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TECHNICAL REPORT CPO-89-2

**RECRUITMENT OF WHITE FEMALE ENGINEERS AT THE
U.S. ARMY MISSILE COMMAND, FY 79-FY 89**

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Civilian Personnel Office
U.S. Army Missile Command

JULY 1989



U.S. ARMY MISSILE COMMAND

Redstone Arsenal, Alabama 35896-5000

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I. INTRODUCTION

As the nation's largest employer, the Federal Government, with 2,984,000 employees as of March 1989 [1], is often the leader in new innovative programs for diverse groups, i.e., minorities, females, and handicapped. At the same time, the Federal Government, to one extent or another, mirrors espoused societal attitudes and values in personnel policies.

A careful examination of occupational data presents an impressive and unmistakable picture of occupational segregation on the basis of sex. This occupational segregation has two noteworthy aspects. First, it involves a horizontal division of labor - a distribution of workers such that certain occupations are dominated by women and others by men, disproportionate to their overall participation in the labor force. Measurement of this type of concentration has shown that, despite changes in the sexual distribution of specific sectors over time, the overall level of occupational segregation has changed very little in the past few decades [2] [3]. A horizontal division of labor by sex appears to be universal in human society, although the exact division of sex-ordered tasks varies considerably from one society to another [4].

The second dimension of job segregation is concerned with the vertical stratification of particular occupations. Regardless of the occupation, there is a marked tendency for the proportion of men to increase at successively higher levels of status, income, and responsibility. Hierarchical stratification is evident even in those occupations in which women predominate, such as teaching and social work [5].

The narrowness of women's occupational range has been well documented. In the decade between 1960 and 1970, despite a substantial increase (38 percent) of females in the labor force, women remained concentrated in a handful of occupational groups. Statistics from the 1960 and 1970 census revealed that over half of employed women were employed in clerical, operative, or service positions. Employment growth during this decade (1960-1970) was primarily in traditional female occupations, i.e., typists, stenographers, secretaries, and health service workers [6].

Great progress for females was made in the area of equal employment opportunity in the 1980's. However, the following problem areas are noted: twenty-eight percent of all women were employed in administrative support, including clerical, for the year ending December 1987. Eighty percent of all administrative support positions, including clerical, were filled by females. Of the total of 1,805,000 engineers employed, 132,000 or 7.3 percent were female. Of the total, 116,000 were white females which equates to 6.4 percent [7]. As the above statistics show, there has been continuing progress for females; however, the field of engineering continues to be dominated by males.

Unlike some highly industrialized countries, recruitment programs within the United States generally show more concern for fairness, equal employment opportunity and nondiscrimination. Hatvany and Pucik state that Japanese companies develop an internal labor market whereby male employees will be hired just after graduation from high school or a university with the expectation of retaining him for the rest of his working life, but the female employee is considered as temporary [8]. Utilization of female and part-time workers

allows flexibility in adjusting the size of the work force in accordance with current economic conditions while at the same time maintaining employment for full-time male workers.

This report provides additional longitudinal recruitment data that was not available when Technical Report CPO-85-4 was published [9]. It was then reported that the introduction of the centralized college recruitment program did have a positive effect on the recruitment of female engineers. At that time, archival recruitment data was available for only six years.

II. BACKGROUND

Since the end of World War II, each national administration, to one degree or another, has supported large Department of Defense (DOD) budgets. A large portion of the DOD research and development budget goes for pay of civilian employees and for development of weapon systems under the guidance and leadership of civilian employees. The increasingly technical nature of the world environment has placed a strain on the supply of well trained engineers.

From 1960 to the present, private industry in the U.S. has faced increasing competition from foreign industry. This increased competition has caused U.S. companies to expand their research capabilities and monetary outlays for modernization to remain competitive both at home and in the world market. An increased need for scientific and technical personnel from within the defense establishment as well as the larger society have combined to create a shortage of engineers that at times approaches the critical level. A review of scientific history reveals that many innovative ideas and inventions were products of small, individually owned laboratories or shops. The present emphasis by industry for research in highly specialized areas, usually requiring complex and costly facilities combined with monetary incentives offered to research engineers and scientists, has practically eliminated the small, independent researcher [10].

