options, ideally, will be more varied. Fee for service in the training and education function should be operational and permit organizations to use a market driven environment to construct and deliver education and training opportunities.

A difficult but necessary part of both the immediate and ten year strategy plans is the identification and development of measurements to assure that education and training dollars are well spent, i.e., human performance substantially improves at a reasonable cost to the government.

Lastly, DMRD 918 is a major change in the way DoD conceptualizes and manages information systems. To accelerate learning and acceptance of the "new world order," the DoD needs to develop a series of "training for change" courses and give them to every individual in the DoD information systems workforce.

Recommendation 4. Initiate a DoD-wide information systems civilian career development program. The main steps involved in constructing this program include:

a. Develop information systems career paths based on the information systems cluster concept, first focusing on the process reengineers and the systems integrators and developers.

b. Designate key information systems positions, DoD-wide, for central selection and rotational assignments.

c. Establish programs to intake top quality information systems individuals at all levels, i.e., entry, mid-level, and executive.

d. Establish certification programs for information systems professionals.

e. Emphasize information systems degree programs (on and off duty), offering a certain percentage funded centrally on a competitive basis.

f. Develop a DoD-wide information systems career development and referral system which enables crossovers among the DoD Components.

Information systems career development for civilian employees in the DoD varies widely among the Components. Our intent in designing a career development program for use by the entire Department is to take the best examples from all the Components as well as from selected ones in the private sector and construct a program that takes the high road rather than the lowest common denominator.

Our overall career development pattern takes in individuals from over a dozen job series, trains them initially in their entry job series, broadens them individuals by introducing additional skills and knowledge in their cluster groups, then further broadens them by cross training as appropriate in other information systems related clusters. Training and education in managerial, leadership, and customer/business skills and knowledge is interwoven with this technical skills training. The DoD must strongly emphasize rotational assignments in various infrastructure components (network control centers, software design agencies, etc.) and DoD organizations (CINC headquarters, Component organizations, etc.). The end goal will be to produce executive level information systems leaders who are broad-based in their technical, interpersonal, conceptual, and business skills and abilities.

The most important career clusters to develop first are the systems integrators, the systems developers, and the process reengineers. The integrators and developers essentially have the same series. The main difference is that the developers are typically more singularly skilled in their entry series and can work solely on systems development work such as coding or maintenance for their entire careers. However, it is from this group of systems people that the integrators are "born and raised." An implementation goal will be to define the specific skills and associated training and education needed to grow or hire our DoD systems integrators. We currently do not include process reengineers in our statistics for the information systems workforce; however, these are individuals who are equally adept in systems development and functional analysis skills. They are critical in spearheading efforts to restructure and remodel the Department's business and C2 functional processes to achieve DMRD savings and streamline Departmental operations. Again, an implementation goal will be to define more clearly the career development and training required for these people.

We are recommending designating key information systems positions throughout the Department for central selection and rotational assignments. For central selection, these would be the key jobs in DISA and, for consideration, similar jobs in the DoD Components. For rotational assignments, these would be positions throughout the DoD in all information systems areas (business, C2, and weapons systems). Although the mission supported may be outside the DMRD 918 scope, the basic skills and knowledge required is the same for the individual. Thus, rotational assignments in these areas can improve the performance of both mission areas and information systems professionals.

The intake of top quality information systems individuals is imperative at all levels, entry, mid-level, and executive. Programs are typically less concentrated at the mid and executive levels, but we believe there is great merit in introducing some of these experienced individuals into the workforce. Rotational assignments with industry or academia as well as opening the entrance gates wider at mid-career are avenues to pursue. At the entry level, there are numerous existing programs to intake individuals, e.g., the Outstanding Scholar Program, Presidential Management interns, 2/4 year college scholarships, summer students and co-ops. In addition, it would be beneficial to establish and centrally fund a DoD-wide information systems intern program. At present, there are no standards in this area, and the programs among the Components vary widely in dollars available and technical subject matter emphasis. A standard intern program, emphasizing degreed individuals but providing opportunities for upward mobility individuals, would benefit the Department by providing an upgraded, common technical baseline for the entering workforce.

Certification is an excellent way to improve the technical vitality of the workforce and enhance the contribution of the individual to the organization. There are numerous types of certification programs. The best ones appear to be those which involve a combination of completing designated courses, successfully designing and completing a project, and/or writing a paper -- all these endeavors being directly related to the person's work. There are three points in an information systems individual's career when certification makes sense -- first, after

entering the workforce and completing initial training; second, at mid-career, typically to promotion to GS/M-13; and, lastly, at the executive level. The DoD needs to develop the certification for each of these levels and, as is the intent of the program, make the process as natural and as least bureaucratic as possible.

