

2

PROFESSIONAL PAPER 369 / January 1983

# THE ALL-VOLUNTEER FORCE: A POSITIVE PERSPECTIVE

Aline O. Quester  
Robert F. Lockman

*Nov 14-76 - e - 0001*

AD A 128279

DTIC FILE COPY



CENTER FOR NAVAL ANALYSES

DTIC  
ELECTE

MAY 18 1983

S

E

83 05 18 027

This document has been approved  
for public release and sale; its  
distribution is unlimited.

# THE ALL-VOLUNTEER FORCE: A POSITIVE PERSPECTIVE

Aline O. Quester  
Robert F. Lockman

Accession For	
NTIS GRA&I	<input checked="" type="checkbox"/>
DTIC TAB	<input type="checkbox"/>
Unannounced	<input type="checkbox"/>
Justification	
By	
Distribution/	
Availability Codes	
Dist	Avail and/or Special
A	



*Naval Studies Group*

**CENTER FOR NAVAL ANALYSES**

2000 North Beauregard Street, Alexandria, Virginia 22311

## THE ALL-VOLUNTEER FORCE: A POSITIVE PERSPECTIVE

### INTRODUCTION

Despite strong reluctance to return to conscription, the concern about the future viability of the All-Volunteer Force (AVF) continues in Congress, the popular press, expert panels, and scholarly journals. In the late seventies, when the armed forces had problems recruiting non-prior-service males, even those philosophically inclined toward the AVF began to worry: the combination of a strong civilian economy, caps on military pay, cuts in G.I. Bill benefits, and increases in federal civilian youth programs created recruiting shortfalls in 1978 and 1979 for all services. The recruiting problems of the active forces were magnified in the reserves, where strengths fell to record lows.

By 1980, however, or certainly by 1981, the recruiting market had changed. All the armed services are currently meeting or exceeding their active force recruitment goals, and recruit quality (at least as measured by high school graduation and entry test scores) is increasing. Reserve manning is higher than in the late seventies, although there is still substantial room for improvement.

While some continued concern about reserve manning is understandable, one might have thought that today's healthy recruiting environment

would have alleviated concerns about manning the active force with volunteers. But such is not the case. Concerns continue to be expressed about the supply of young men, their quality and representativeness, and how much it will cost in the future to obtain them. We will address each of these concerns in turn.

Age changes in the population are easily projected; indeed, the birth-dearth and the subsequent youth-dearth have been exhaustively documented. While we have no desire merely to add to this documentation, we found most of such analyses lacked historical perspective. Looking at the future from the vantage point only of the seventies makes the future look gloomy indeed. We will instead look at the size of the youth population, and the demand that the military makes on it, from a longer time frame, starting in 1960 and projecting to the year 2000. After this, we examine youth attitudes toward military service. The time frame for this examination is not long, but signs of renewed interest in military service are encouraging.

Next, we examine the quality and representativeness of the armed forces, looking first at the entry test scores of recruits over the last 30 years. Additionally, we compare the test scores of current AVF recruits to those of the male youth population. Evaluating representativeness in a systematic, historical manner is more difficult. We focus on the analyses of recent data, supplemented by our judgements about future representativeness in the AVF inferred from demographic and economic trends.

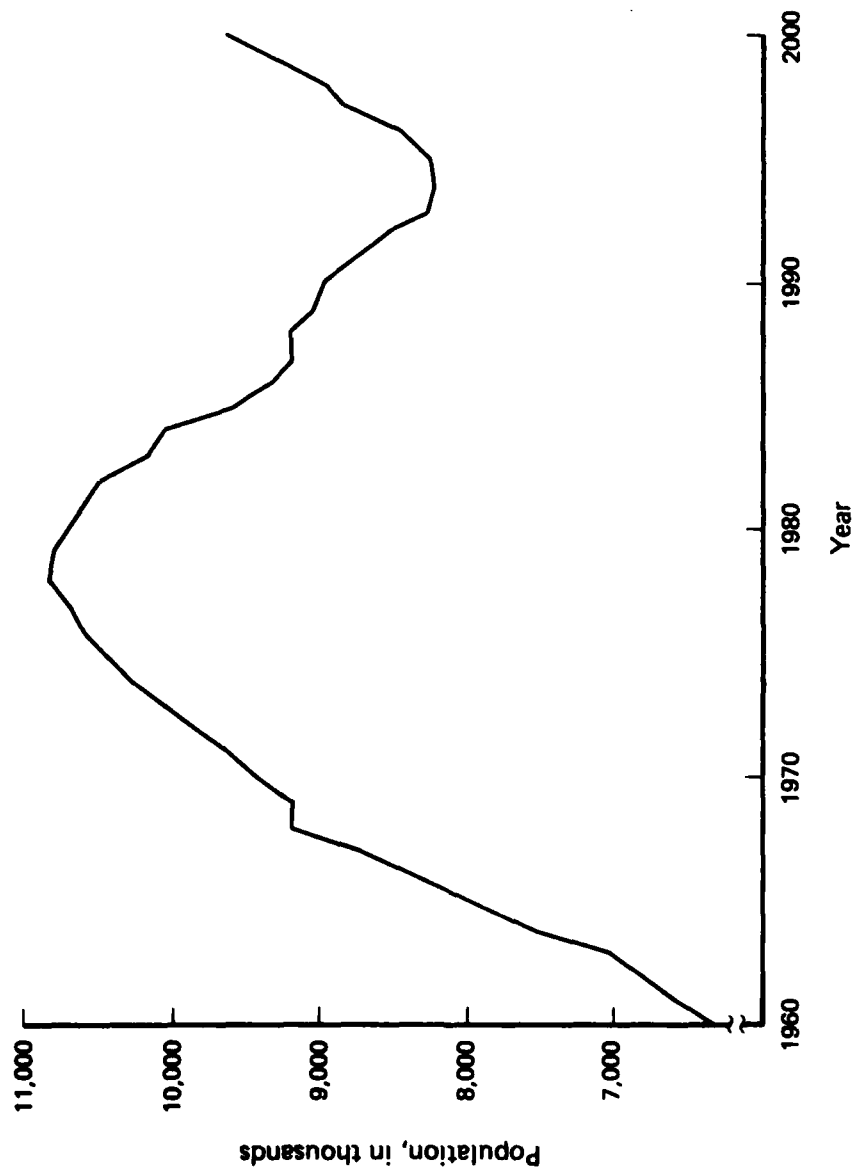
Finally, since keeping military pay competitive with civilian pay is a necessary condition for the viability of the AVF, we estimate how the wages of civilian youth can be expected to change because of the smaller youth cohorts of the future. Drawing on established research to develop projections of these wage changes, we find, not surprisingly, that the relative wages of youth can be expected to rise. Since military pay raises in the early eighties helped turn the recruitment market around, knowledge of future civilian youth wages is important. We estimate non-trivial increases, but probably smaller increases than some had expected.