Lower pay scales and less attractive fringe benefits have long proved serious hurdles for Federal recruiters in their search for engineers and scientists. In an attempt to place the Federal Government in a more competitive position, the Office of Personnel Management (OPM) approved an increased rate of pay, grades GS-5 through GS-12, for engineers and scientists. Even with the increased rate of pay, positions often went unfilled for long periods of time. In an attempt to further improve the Federal Government's recruitment position and to speed up recruitment actions, Federal agencies were delegated direct hire authority in the appointment of engineers and scientists. Direct hire authority enables Federal agencies to bypass OPM registers and deal directly with applicants in filling certain hard-to-fill engineering and scientific positions. Even though the advanced pay rate and the direct hire authority greatly improved recruitment for these positions, the problem of attracting a sufficient number of highly qualified engineers was not eliminated.

In an attempt to further alleviate the problem of recruiting engineers, a decision was reached by the U.S. Army Missile Command's Civilian Personnel Office to initiate a centralized recruitment program by visiting certain colleges to attract engineering graduates.

III. OVERVIEW OF PERSONNEL IN THE FEDERAL SECTOR/EQUAL EMPLOYMENT OPPORTUNITY

Discussion of these topics is found in Technical Report CPO-85-4, dated Sept 1985 [9].

IV. U.S. ARMY MISSILE COMMAND

The U.S. Army Missile Command (MICOM), located on Redstone Arsenal, is a 39,000 acre military reservation in Madison County, Alabama, responsible for the total life cycle management of all Army missile systems. Total life cycle management includes research, development, production management, procurement, quality assurance, maintenance, and logistics support to U.S. troops and foreign governments that have purchased Army missile systems. In excess of 7,000 civilian and approximately 1,000 military employees are assigned to MICOM.

The primary mission of the U.S. Army Missile Command (research, development, and production of missiles) dictates a strong emphasis on the recruitment, and retention of highly qualified engineers. While specialists from many occupational categories are required for overall mission accomplishment, the engineer and scientist career program, with over 1,400 members, is the largest career program within MICOM. Increasing competition from private industry coupled with an aging workforce has created the need for developing and utilizing an innovative and competitive recruitment program to attract qualified engineers and scientists into the Federal sector.

V. DISCUSSION

Females, during the 1980's, continued to make impressive inroads into engineering and other occupations that were once viewed as male only. It is important to note that women continue to have heavy representation in lower paying occupations and light representation in higher paying occupations. Examples of this are that in 1985, female representation in some of the ten highest paid occupations were stock and bond sales agents, 12.5 percent; managers and administrators, 11.0 percent; bank officials and financial managers, 23.5 percent, whereas representation in some of the lowest paid occupations were practical nurses, 97.8 percent; school monitor, 95.8 percent; hairdresser and cosmetologist, 92.4 percent [5]. The increase in the number of female role models in engineering will most likely encourage more women into the engineering field; however, even with more women engineering graduates, the shortage of all types of engineers will most likely remain critical. The demand for engineers, as measured by the High Technology Recruitment Index, continued to move upward in June 1988, reaching its highest level in 16 months [11].

The initiation of the formal centralized college recruitment program in 1981 was one of many initiatives designed to attract more engineers into the MICOM workforce. The utilization of career fairs and continuing emphasis on student cooperative education programs in engineering are examples of two other special recruitment efforts.

Fifty to 80 entry level positions (GS-5 and GS-7) continue to be set aside each year for the recruitment of engineers. While there have been recruitment restrictions in some years, top management has requested and received relief from these restrictions in order to continue to intake recent engineering graduates.