Two of our force structure considerations -- to develop an organic DoD systems integration capability and to transition individuals from stovepipe technicians to broadened technology leaders -- imply that we will need a more highly educated information systems workforce. At present, 57 percent of our civilian workforce has a baccalaureate degree or higher. Yet, the needed technical integration and managerial/business skills require the knowledge that only college level (both undergraduate and graduate) courses and degrees typically provide. We are recommending that a portion of central education dollars be set aside and competitively funded for those individuals who are pursuing college degrees in information systems fields. Ways to make this most economical are through distance learning techniques, on-site classes, and off-duty courses.

Lastly, to manage an exceptionally large workforce, we are recommending a DoD-wide information systems career referral system that would allow crossovers among the DoD Components. The referral system should be easy to use (by both employees and managers), and should provide value added (skill codes, personal career assessments, etc.). A decision should be made on implementing a referral system as soon as practical in the DMRD 918 implementation to assure that individuals coming from all the Components into DISA will have a means to register and be competitive for future career opportunities.

Recommendation 5. Evaluate information systems training and education activities for consolidation and increased efficiency.

This recommendation is directly attributable to DMRD 918. The following major schools or consortium of schools should be, at minimum, the basis for an analysis of numbers of instructors and types and numbers of courses/curricula taught. These schools include:

> The Information Resources Management College
> Defense Systems Automation Center (DLA)
> The Army Computer Science School*
> The Army Management Engineering College
> The Marine Corps Computer Science School*
> The Marine Corps Communications Officer School*
> The Marine Corps Communications and Electronics School*
> The Naval Postgraduate School*
> Naval Education and Training Centers*
> Naval Computer and Telecommunications Stations
> The Air Force Institute of Technology*

Keesler Training Center*
The Visual Information Center*

* Indicates that the school is primarily targeted towards providing military specialty training and/or education.

The evaluation should recommend specifics for the elimination of unnecessary overhead, course duplication, and/or obsolete courses; potential areas to cut costs and/or improve management efficiencies; opportunities for computer based training and distance learning; obvious and glaring shortfalls in training and education; and outside sources (private corporations, academia, other government agencies) which can provide information systems technical training to the DoD.

Recommendation 6. Develop an Information Systems Executive Resources Program.

On a percentage basis, there are relatively few SESs in the DoD information systems community. This small group of less than 70 individuals represents the current inventory of senior civilian executives from which to build the Department's IS infrastructure.

Based on the far reaching goals of DMRD 918, the need for an increased number of information systems senior civilians is apparent. The implementation of DMRD 918 will establish new mega centers for systems development, data processing, and network control. An appropriate number of senior executives possessing both technical and managerial expertise must be groomed and hired for these key positions. At present, it is uncertain, over time, what the SES/flag officer ratio will be for these key positions. It can be assumed, with the drawdown of the military force structure and the inclination of the Services to save their scarce military resources for the combatant positions, that there will be a need for increased civilian executives in the information systems infrastructure. The target SES/flag officer ratio will probably change towards a higher percentage of SES individuals; however, to assure military needs are met, there must be a credible percentage of flag officers in the information infrastructure.

Despite these dilemmas, the need remains to develop a top notch executive corps of information systems individuals, both military and civilian. The DoD needs to develop a specific strategy to grow, groom, and deploy these individuals. First, the DoD must make an exact definition and current inventory of the information systems executive workforce by numbers, skills, and locations of the individuals, e.g., should it include only SES and flag officer billets or also include GM/S-15 and O6 billets. Next, the DoD needs to analyze force structure considerations such as the targeted military/civilian mix and the specifics of the military billets that will be in the information systems infrastructure. The DoD also needs to make an initial estimate of the number and types of executive positions needed in future years. Finally, the DoD needs to develop career paths that will emphasize standards for technical and

managerial/business training as well as executive certification and rotational assignments. Rotational assignments should be inside the DoD, and occasionally outside the DoD, particularly with industry.

Succession planning is an essential aspect of SES development especially in FYs 94 and 95 when a larger than usual percentage of senior executives are expected to retire. We recommend that the information systems community work with the staff in OASD(FM&P) on succession planning so that it is consistent with other DoD initiatives in this area. Also, we recommend that SES billets in the central information systems infrastructure be centrally managed for the benefit of the organization as well as that of the individual professionals. Central management can assure the optimum utilization of these critical resources across the organization and can be a positive force in ensuring retention of the billets in the information systems community. By also providing career path guidelines, central management can better guarantee that the Department of Defense has the correct mix of technical and managerial skills and knowledge to provide world class information systems infrastructure management.

Recommendation 7. Within the framework of the Information Technology Policy Board (ITPB), establish a high level Information Systems Skills and Education Working Group.

To assure top quality and consistent career development, education, and training throughout the entire DoD information systems workforce, we recommend an Information Systems Skills and Education Working Group be established within the ITPB. Reporting to the ITPB, this standing group at the GS/M-15/O-6 level will study workforce (military and civilian) skills, career paths, education, and training and provide recommendations to the ITPB for executive level review (SES/flag officer).