#### THE SUPPLY OF YOUNG MEN

##### The Numbers: Past and Future

Our analysis concentrates on the 17-21 year old male population, the principal source of recruits for the armed forces. Figure 1 shows how the numbers of these youth have changed since 1960 and will continue to change until 2000. The year 1978 was a peak year, when the numbers of these young males was almost double that of 1960.

From 1978 until the early nineties, the youth cohort will decrease in size. But at the trough, there will still be as many young males as there were in 1966. After 1993, the numbers will begin to grow again because the sheer size of the postwar baby boom resulted in large



Source: The numbers in all figures are calculated from the United States Bureau of the Census, Current Population, Reports, Series P-25, Report Numbers 519, 720, 721, 704, and 870.

FIG. 1: POPULATION OF 17-21 YEAR OLD MALES, 1960-2000

numbers of women of child-bearing age in the seventies. On average they had had fewer children than earlier generations, but there were more of them.

In short, looking only at population changes from the late seventies to the early nineties causes considerably more concern than would be occasioned by a longer look. The military in the early sixties, with very low peacetime draft calls, manned itself with considerably smaller youth populations than it will find in the eighties and nineties.

As the military expanded and contracted over the last two decades, however, it placed proportionally different demands on the youth labor pool. Figure 2 illustrates these demands, showing the proportion of 17-21 year old males who were in the military each year of the last two decades. Except for the years of the Vietnam War, the trend has been strictly downward: as the size of the young male population increased, the military took proportionally fewer youth.

What happens, though, if we have to fight a war? In 1968, for example, 17 percent of the 17-21 year old male population was in the military—a total of 1,561,000. Figure 3 looks at this requirement for "surge capacity" from the perspective of the past and the future. If the military demanded (were to demand) the numbers of young males it did at the peak of the Vietnam War, what fraction of the youth population would be (or would have been) in the armed forces?

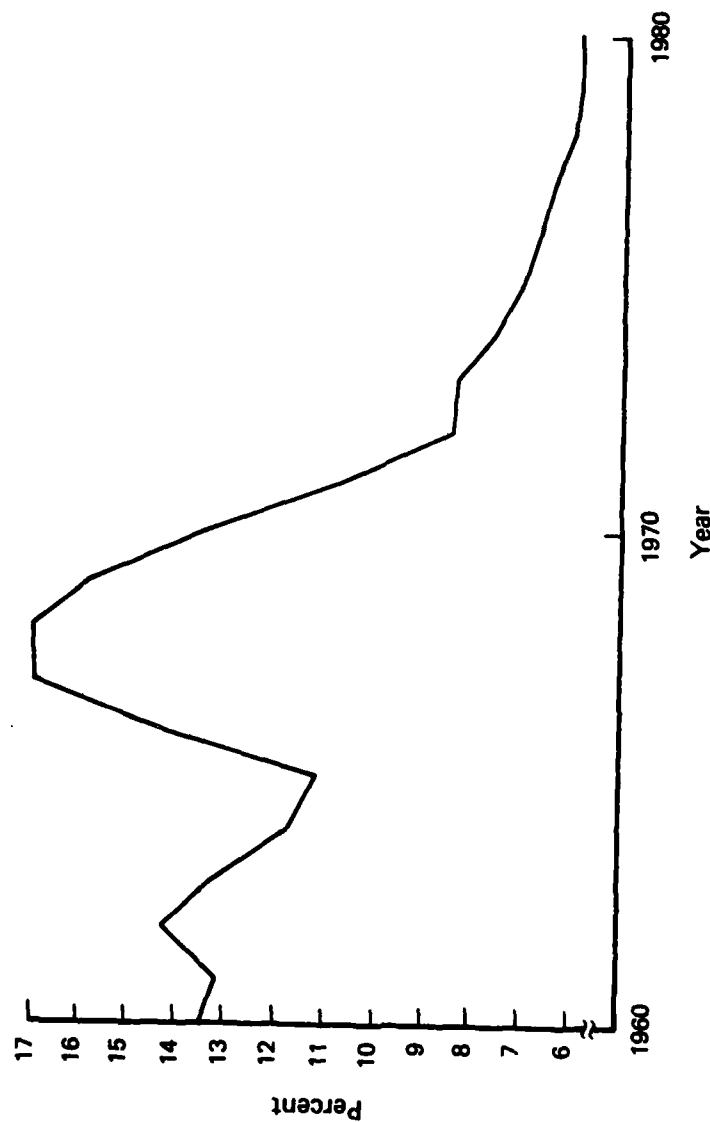
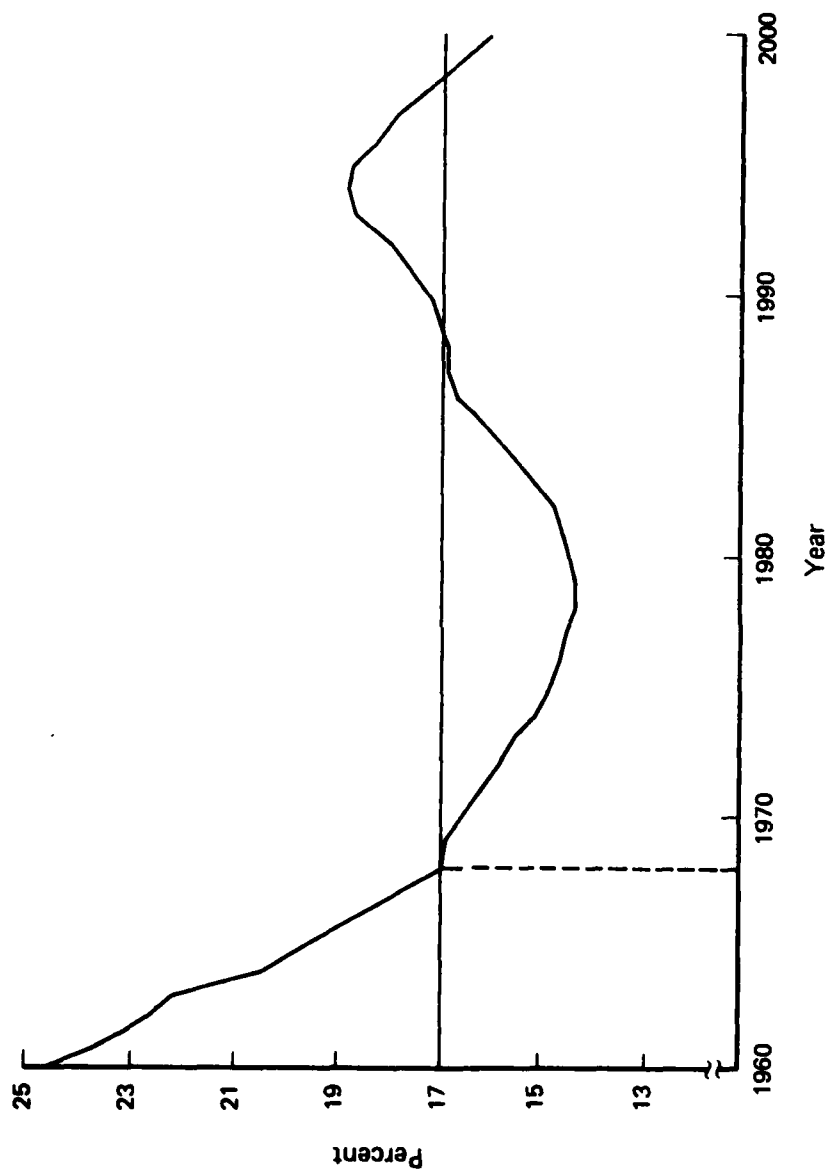