To determine the effectiveness of the centralized college recruitment program in recruiting white female engineers, data was gathered from MCOM's automated data bank. The data reflects a 6-year recruitment period (Table 1). The first 3 years of the program included data from October 1981 through September 1984, and the 3 years prior to the implementation of the centralized college recruitment program covered the period from September 1978 through September 1981.

TABLE 1. White Female Engineers Recruited in Grades GS-5 and GS-7
FY 79 through FY 84

<u>U.S. Army Missile Command Appointments</u>			
FY 79	FY 80	FY 81	TOTAL
1	1	3	5
FY 82	FY 83	FY 84	TOTAL
7	9	14	30

As the above figures depict, the total number of white female engineers, grades GS-5 and GS-7, increased from 5 for the 3 years prior to implementation of the centralized college recruitment program to 30 for the first 3 years of the program. This increase of 25 appointments equates to a plus 500 percent. In an earlier technical report [9], significant increase was defined as an increase of twice as many white females recruited. According to that stated definition, the centralized college recruitment program resulted in a significant increase in the number of white females recruited.

The time frame October 1978 through September 1981 represents the only period prior to the implementation of the centralized college recruitment program that is available for comparison and analysis of the recruitment data. Studies of this nature are enhanced by the utilization of longitudinal data to help verify whether or not the results indicate a trend or instead represent a flash in the pan. The additional 4 years, FY 85 through FY 88, shown in Table 2 indicates an increase in the number of white females recruited (14 per year as compared to 10 per year for the first three years of the program). With the increasing competition for engineers from all other sources, any improvement is viewed as being very positive.

TABLE 2. White Female Engineers Recruited in Grades GS-5 and GS-7
FY 85 through FY 88

FY 85	FY 86	FY 87	FY 88	TOTAL
11	12	22	11	56

VI: RESEARCH SIGNIFICANCE

The percentage increase in the number of white female engineers during the first 3 years of the college recruitment program appear to attest to the program's success. The recruitment data in Table 2 indicates continuing success. Although the extent of influence this program had on the increased recruitment of female engineers cannot be concluded precisely, there were, without a doubt, positive strides for recruitment of white female engineers. Campbell [12] has addressed various threats to internal and external validity that may confound studies such as the present one; however, since the data used in this report are archival in nature, history - one of the threats to internal validity - should be discussed. Historical occurrences which may have influenced the results of the 6-year period studies are: (a) a slow-down of recruitment of all engineers and scientists by private industry; (b) a larger number of engineering graduates in general, and female engineering graduates in particular; (c) changes in engineering graduates' attitudes toward the Department of Defense; and (d) the allotment of 50 to 80 spaces for engineers which may have caused additional management focus on filling these particular vacancies.

While it is not possible to address with accuracy all of the forces that confound studies of this nature, it is important to keep in mind that recruitment programs are not conducted in a vacuum and results are not altogether caused by a specific intervention of a program or change to that program. There is a continuing call for improved program evaluation from both within and without government circles. Much of the evaluation that is conducted fails to utilize appropriate methods and does not attempt to control outside influences. Public administrators are often so committed to a particular program that there may be a tendency to avoid any form of evaluation that may cause other than a positive reflection on their particular program. These evaluations become, however, increasingly significant when funding and/or resource restraints exist. The effectiveness of future evaluations within the government is dependent on the ability of public administrators to conduct meaningful research.

According to Kazi-Ferrouillet [13], some of the biggest demands for new bachelor's degree graduates continues to be in the engineering field with a average starting salary of \$29,820.00. Compared to the Federal Governments starting salary in the low 20's, it is obvious that recruitment of engineers, particularly female and minority engineers, will continue to be a problem for Government agencies. The Woman Engineer [14], in commenting on studies conducted by the Commission on Professionals in Science and Technology, states that in most fields of science, the percentage of women and minorities among bachelor's graduates has peaked. In light of the above research, there is even more reason for agencies to utilize every source available to recruit members of protected groups.

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