In addition to the current ITPB DoD Component membership, additional members would be included in the Information Systems Skills and Education Working Group to facilitate infusion of a variety of career development, education, and training ideas. Additional members would include the Service academies, the Reserve Components, selected DoD schools, the private sector, and academia. For the private sector and academia, membership would be on a rotating basis to involve different communities and viewpoints and assure a competitive basis for information exchange.

Through the working group, the ITPB would serve as a forum for infusing senior Component leadership into the career field and ensuring consistency of concept and application of policies across the DoD. Also, the ITPB forum provides the means to expeditiously interject decisions into DoD policies for maximum value.

To assure that the Board is neither infringing on nor duplicating work of the Inter-Service Training Review Organization (ITRO), the Information Systems Skills and Education Working Group should establish and maintain close ties with the ITRO. (The ITRO, formed in 1972, has the objective of eliminating duplicate training programs, reducing costs associated with training and training development, and standardizing courses of instruction. ITRO focuses predominantly on military training.)

Appendix A - TASK FORCE METHODOLOGY

The purpose of the Executive Resources Task Force was to develop a concept and implementation plan for the education, training, and career development of information systems individuals in the DoD. To perform this assignment, we adopted the strategy to seek out the best and brightest ideas in DoD and private industry and develop an implementation plan that identifies where the Department is now in relationship to where it needs to be positioned for the future.

The Task Force used three methods to gather data for its report: site visits, literature search and workforce statistical analysis.

We made brief site visits to several top information systems organizations including Xerox, Electronic Data Systems, and International Business Machines. These organizations each had top notch human resources programs that were used as models by the Executive Resources Task Force. In addition to industry visits, the Task Force visited many DoD organizations. DoD Components visited included: Defense Intelligence Agency, National Security Agency, Defense Information Systems Agency, Defense Logistics Agency, the Army, the Navy, the Marine Corps, the Air Force, and the Information Resources Management College. In addition, we held discussions with a number of senior staff members in various OSD offices. The Task Force found excellent models for IS education, training, and career development throughout the DoD.

The literature search of publications, reports, books and periodicals provided additional insight into human resource practices, concepts and ideas as well as analyses and discussions of issues similar to those confronting the DoD as it realigns its information systems workforce. The literature review list is at Appendix C.

We conducted workforce statistical analyses concurrently with the site visits and literature search. The Defense Management Data Center (DMDC) provided data to support this requirement. To assist DMDC in identifying IS workforce individuals, we used DoD and Service occupational manuals and regulations.

We analyzed and evaluated all of the information obtained during the research phase. Based on this evaluation, the Executive Resources Task Force developed a draft concept and findings. The Task Force briefed these to the DoD Components during its visits and obtained input from all the organizations visited. We briefed the initial report to the DoD Information Technology Policy Board on 16 September 1992. The Board approved the report, and we incorporated changes recommended by the Board as well as those made by other DoD Components into this final report.

Appendix B - BEST PRACTICES

A SUMMARY OF EXCELLENT PROGRAMS IN DoD

This appendix summarizes current DoD best practices in the IS world which can be considered as potential models for the DoD-wide IS education, training, and career development program. The best practices included are listed below.

ARMY .... Civilian Leader Development

ARMY .... Career Program 34

NAVY .... College at Sea Program

NAVY .... Naval Academy Multi-Media Educator Assisted Network System

AIR FORCE .... IS Career Management

NSA .... IS Certification Program

DIA .... IS Certification Program

DIA .... On-Site Training

DLA .... On-Site Training

OUSD(ACQUISITION) .. Course Quota Allocation

BEST PRACTICES - ARMY
CIVILIAN LEADER DEVELOPMENT

The Army designed a career development program that is a sequential and progressive development of its key civilians from intern to SES, similar to the system for military officers. This civilian leader program has as its objective the development of high performing civilian members of the force.

The main mechanism through which the Army delivers this program is the Army Civilian Training, Education, and Development System (ACTEDS). ACTEDS has as its origins a 1985 Department of the Army Inspector General report criticizing a number of civilian training deficiencies and recommending that the Army takes a more pro-active role in leading and caring for civilians. ACTEDS is a blend of institutional training, operational assignments, and self development. It is functionally based and offers the civilian individual a career progression road map. The ACTEDS program includes central funds for interns, leader development courses, senior service colleges and fellowship programs, and selected career program competitive opportunities. Army organizations cover the training costs associated with mandatory skills training, supplements to the central programs, and unique organizational requirements.

Army leader development courses are at the heart of the ACTEDS program. These courses start at the intern level, go through to the SES executive ranks, and provide top quality leadership education and training for civilians. These civilian leader development courses parallel similar training for the military (see Figure B-1.)