FIG. 2: PERCENT OF THE 17-21 YEAR OLD MALE POPULATION IN THE MILITARY, 1960-1980





**FIG. 3: SURGE CAPACITY (PERCENT OF THE 17-21 YEAR OLD MALE POPULATION THAT WOULD HAVE BEEN IN THE MILITARY WITH PEAK (1968) FORCE LEVELS)\***

*\*In 1968, 1.561 million 17-21 year old males were in the military. Figure 3 shows what percent this force level would have (will) require of the 17-21 year old male population.*

Perhaps the most salient information to emerge from this exercise is that the past two decades once again look worse than the next two decades. There will be a period from the late eighties through the late nineties where a "surge" capability requires enlisting proportionally more young men than in 1968. But had we required this "surge" capacity in the early sixties, it would have involved considerably greater strain.<sup>1</sup>

#### YOUTH ATTITUDES TOWARD MILITARY SERVICE

The numbers of 17-21 year old men appear large enough to support a volunteer military for the rest of the century, but will they be willing to serve? We cannot predict what attitudes will be 15 years from now, but we can say what they have been in the recent past and what they are today. How do youth feel about military service, and what proportions are contemplating a military career? Our data comes from two sources: the Youth Cohort from the 1979 National Longitudinal Survey of the Labor Force, and the yearly surveys from 1976 through 1981 of over 17,000 American high school seniors by the Survey Research Center of the University of Michigan. We will first look at the trends in attitudes over the last 5 years; then, we will look in detail at the attitudes and intentions of 15-22 year olds in 1980.

We focused on two items from the surveys of American high school seniors: the likelihood of enlistment and the preferences for enlistment. Male responses to these questions were compared with the unemployment rates for 16 to 19 year olds, and with the ratio of military to civilian pay. As Table 1 shows, all of the attitudinal and economic indices declined from 1976 to the low point in 1979. Thereafter, they began an upward trend and by 1981 equalled or surpassed 1976 levels.

The most encouraging finding about the intentions of male high school seniors for military service is that there is more than sufficient interest to meet anticipated force levels. For example, 1981 force average-levels, required about 6 percent of 17-21 year old males; these force levels would require 8 percent of the male youth population through 1990 and about 9 percent in the mid-nineties. As Table 1 indicates, in 1981 23 percent of high school seniors thought they would enlist, and 19 percent preferred to enlist.<sup>2</sup>

The male intent rate is highly correlated with both the youth unemployment rate and the ratio of military to civilian pay. To the extent that youth unemployment falls in the future, enlistment intentions will decline unless there are compensating increases in military pay.

TABLE 1

## PLANS AND PREFERENCES FOR MILITARY SERVICE: MALE HIGH SCHOOL SENIORS

<u>Year</u>	<u>Likely to serve</u>	<u>Prefer to serve</u>	<u>Unemp. rate<sup>a</sup></u>	<u>Rel. pay<sup>b</sup></u>
76	22.2	19.7	19.2	1.13
77	19.0	17.9	17.3	1.12
78	18.7	18.3	15.8	1.04
79	17.6	15.5	15.9	1.02
80	21.0	16.6	18.3	1.05
81	23.4	19.2	20.1	1.13

Source: Monitoring the Future, 1976 through 1981 editions.

<sup>a</sup> 1982 Economic Report of the President, February 1982, Table B-30, 16-19 year olds.

<sup>b</sup> Regular Military Compensation divided by Civilian Earnings of Youth, See authors for calculation procedure.

We separated college-bound and non-college-bound high school seniors and looked at their attitudes toward military. The likelihood rates for non-college bound seniors were twice those of the college-bound (20 percent of the non-college-bound males prefer military service and are likely to serve compared to 10 percent of the college-bound). If the fraction of college-motivated youth who prefer and expect military service remains constant, it is large enough to allow this group to be proportionately represented even in the force of the early

nineties. Recall, however, that the pre-enlistment attitudes of the 1981 senior class are at or near the six-year historical high, as is the unemployment rate for young males.

Next we sorted male responses in the Youth Cohort survey, a national sample of nearly 12,000 youth, as to perceived desirability of military service and enlistment intentions. Table 2 shows that roughly two-thirds of the 15 to 18 year old males and three-quarters of the 19 to 22 year old males thought serving in the military was definitely or probably a good thing. The younger group was more favorably disposed to enlisting, as were non-white males. If the younger male response implies greater willingness to serve rather than an age effect, a relatively larger pool of potential recruits will be available to the military than in the past. For older males, we tabulated responses by employment status. It is interesting to note that employment status generates only small differences in the perceived desirability of military service.

The total intent rates in both surveys are very similar: from 21 to 24 percent of males indicate they are likely to enlist. Positive attitudes toward the armed forces have been on the upswing since 1979. So have the intentions of young men to enlist, which now stand at just over 20 percent. This implies a potential pool of over 2 million males today, and over 1.5 million in the mid-nineties when the age group is at low ebb.

TABLE 2

## ATTITUDES TOWARD MILITARY SERVICE OF MALE YOUTH

<u>Age in 1980</u>	<u>Race and Employ- ment Status</u>	<u>To serve a good thing (%)</u>	<u>Will try to enlist (%)</u>
15-18	White	69.7	30.8
	Non-white	66.5	45.9
19-22	White,	76.1	11.1
	Non-white	76.2	29.0
15-22	Total	72.5	24.2
19-22	White, employed	75.8	9.7
	White, not employed	76.9	14.9
19-22	Non-white, employed	76.0	28.2
	Non-white, not employed	76.5	30.2

Source: 1979 Youth Cohort, 1980 questionnaire. All responses are appropriately weighted to youth population proportions.

## QUALITY AND REPRESENTATIVENESS

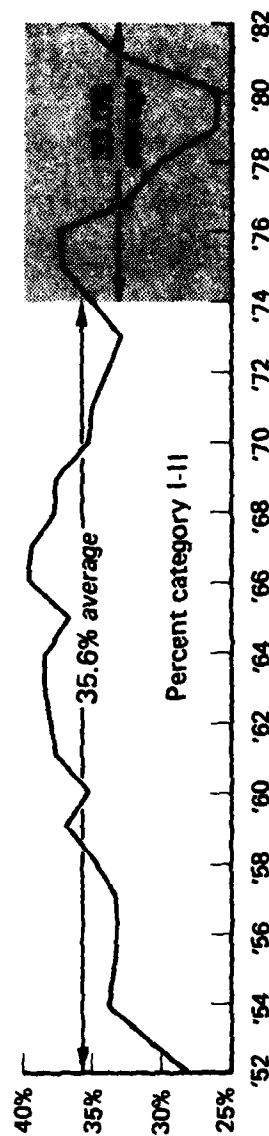
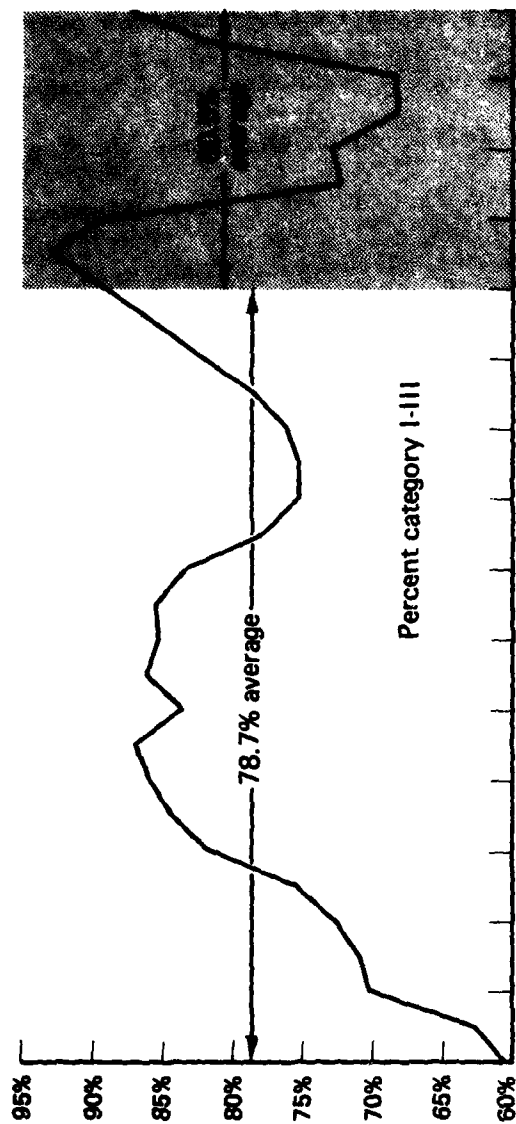
Entry Test Scores

Looking ahead, we can expect population changes to make a less favorable recruiting environment. Military compensation will have to rise if it is to keep pace with civilian compensation. Later we will estimate the expected size of these wage changes. Now, a discussion of military recruit "quality" is in order.

One plausible measure of the quality of military accessions is the Armed Forces Qualification Test (AFQT). It is given to all applicants to measure their trainability for military service. Figure 4 compares AFQT test scores for all male non-prior-service (NPS) accessions over the last 30 years. The upper portion shows the percentage of NPS male recruits who were in mental categories I-III, which encompass the top 70 percent of the ability distribution. The last 30 years have witnessed wide variations in this percentage, but the averages for the years before and during the AVF are surprisingly similar. From 1952 to 1973, 78.7 percent of recruits were in mental groups I-III. Since the advent of the AVF, 80.5 percent were in these groups.<sup>3</sup>

The lower portion of figure 4 shows a substantial variation in the percentage of recruits in mental categories I-II, roughly the top 30 percent of the ability distribution. Again, there are more between-year differences in this percentage than there is variation in the average before and during the AVF. In short, from this time-series look at recruits by AFQT categories, it is difficult to find any differences between the average quality of military recruits before and after 1974.

Now we will compare today's military recruits with today's youth in general and both of these groups with an earlier benchmark population. Table 3 contains AFQT results for all DoD recruits in FY 1981, a representative sample of the 1980 male youth population, and the World War II AFQT reference population of December 1944. Not only do today's youth



Source: Data for 1952-75 are from Office of Assistant Secretary of Defense (Manpower, Reserve Affairs, and Logistics). Data for 1976-81 provided by Defense Manpower Data Center. Data for 1982 is for the first three quarters only. Data for 1976-80 have been reformed.