Figure B-1

Army Leader Development Courses

CIVILIAN		MILITARY
Capstone (Proposed) Ldr Dev Prog (CCL) Force Integ SES Orien Conf	Mandatory for Senior Executive Service	Capstone Ldr Dev Prog (CCL) Force Integ BG Orien Conf
Senior Svc Coll	Sr Managers (GM 14-15)	Senior Svc Coll
*Orgl Ldrshp for Exec Pers Mgt for Exec *New Mgr Crs	New Managers (GM 13-15)	
Army Mgt Staff Coll	Key Positions (GS/GM 12-14) (GS/GM 15 By Execption)	Cmd & Gen Staff Coll
Action Officer Crs	Staff Off Tng (Any Grade)	Comb Arms & Svcs Stf Sch (CAS³)
Ldr Educ & Dev Crs *Basic Supv Crs	Mandatory for Supervisors (Any Grade)	Officer Adv Crs
Intern Ldr Dev Crs	Mandatory for Interns (GS 5-9)	Officer Basic Crs

Progressive and Sequential Schooling

* Will be mandatory when adequate spaces or corresponding studies are available
** Selected positions only

One of the best courses is the Army Management Staff College 16 week course (target population is GS/M 12s-14s) which is equivalent to the Army's Command and General Staff College for majors and lieutenant colonels. The course emphasizes major Army directions and programs, management concepts, personal assessment, communications skills, executive health, and leadership concepts and applications. The College instills learning through methods such as lectures, papers, case studies, and examinations. Army expects to train 600 civilians annually starting in FY 93. This is a career enhancing course for individuals seeking to enter the top mid-level positions and advance further in the Army.

Lessons for DoD: As the DoD educates information systems professionals for broadened skills and positions, it should evaluate the management and leadership modules not only from the Army Management Staff College but from other leader development type courses.

BEST PRACTICES - ARMY
CAREER PROGRAM 34

In January 1992, the Army formally established a new civilian career program for its information systems individuals. This integrated program that supports the Army's Information Mission Area combined the previously separate career fields of automatic data processing, telecommunications, library management, visual information, records management, and printing and publications. The list of series in CP 34 is at Figure B-2. The Army officially designated the Director of Information Systems for Command, Control, Communications, and Computers (DISC4) in the Office of the Secretary of the Army as the Functional Chief for the new career program.

Figure B-2

Tracks / Series In CP-34

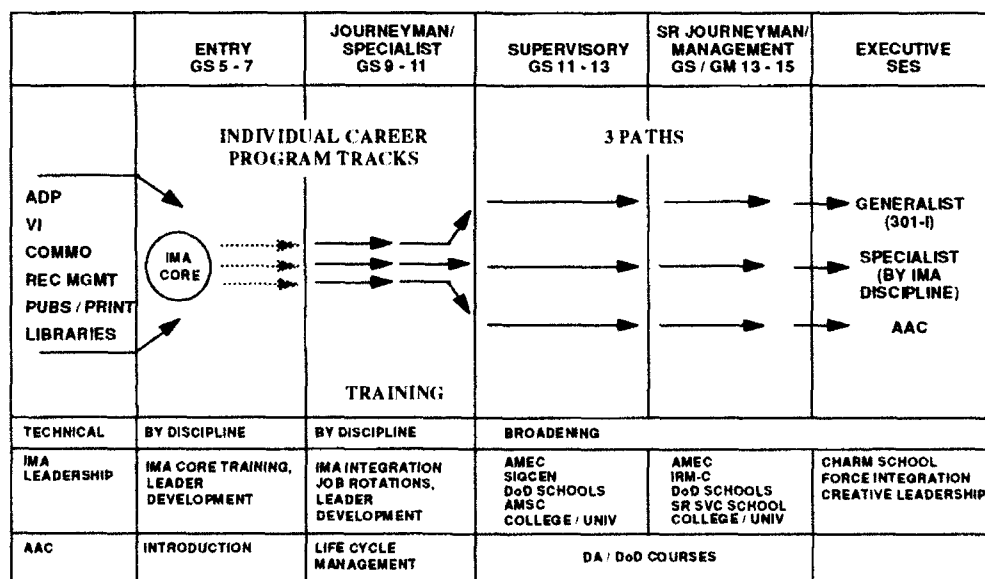| TRACK	SERIES	ACCESS REFERRAL LEVELS	CP GRADES
AUTOMATION	334 - COMPUTER SPECIALIST	13 - 15	5 - SES
TELECOMMUNICATIONS	391 - TELECOMMUNICATIONS SPECIALIST	12 - 16	5 - SES
VISUAL INFORMATION	1001 - GENERAL ARTS & ADMINISTRATION 1020 - ILLUSTRATOR 1060 - PHOTOGRAPHER 1071 - AUDIO-VISUAL PRODUCTION SPEC 1084 - VISUAL INFORMATION SPEC	11 - 15	5 - 15
RECORDS MANAGEMENT	343 - MANAGEMENT ANALYST	11 - 15	5 - 15
PUBLISHING	1082 - WRITER-EDITOR	11 - 15	5 - 15
PUBLISHING-TECHNICAL	1083 - TECHNICAL WRITER-EDITOR	11 - 15	5 - 15
PRINTING MANAGEMENT	1654 - PRINTING MANAGEMENT	N/A	5 - 15
LIBRARY MANAGEMENT	1410 - LIBRARIAN	9 - 15	5 - 15
INFORMATION MANAGEMENT	301 - INFORMATION MANAGEMENT SPEC; INFORMATION SYS SPEC; OTHERS	TBD	12 - SES