FIG. 4: MALE NONPRIOR SERVICE ACCESSIONS BY AFQT CATEGORY



have a higher median score than males (officer and enlisted) on active duty in the World War II reference population, but a greater percentage of today's military recruits come from AFQT mental categories I-III than do today's civilian youth.

TABLE 3

ARMED FORCES QUALIFICATION TEST (AFQT) DISTRIBUTIONS  
OF 1980 MALE YOUTH POPULATION AND WORLD WAR II  
REFERENCE POPULATION

(Percent)

Population Group	Category					Total	Median	Category I-III
	I	II	III	IV	V			
1980 Male Youth <sup>a</sup>	5	35	29	23	8	100	53	69
FY 1981 DoD Male Accessions	3	30	47	20	0	100	52	80
World War II Reference <sup>b</sup>	8	28	34	21	9	100	50	68

<sup>a</sup> 1980 Male Youth Population and FY 1981 male accessions are restricted to persons born between January 1, 1957 and December 31, 1962 (18 through 23 years at time of testing, July-October 1980). The 1980 male youth data are a national representative sample of approximately 6,000 individuals; data are weighted to reflect the population.

<sup>b</sup> The "World War II reference population" approximates the actual composition of males on active duty (officers and enlisted personnel) as of 31 December 1944 — approximately 12 million males.

The military has generally found high school graduates to be better "quality" recruits than non-high school graduates when quality is measured by survival probabilities. (These are the probabilities that recruits will complete the first enlistment term and thus reflect their adaptability to service life.) High school graduation, in fact, is the most important predictor of survival, and the AVF has been successful in recruiting graduates. From FY 1964 to 1973, an average of 71 percent of total active duty non-prior service recruits were high school diploma graduates. In the AVF years since FY 1973, the average has been 70 percent.

In the strong recruiting market of FY 1982, diploma graduates were 86 percent of DoD accession. The Army and the Marine Corps, in fact, never before recruited such high proportions of graduates.<sup>4</sup>

#### Representativeness

Concerns about the representativeness of today's military recruits differ from concerns about the quality of accessions. While for quality "more is better," for representativeness a cross-section of the diverse U.S. population is desired. Most discussions of representativeness focus on race or social class, but education, geographic origin, ethnic origin, and religious preference could also be included.

A representative military is deemed important because of fairness, because no one group should be able to dominate the military, and because of concerns that America's foreign image and self-image is tarnished when minority groups are disproportionately burdened with military service. Discussions of representativeness arouse considerable passions, and polarize around arguments about individual freedom of choice versus the duties of citizenship. To further complicate the discussion, the criteria of representativeness are fuzzy, leaving considerable room for disagreement over whether or not they have been achieved.

Unfortunately, we have only spotty historical information on the socioeconomic backgrounds of individuals in the military. What there is tends to suggest that the military has traditionally drawn, and continues to draw, heavily from the lower middle class.<sup>5</sup> This is not surprising; the military provides essentially free training (much of it transferable to the civilian sector), status, and stable employment.

Fredland and Little examined the 1979 Youth Cohort data, attempting to distinguish between males who enlisted in the military from those who did not.<sup>6</sup> They analyzed background variables (such as parents' schooling, father's occupation, geographic location, and siblings) as well as a personal characteristics (such as age, education, educational plans, and health). Separate analyses were done for 18-22 year old white, black, and hispanic males.

In general, the comparisons revealed more similarities than differences between youth in the military and youth not in the military. However, blacks and hispanics in the military tended to come from better socio-economic backgrounds than their non-military counterparts; for whites, there was an opposite tendency. Since most of the concern about socio-economic class has centered on whites, it is worth examining these results in some detail.

Five of the 13 background characteristics were statistically different between the white male military and non-military samples. White males in the military had more siblings (3.45 versus 2.99); were less likely to have lived with both parents at age 14 (71 percent versus 83 percent); were more likely to have had a father in the military (7 percent versus 2 percent); were more likely to have a father with a blue-collar occupation (51 percent versus 44 percent) and less likely to have a father with a professional occupation (21 percent versus 33 percent) than their civilian counterparts.<sup>7</sup> Whether or not these differences in background satisfy the representativeness criteria is unclear because the criteria are not precisely defined. In our judgement, the socio-economic backgrounds of white youth in the AVF are sufficiently representative of the white population. While proportionally more white males with lower middle class backgrounds are in the military, the differences between them and the youth population are not large enough to be troubling.

What about the racial representativeness? Here the primary concern is with the disproportional representation of blacks in the military. While blacks make up about 11 percent of the youth population, they make up 22 percent of current DoD recruits. In the Army, the fraction is roughly one-third.

The reasons that the military is attractive to black Americans are not difficult to uncover. It is not so likely that young blacks are more patriotic or more inclined to military life than are young whites; it is more certain that their unemployment risk is higher, and their earnings potential lower, in the civilian sector. The civilian sector has racial earnings differentials that the military does not.

The important (albeit often unrecognized) message contained in this racial comparison of opportunities in the military and civilian sectors is that the military will become more racially representative as civilian opportunities for blacks improve. Blacks' earnings, particularly those of young blacks, have increased substantially relative to whites' earnings since World War II. After fairly sluggish growth until the mid-sixties, the ratio grew substantially in the sixties and seventies.<sup>8</sup> Assuming it continues to grow throughout the eighties, the eighties should increasingly be characterized by smaller and smaller differences between the races in the returns from military enlistment.

Our philosophical position clearly represents individual freedom of choice rather than the duties of citizenship. From that position, we submit that America's image can be as tarnished by a military populated by unwilling conscripts as it can be by a military that is not completely representative. Although we do not see a quick solution to current lack of compatibility between volunteerism and ethnic representativeness we do not see the problem worsening in the future. Instead, we expect that as the civilian earnings ratio of black to whites improves, racial representation in the military will also improve.

#### COHORT-INDUCED WAGE CHANGES

Most analyses of the future recruiting environment suggest that recruitment success depends upon military wages keeping pace with civilian wages.<sup>9</sup> This finding, while reassuring on its face, does not really address a critical question force planners must answer as they plan for the next two decades: how can civilian wages be expected to behave? What wage levels will the military have to match, to be competitive in a labor market characterized by a substantially smaller pool of young men than was available in the seventies? As colleges and universities try to maintain enrollments, as private sector employers bid for entry level workers, and as the military attempts to recruit the same or greater numbers of youth, how high will the wages of young males go?

Before attempting to answer these questions, it is worthwhile to review why changing age distributions might change earnings distributions. If workers in all experience categories substituted perfectly for one another, changes in the age distribution of the population would not change the earnings distribution: the returns for a worker's labor would be unrelated to the numbers in his experience category. Although we know little about the parameters that determine the substitution possibilities among workers of different experience levels, we do know that substitution possibilities are not perfect: changes in the proportion of young (inexperienced) workers to older (experienced) workers change relative wage rates.

In fact, the wage changes that resulted from the baby boom's entry into the job market are well documented (see Wachter, 1977, and Welch, 1979). Empirical estimates of the pure effect of a cohort's size on its earnings have been calculated, and the sharpest cohort-wage-effects have been found for entry-level workers. This result is intuitively appealing. Population size differences make greater differences when workers are young; as they age, their labor substitutes for a broader range of age groups, and the particular size of their birth cohort makes less difference in their earnings.

Table 4 provides the wage changes expected from the future changes in the size of the youth cohort. What is perhaps most striking about these projected wage changes is their small size. In hindsight this is

not so unexpected. For the age group, cohort-induced wage reductions when the baby boom entered the job market (1967-75) have been estimated to be 8 percent. Our future projections indicate real wage increases of the same order of magnitude.

TABLE 4

PREDICTED CHANGES IN THE RELATIVE REAL WAGES  
OF YOUNG MALES, 1982 BASE<sup>a</sup>

	<u>1985</u>	<u>1990</u>	<u>1995</u>	<u>2000</u>
Relative real wage increase from 1982 base year	3.3 to 4.2%	5.9 to 7.8%	10.4 to 11.8%	6.8 to 8.3%

<sup>a</sup>Source: See Quester and Lockman, 1982.

Thus, to maintain comparability with civilian wages, the military will have to pay higher entry-level wages in the latter part of the eighties and nineties than it is currently paying. Youth wages will not, however, rise as sharply as some might have projected. Wage changes of under 12 percent (our upper bound estimate for the year of sharpest drop in potential military manpower) can be planned and budgeted.



## CONCLUSIONS

We have concentrated our analysis on the supply of first-term manpower, the military manpower that was obtained partially through conscription prior to 1974. First, we documented changes in the size of the youth cohort over the next two decades. While the future promises smaller numbers of young men than are currently available, these reduced cohorts are not unprecedented. In the sixties, with smaller youth populations than we expect in the eighties and nineties, we manned a large, young armed force. (We did not man it exclusively with volunteers, however. In short, while we have historical experience with small youth cohorts and large youthful forces, we have no experience doing it in a volunteer environment.)

Next, we examined youth attitudes toward the military and found relatively large fractions of youth favorably disposed toward military service. In fact, current accession goals require only one-third the young males who say they are "likely to enlist".

Third, we tried to evaluate the quality and representativeness of the AVF, measuring quality primarily by the entry test scores and high school graduation status of military recruits. Although we found some sharp year-to-year variations in recruit "quality," we found no significant differences in a force manned exclusively (versus partially) by volunteers.

Overall, we found no convincing evidence that the quality of today's recruits is inadequate, although not maintaining military pay at a level comparative with civilian wages could quickly change that situation.<sup>10</sup> We submit, in fact, that the relationships among individual characteristics, unit characteristics, and productivity are the most poorly understood area in military manpower research. Still, according to our best measures of recruit quality, entry test scores, our military today is as good as it has ever been.

Representativeness is a more difficult problem. It might appear that one can produce a representative military straightforwardly by conscription, and it may not be so simple to produce a representative military by volunteerism. In general we found the socio-economic class backgrounds of current recruits to be reasonably representative of the population. The AVF is currently characterized by disproportionate representation of minority groups, particularly blacks, but this would change if blacks' earnings continue to improve relative to white earnings.

Finally, we turned to the future costs of the AVF, estimating how much smaller youth cohorts will change youth wages. Recruitment success necessitates that military wages keep pace with civilian wages; real civilian youth wages will rise for most of the rest of this century. To keep pace with civilian wages, we estimate the military will need to pay 10 to 12 percent more than current real wage levels by 1995.<sup>11</sup>

Not surprisingly, the opportunity cost of utilizing young men thus rises when there are fewer of them. However, changes in real resource costs are independent of an AVF/Draft debate no matter how we obtain first-term personnel in the future, the cost in reduced civilian output will be somewhat greater than it is currently.

In summary, our position is that the All-Volunteer Force is working today. We submit that the chances are good that it can continue to work in the future.

## FOOTNOTES

- <sup>1</sup> Our discussion of a "surge" capability addresses our ability to fight a future war with a military force which, as in the Vietnam era, relies heavily upon young men. We expect that a wartime "surge" would involve a draft. Here, we merely evaluate whether in the future there will be sufficient numbers of these young men.
- <sup>2</sup> For males, career expectation rates were one-fourth of their preference rates and one-fifth of their intent rates. Again, this exceeds current first-terminer to careerist transition probabilities. For females, preference rates uniformly exceed intent rates, indicating more women would like to (as opposed to expect to) serve in the military. Should the military be able to find efficient ways to utilize more women, it can get them. (Currently less than 1 percent of this female population is in the military.)
- <sup>3</sup> Test scores were misnormed in the 1976-80 period, leading the military to believe it was accessing a larger proportion of higher mental group youth than it actually was. (Our data reflect the renormed numbers, illustrating the sharp drop in accession quality during this period.) Thus, in hindsight, it is difficult to tell how much of the drop in accession quality in this period was due to economic factors like military pay and how much was due to test miscalibration.