Before 1992, there was no central focus on the career development of information systems individuals. There were outdated training courses, fragmented career development, limited career paths, intern programs that varied in content and length among the commands, and no executive education. CP 34 is beginning to change all of that. Its main goals are to:

a. Recruit and retain qualified information systems individuals.

b. Provide state of the art (content and delivery) training opportunities

c. Create a pool of multidisciplined IMA personnel to fill key positions.

d. Provide qualified IMA individuals to the Army Acquisition Corps.

The most important aspect of CP 34 is its "Triple Track" education, training, and career development model. See Figure B-3. In essence, individuals enter the career program in one of the IMA specialties and receive training in the skills necessary to become a journeyman or specialist. At the senior journeyman level, typically GS 11-13, the individual can branch into one, two, and/or three career paths: an IMA specialist, an IMA generalist, or a member of the Army Acquisition Corps. Army provides both technical skills training and leader development education for all three career paths. The advantages of the "Triple Track" are that it expands opportunities to all IMA individuals, enhances their career options and develops them as multidisciplined information systems professionals.

Figure B-3

Army CP-34 "Triple Track" Model

	ENTRY GS 5 - 7	JOURNEYMAN/ SPECIALIST GS 9 - 11	SUPERVISORY GS 11 - 13	SR JOURNEYMAN/ MANAGEMENT GS / GM 13 - 15	EXECUTIVE SES
ADP VI COMMO REC MGMT PUBS / PRINT LIBRARIES	INDIVIDUAL CAREER PROGRAM TRACKS IMA CORE TRAINING		3 PATHS		GENERALIST (301-I) SPECIALIST (BY IMA DISCIPLINE) AAC
TECHNICAL	BY DISCIPLINE	BY DISCIPLINE	BROADENING		
IMA LEADERSHIP	IMA CORE TRAINING, LEADER DEVELOPMENT	IMA INTEGRATION JOB ROTATIONS, LEADER DEVELOPMENT	AMEC SIGCEN DoD SCHOOLS AMSC COLLEGE / UNIV	AMEC IRM-C DoD SCHOOLS SR SVC SCHOOL COLLEGE / UNIV	CHARM SCHOOL FORCE INTEGRATION CREATIVE LEADERSHIP
AAC	INTRODUCTION	LIFE CYCLE MANAGEMENT	DA / DoD COURSES		

To manage CP 34, DISC4 created a Professional Development Office under the direct supervision of the Director of Army Information, a senior SES, who serves as the Functional Chief's Representative. In addition, Army established an IMA Career Advisory Council to exchange information, analyze and review IMA career issues, and make recommendations to the DISC4 on information systems career matters. Assisting the DISC4 in the management of IMA civilians is the Army Management Engineering College (AMEC). An MOU signed between the two organizations designates AMEC as the Executive Agent for IMA sustaining base training. As such, AMEC develops courses and trains IMA individuals and provides consulting services on many aspects of IMA career development. AMEC trains approximately 1,200 students a year and has successfully consulted on degree programs and intern training.

An important aspect of CP 34 has been its focus on executive education. Army developed two senior level seminars, Army Executives for Software (ARES) and the Executive Information Systems Seminar (EISS), to educate senior Army leaders (SES, general officers, GM-15s and 06s) in various aspects of information systems. ODISC4 and the United States Military Academy at West Point sponsor ARES which focuses on software's importance on the battlefield. ODISC4 and the Information Resources Management College at Ft McNair sponsor EISS which provides a high level overview of the information systems environment in both the Army and DoD.

In sum, CP 34 has consolidated previously fragmented career fields into an integrated, centrally managed one in which there are numerous opportunities for acquiring multiple skills, career broadening assignments, and leader development training. With a more technically proficient IMA workforce, the Army can better accomplish its varied mission in the information systems area. Lastly, the education of Army executives in information systems concepts and issues assists in the obtaining of corporate understanding and support for the importance of information systems in the Army.

Lessons for DoD: The "Triple Track" model maximizes career opportunities and multiple skills training. Executive education needs to be pursued to obtain corporate understanding and support for information systems in all environments.

BEST PRACTICES - NAVY
COLLEGE AT SEA PROGRAM
NAVAL ACADEMY MULTI-MEDIA EDUCATOR
ASSISTED NETWORK SYSTEM

The Department of the Navy has developed two innovative programs for its military personnel. These are the Navy College at Sea Program and the US Naval Academy (USNA) Multi-Media Educator Assisted Network System (MEANS).

The Navy initially developed the College at Sea program as an educational technology demonstration project for the Chief of Naval Education and Training (CNET). Through this program, sailors were able to keep up with their college studies while deployed in the Persian Gulf. The program is a cooperative venture between CNET and the George Washington University, the University of Oklahoma, the Coastline Community College and a private educational consulting firm. Sailors on-board ship earn college credits at these universities through interactive computer-based courses. Not only does the student interact with the computer, but the computer tracks the student's progress through the course. The program includes courses in computer science, mathematics, physics, statistics and many others. The courses can culminate in an associate's degree in science, mathematics, or several other disciplines. The program has been very successful and is operating on submarines as well as surface ships. It is estimated that 300 to 400 sailors took these courses in 1990.

The Navy developed the Naval Academy's Multi-Media Educator Assisted Network System (MEANS) as a way to incorporate media technologies in the classroom to improve the midshipman's understanding of course material. Installed in 28 classrooms, the technology included a 35" monitor connected to a video presentation system. To date, 2700 students received training in "Terrestrial and Celestial Navigation" using this technology since August 1990. There are many other courses now offered. Other Navy training organizations and the Merchant Marine Academy incorporated the advanced technology into their classrooms and used or incorporated USNA course material in their curricula. USNA is currently incorporating interactive display technology into the classroom and by the spring of 1993 expects to teach all professional development (leadership) classes using the interactive display format. The interactive display tools will permit student responses to the instruction and increase student attentiveness and retention.

Lessons for DoD: The DoD can export the techniques and lessons learned from these two programs to improve training opportunities and decrease their costs. The DoD can share these educational materials throughout the DoD Components. The MEANS program has already reduced production costs by over 600 classroom instructional hours, between the participating commands, in its first year.

BEST PRACTICES - AIR FORCE
CAREER DEVELOPMENT

The Air Force uses centralized civilian career development to develop employees with strong professional, technical, managerial, and administrative skills to satisfy current and future Air Force mission needs. This approach relies heavily on functional community involvement to decide how a career field is managed Air Force-wide, centralized management/funding, and automated civilian personnel support systems.

The Air Force Communications-Computer Systems Career Program (CCSCP) is the central career development program for their civilian IS workforce. Through the Career Program Policy Council, senior Air Force leaders in communications-computer systems decide how the career field will be managed. The Policy Council's decisions determine grade levels, training goals, intake options, rotational assignments, internships, tuition assistance, career referral methods, and career counseling supported by the career program. Day-to-day administration of the career program to implement the Policy Council decisions are made by a team of eight functionalists and one personnelist at the Civilian Personnel Management Center, at Randolph AFB, TX. This structure places management of the career field squarely in the hands of the functional community.

The CCSCP participates in an Air Force centrally managed career broadening program. Under this program, slots are offered by the functional community for placement in a centrally managed pool. The functional community then determines the location of the best career broadening opportunities and places the slots there for one to four years. A competitive or management reassignment then places an individual in the position on a rotational basis. During the career broadening assignment, the individual gains a different perspective, additional skills, and experiential learning opportunities. When the employee completes the career broadening rotation, the person is reassigned to a permanent position and the slot reverts to the central pool for reallocation. The centrally-provided funds for this program include PCS costs. There are protections from reduction in force actions for persons in career broadening assignments. This program provides for diversification of individuals within the various communications-computer systems arenas and, in limited cases, across functional areas.

The CCSCP also participates in an Air Force centrally managed intern program, recruiting college graduates under the Outstanding Scholar Program. The internships are three year programs, GS-7/9/11, with funding for the first three years' salary and all training costs (tuition and travel) provided by the career program. Through standard training guidelines, the interns are provided different communications-computer systems experiences and all attend common training in telecommunications-computer systems management, data communications, LAN-DDN-fiber optics, communications-computer security, project management, software engineering and Ada.

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The CCSCP also uses Air Force central funds for its management development training, long-term full time training, and tuition assistance to the maximum extent possible. They competitively allocate training and tuition assistance using Policy Council decisions on where to focus training dollars. This levels the playing field for receipt of training opportunities and tuition assistance. Ultimately fencing the money for civilian training this way avoids the practice of cutting training to stretch O&M dollars.