- 4 The data are from the Office of the Assistant Secretary of Defense, Manpower, Reserve Affairs and Logistics, DoD (MRA&L).
- 5 See Davis and Dolbeare, 1968, for a discussion of the Vietnam period. Choongsoo et al, 1980, provides more recent evidence.
- 6 These data are the ones we analyzed in the earlier section concerning youth attitudes toward military service.
- 7 See Little and Fredland, 1982. The remainder of both samples were distributed between farm and sales occupations where there were no significant differences between military and non-military youth.
- 8 See Smith and Welch, 1977 and 1978.
- 9 For example, see the studies by Lawrence Goldberg, Center for Naval Analyses Memoranda 81-0145.10, 81-1158, and 81-1795.
- 10 We acknowledge, however, that we bench mark our quality comparisons with the pre-AVF force, knowing that direct measures of military effectiveness are lacking.
- 11 A potentially more serious problem that military manpower procurers will face in the next two decades is the projected shortage of

skilled technicians. These problems will be especially acute in the Air Force and Navy, where requirements for highly skilled technicians are rising sharply. Since skilled technicians are not first-termers, however, projected future retention difficulties are not part of the AVF debate.

## REFERENCES

- Bachman, Jerald G., "American High School Seniors View the Military: 1976-1981," Survey Research Center, Institute for Social Research, The University of Michigan, February 1982
- Binkin, Martin and Mark J. Eitelberg with Alvin J. Schexnider and Marvin M. Smith, Blacks and the Military (Brookings, Washington, D.C.), 1982
- Choongsoo Kim, Gilbert Nestel, Robert L. Phillips, and Michael E. Borus, "The All-Volunteer Force: An Analysis of Youth Participation, Attrition, and Reenlistment," Center for Human Resources Research, The Ohio State University, May 1980
- Davis, James W. Jr. and Kenneth M. Dolbeare, Little Groups of Neighbors: The Selective Service System (Markham) 1968
- Fredland, J. Eric and Roger D. Little, "SocioEconomic Characteristics of the All Volunteer Force: Evidence from the National Longitudinal Survey, 1979, (Report prepared for the Office of Naval Research)," U.S. Naval Academy, February 1982
- Goldberg, Lawrence, "Summary of Navy Enlisted Supply Study," CNA Memorandum 81-1158, 22 July 1981

Janowitz, Morris and Charles C. Moskos, Jr., "Five Years of the All-Volunteer Force: 1973-78," Armed Forces and Society, Vol. 5, No. 2, Winter 1979: 171-218

Moskos, Charles C., John Sibley Buter, Alan Ned Sabrosky, and Alvin J. Schnexnider, "Symposium: Race and the U.S. Military," Armed Forces and Society, Vol/ 6, No. 4, Summer 1980: 586-613

National College Bound Seniors, 1981, Admission Testing Program of the College Board, Educational Testing Service, Princeton, New Jersey, 1981

National Opinion Research Center, University of Chicago, and Center for Human Resource Research, Ohio State University, National Longitudinal Survey of Labor Force Behavior, Youth Survey, 1980, NORC-4300, 1/80

Quester, Aline O. and Robert F. Lockman, "The Market for Military Recruits," Memorandum (CNA)82-1137, 24 Sep 1982, Center for Naval Analyses

Smith, James P. and Finis R. Welch, "Black-White Male Wage Ratios: 1960-1970." American Economic Review, 67 (June 1977): 323-338

\_\_\_\_\_, "Race Differences in Earnings: A Survey and New Evidence," R-2295-NSF, The Rand Corporation, March 1978



Survey Research Center, Institute for Social Research, The University of Michigan, Monitoring the Future, Questionnaire Responses from the Nation's High School Seniors, 1975 through 1981 editions

United States Bureau of the Census, Current Population Reports, Series P-25, Report Numbers 519, 704, 721, and 870

Wachter, Michael L., "Intermediate Swings in Labor Force Participation," Brookings Papers on Economic Activity, no. 2, 1977, 545-574

Welch, Finis, "Effect of Cohort Size on Earnings: The Baby Boom Babies' Financial Bust," Journal of Political Economy, 87, October, 1979, S65-S98