Finally, the Air Force centrally manages funds for all civilian PCS moves. This allows the selecting supervisor the freedom to make the best selection of all candidates Air Force-wide without worrying about local budget shortfalls. This practice has stimulated selections of other than local candidates.

Central management and funding in the Air Force bring a strategic planning approach to career development. In each case of central management or funding, the rationale is the same: the organization/selecting supervisor can make the best decision on civilian assignments and training attendance without competing with local funding needs of the unit. This balances the long term interests of the Air Force against the immediate needs of today.

Automation is a vital component of the Air Force's ability to career manage civilians. The Air Force personnel management system relies heavily on functional community developed skills codes to identify skills required by each job and skills found in an employee's experience history. This provides consistent interpretation of employee experience history across the Air Force and is the vehicle for automated referral with standard promotion criteria Air Force-wide. Through this automated assist, the referral process is better able to distinguish between candidates to match the job requirements with the employee experiences and provide the selecting supervisor a better candidate pool. Additionally, the automated process eliminates job advertising, submission of SF 171s, and evaluation of individual applications by personnelists.

Lessons for DoD: Functional community involvement is critical to the success of career development of the IS workforce. Their commitment, investment of time, and strategic visions to steer the career field will make the career program responsive to the DoD mission.

Central funding of PCS, training, and interns constitutes strategic planning for the IS workforce and is essential to a DoD-wide career program during budget cuts.

Skills coding mechanisms are essential to providing a robust career referral program to service the entire DoD. The substantial initial start up costs of codifying all positions and employee histories are offset in the long-run by efficiencies in the career referral process. It also produces a personnel system that is responsive to the needs of the IS functional community, with DoD-wide referral opportunities on a level playing field via a common referral process based on standard skills codes.

A centrally managed career broadening program can provide diversification across service/agency organizations and promote joint service perspectives. With DMRD 918 changing the Components' roles and DISA's role, rotational exchange programs will give the needed interchange of ideas among DoD organizations.

BEST PRACTICES - NSA and DIA
CERTIFICATION

National Security Agency has a professional certification program for computer scientists administered in-house for individuals advancing past GS-12. To be certified, employees must meet specified criteria established by a committee of functional IS managers working in conjunction with personnel specialists. The requirements for certification include: specific training courses/education, designated IS experiences, a research paper on an approved IS topic, and an oral presentation. Additionally, certification requires work samples, depending on the area of specialization.

The requirements for professional certification are based on a Job Task Analysis conducted in 1988-1989 at NSA to assure that standards for certification have relevance to the actual jobs being performed. Five distinct specialties leading to the professional level are identified. Each of these specialties has its own set of requirements, and the specialties are considered to be equivalent in the effort required. An aspirant has a choice of one of the following areas in which to achieve certification: operations, architecture/hardware, systems software, applications software, or computer security. There is one certificate for computer scientist for all these areas, but NSA personnel records include the field of specialization, or multiple specializations if appropriate.

NSA publicizes the requirements for certification so that employees aspiring to advance past GS-12 are aware of the requirements, well before time of eligibility for promotion to GS-13. Individuals who do not meet the requirements are not advanced.

Benefits derived include proven common experiences and training for those advancing to GS/M-13, demonstrated ability to write and brief in addition to technical skills, and a more highly educated, technically enriched IS workforce.

DIA also has a professional certification program. They administer in-house certification, which involves completion of a project in addition to having met individual training and development plans, for aspirants who wish to advance past GS-12. Similar to NSA, DIA established specific criteria for education, training, and certification projects and publicized the information within its IS workforce.

Lessons for DoD: A DoD-wide certification program provides the means to achieve parity among DoD Components' IS workforce experience, training, and education at specific career points and to develop and maintain the technical vitality of the IS workforce.

BEST PRACTICES - DLA and DIA
ON-SITE TRAINING

The Task Force identified several examples of excellent training programs. Of note, are the on-site training and education programs at DLA and DIA. In these instances, the training and education programs were tied to a very careful analysis of the training and education needs of the organization. Also, management support for funding and employee attendance is strong.

DLA has a training center at its DLA Systems Automation Center (DSAC) in Columbus, Ohio, providing on-site job-related IS training. Through its training advisory council to review curricula and oversee training delivery for the school, DSAC can rapidly change the curriculum and throughput in response to changing missions and technology. Instructors are primarily in-house DSAC IS individuals, with rotation between instructing and IS duties every three to four years. Also, DSAC augments their in house IS instructors and curricula via contractor/vendor provided IS training. In addition to the traditional classroom training, DSAC supports a Computer Based Training (CBT) library of over 100 courses available to anyone in DLA on the DLANET of 50,000 terminals and to external organizations via the Defense communications network. The CBT courses deal with information systems topics, standard business and management skills, and CBT authoring courses.

DIA also has an on-site school house offering both training and education for its IS employees. DIA's purpose is twofold: to improve specific job related performance and to upgrade the skills and professional levels of its personnel. Via a special arrangement with DIA, the University of Maryland teaches undergraduate level IS courses (focusing on computer science courses) at the DIA facility during duty hours. DIA IS individuals take the courses with DIA tuition support, using approximately 2 hours per week per course of government time, to fulfill their personal and DIA standard career development requirements. In many instances, completion of these courses leads to a degree. Under this arrangement, DIA encourages employees who do not have degrees to complete their degree.

DIA also has a similar agreement with American University to provide a graduate level courses. Through on-site classes and DIA tuition support, an individual completing five courses out of eight can be awarded a Graduate Certificate in Computer Science. DIA employees can take additional graduate courses to obtain a Masters degree.

DIA has been very successful in upgrading the skills of its employees through this program. Additionally, this DIA fully funded support program for employees to obtain degrees -- in the DIA facility, on government time, and with government funding -- is an attractive recruitment and retention factor for DIA.

Lessons for DoD: On-site, fully funded accredited university courses in information systems topics provide outstanding value for DoD in terms of costs, the technical vitality of the workforce, and the retention and motivation of the workforce.

BEST PRACTICES - OFFICE OF THE
UNDER SECRETARY OF DEFENSE FOR ACQUISITION
COURSE QUOTA ALLOCATION

The Director of Acquisition Education, Training and Career Development administers career development and training of the acquisition workforce in accordance with the Defense Acquisition Workforce Improvement Act of 1990. In this role, the Director oversees acquisition training including the DoD schools teaching acquisition training, the curricula, budgets, and quota allocation. Of particular interest for this report is the methodology developed to handle the two elements of course quota allocation: training quotas available from DoD schools and the DoD Component requirements for quotas.

Without conscious intervention by a DoD oversight office, the tendency would be for the DoD Component members needing training to be trained within their own Component schools' curricula, quota, and schedules. This results from lack of knowledge of other Component's training, service unique training, or lack of avenue to gain quotas. The acquisition quota allocation method addresses this potential problem and balances the competing needs of the Components for acquisition training in short supply.

Under the Director of Acquisition Education, Training and Career Development, there is an annual meeting of Defense Acquisition University consortium of school representatives and Component acquisition workforce representatives. Each Component states its needs for specific acquisition course offerings. Following that, the schools state their capacity to teach specific acquisition courses, i.e., the number of course quotas available, where, and when. The Director of Acquisition Education, Training and Career Development then "brokers" the quotas from all schools against Component requirements, ensuring that Components share quotas.

The Director of Acquisition Education, Training and Career Development believes this "honest broker" concept has provided the best allocation of scarce training resources across the needs of the entire DoD. The method also provides for a broader mix of Component personnel attending acquisition courses than under past practices. The method has worked well for the past two years.

Lessons for DoD: The DoD must identify an "honest broker" and establish a forum to allocate IS course quotas fairly among the DoD Components on the basis of service needs and course availability. This "broker," with authority to make final allocations of scarce training resources to Components, spreads the available course quotas across a DoD-wide audience vice a specific Component audience.

Appendix C

REFERENCES, SITE VISITS, AND TASK FORCE MEMBERS

This appendix provides lists of references, sites visited, and Task Force members.

First, the reference list provides publications, reports, books, and periodicals reviewed and which provided additional insight into human resources practices, concepts, and ideas. Additionally these materials provided analyses and discussions of issues similar to those confronting the DoD as it realigns its information systems workforce.

Next, the site visit lists those organizations, within DoD and in the private section, visited by the Executive Resources Task Force. Due to the limited time available to the Executive Resources Task Force, only brief visits were possible to the limited number of organizations shown.

Third, the list of Task Force members identifies the Service representatives on the Executive Resource Task Force. The Army, Navy, and Air Force provided Task Force members.

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Site Visits

In the limited time available to the Executive Resource Task Force, we conducted initial meetings with major DoD IS activities in the Washington, DC area and a few private corporations with large IS workforces. The following organizations were visited to discuss various aspects of DoD Information Systems Education, Training and Career Development.

Senior Executives: OASD (Comptroller), OASD (C3I), OASD (FM&P), OUSD (Acquisition) (1992, August-September)

Defense Intelligence Agency (1992, 13 August)

Defense Information Systems Agency (1992, 24 August & 17 September)

Defense Logistics Agency (1992, 12 August)

Information Resources Management (IRM) College (1992, 10 August)

National Security Agency (1992, 31 August)

Department of the Army (1992, 10 & 18 September)

Department of the Navy (1992, 1 & 15 September)

United States Air Force (1992, 18 September)

Electronic Data Systems, Herndon, VA (1992, 25 August)

IBM Corporation, Purchase, NY (1992, 2-3 September)

Xerox Corporation, Rochester, NY (1992, 20 August)

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