CNA PROFESSIONAL PAPERS - 1978 TO PRESENT\*

- PP 211  
Mizrahi, Maurice M., "On Approximating the Circular Coverage Function," 14 pp., Feb 1978, AD A054 429
- PP 212  
Mangel, Marc, "On Singular Characteristic Initial Value Problems with Unique Solution," 20 pp., Jun 1978, AD A058 535
- PP 213  
Mangel, Marc, "Fluctuations in Systems with Multiple Steady States. Application to Lancheater Equations," 12 pp., Feb 78 (Presented at the First Annual Workshop on the Information Linkage Between Applied Mathematics and Industry, Naval PG School, Feb 23-25, 1978), AD A071 472
- PP 214  
Weinland, Robert G., "A Somewhat Different View of The Optimal Naval Posture," 37 pp., Jun 1978 (Presented at the 1976 Convention of the American Political Science Association (APSA/IUS Panel on "Changing Strategic Requirements and Military Posture"), Chicago, Ill., September 2, 1976), AD A056 228
- PP 215  
Colle, Russell C., "Comments on: Principles of Information Retrieval by Manfred Kochen," 10 pp., Mar 78 (Published as a Letter to the Editor, Journal of Documentation, Vol. 31, No. 4, pages 298-301), December 1975), AD A054 426
- PP 216  
Colle, Russell C., "Lotka's Frequency Distribution of Scientific Productivity," 18 pp., Feb 1978 (Published in the Journal of the American Society for Information Science, Vol. 28, No. 6, pp. 366-370, November 1977), AD A054 425
- PP 217  
Colle, Russell C., "Bibliometric Studies of Scientific Productivity," 17 pp., Mar 78 (Presented at the Annual meeting of the American Society for Information Science held in San Francisco, California, October 1976), AD A054 442
- PP 218 - Classified
- PP 219  
Huntzinger, R. LaVar, "Market Analysis with Rational Expectations: Theory and Estimation," 60 pp., Apr 78, AD A054 422
- PP 220  
Maurer, Donald E., "Diagonalization by Group Matrices," 26 pp., Apr 78, AD A054 443
- PP 221  
Weinland, Robert G., "Superpower Naval Diplomacy in the October 1973 Arab-Israeli War," 76 pp., Jun 1978 (Published in Seapower in the Mediterranean: Political Utility and Military Constraints, The Washington Papers No. 61, Beverly Hills and London: Sage Publications, 1979) AD A055 564
- PP 222  
Mizrahi, Maurice M., "Correspondence Rules and Path Integrals," 30 pp., Jun 1978 (Invited paper presented at the CNRS meeting on "Mathematical Problems in Feynman's Path Integrals," Marseille, France, May 22-26, 1978) (Published in Springer Verlag Lecture Notes in Physics, 106, (1979), 234-253) AD A055 536
- PP 223  
Mangel, Marc, "Stochastic Mechanics of Molecule-Molecule Reactions," 21 pp., Jun 1978, AD A056 227
- PP 224  
Mangel, Marc, "Aggregation, Bifurcation, and Extinction in Exploited Animal Populations," 48 pp., Mar 1978, AD A058 536  
\*Portions of this work were started at the Institute of Applied Mathematics and Statistics, University of British Columbia, Vancouver, B.C., Canada
- PP 225  
Mangel, Marc, "Oscillations, Fluctuations, and the Hopf Bifurcation," 43 pp., Jun 1978, AD A058 537  
\*Portions of this work were completed at the Institute of Applied Mathematics and Statistics, University of British Columbia, Vancouver, Canada.
- PP 226  
Reiston, J. M. and J. W. Mann, "Temperature and Current Dependence of Degradation in Red-Emitting GaP LEDs," 34 pp., Jun 1978 (Published in Journal of Applied Physics, 50, 3630, May 1979) AD A058 538  
\*Bell Telephone Laboratories, Inc.
- PP 227  
Mangel, Marc, "Uniform Treatment of Fluctuations at Critical Points," 50 pp., May 1978, AD A058 539
- PP 228  
Mangel, Marc, "Relaxation at Critical Points: Deterministic and Stochastic Theory," 54 pp., Jun 1978, AD A058 540
- PP 229  
Mangel, Marc, "Diffusion Theory of Reaction Rates, I: Formulation and Einstein-Smoluchowski Approximation," 50 pp., Jan 1978, AD A058 541
- PP 230  
Mangel, Marc, "Diffusion Theory of Reaction Rates, II Ornstein-Uhlenbeck Approximation," 34 pp., Feb 1978, AD A058 542
- PP 231  
Wilson, Desmond P., Jr., "Naval Projection Forces: The Case for a Responsive MAF," Aug 1978, AD A054 543
- PP 232  
Jacobson, Louis, "Can Policy Changes Be Made Acceptable to Labor?" Aug 1978 (Submitted for publication in Industrial and Labor Relations Review), AD A061 528

\*CNA Professional Papers with an AD number may be obtained from the National Technical Information Service, U.S. Department of Commerce, Springfield, Virginia 22151. Other papers are available from the Management Information Office, Center for Naval Analyses, 2000 North Beauregard Street, Alexandria, Virginia 22311. An index of Selected Publications is also available on request. The index includes a Listing of Professional Papers; with abstracts; issued from 1969 to June 1981.

- PP 233  
Jacobson, Louis, "An Alternative Explanation of the Cyclical Pattern of Quits," 23 pp., Sep 1978
- PP 234 - Revised  
Jondrou, James and Levy, Robert A., "Does Federal Expenditure Displace State and Local Expenditures: The Case of Construction Grants," 23 pp., Oct 1979, AD A061 529
- PP 235  
Mizrahi, Maurice M., "The Semiclassical Expansion of the Anharmonic-Oscillator Propagator," 41 pp., Oct 1978 (Published in Journal of Mathematical Physics 20 (1979) pp. 844-855), AD A061 538
- PP 237  
Maurer, Donald, "A Matrix Criterion for Normal Integral Bases," 10 pp., Jan 1979 (Published in the Illinois Journal of Mathematics, Vol. 22 (1978), pp. 672-681)
- PP 238  
Utgoff, Kathleen Classen, "Unemployment Insurance and The Employment Rate," 20 pp., Oct 1978 (Presented at the Conference on Economic Indicators and Performance: The Current Dilemma Facing Government and Business Leaders, presented by Indiana University Graduate School of Business). AD A061 527
- PP 239  
Trost, R. P. and Werner, J. T., "The Effects of Military Occupational Training on Civilian Earnings: An Income Selectivity Approach," 38 pp., Nov 1979, AD A077 831
- PP 240  
Powers, Bruce, "Goals of the Center for Naval Analyses," 13 pp., Dec 1978, AD A063 759
- PP 241  
Mangel, Marc, "Fluctuations at Chemical Instabilities," 24 pp., Dec 1978 (Published in Journal of Chemical Physics, Vol. 69, No. 8, Oct 15, 1978). AD A063 787
- PP 242  
Simpson, William R., "The Analysis of Dynamically Interactive Systems (Air Combat by the Numbers)," 160 pp., Dec 1978, AD A063 760
- PP 243  
Simpson, William R., "A Probabilistic Formulation of Murphy Dynamics as Applied to the Analysis of Operational Research Problems," 18 pp., Dec 1978, AD A063 761
- PP 244  
Sherman, Allan and Horowitz, Stanley A., "Maintenance Costs of Complex Equipment," 20 pp., Dec 1978 (Published By The American Society of Naval Engineers, Naval Engineers Journal, Vol. 91, No. 6, Dec 1979) AD A071 473
- PP 245  
Simpson, William R., "The Accelerometer Methods of Obtaining Aircraft Performance from Flight Test Data (Dynamic Performance Testing)," 403 pp., Jun 1979, AD A075 226
- PP 246  
Brochling, Frank, "Layoffs and Unemployment Insurance," 35 pp., Feb 1979 (Presented at the Nber Conference on "Low Income Labor Markets," Chicago, Jun 1978), AD A096 629
- PP 248  
Thomas, James A., Jr., "The Transport Properties of Dilute Gases in Applied Fields," 183 pp., Mar 1979, AD A096 464
- PP 249  
Glasser, Kenneth S., "A Secretary Problem with a Random Number of Choices," 23 pp., Mar 1979
- PP 250  
Mangel, Marc, "Modeling Fluctuations in Macroscopic Systems," 26 pp., Jun 1979
- PP 251  
Trost, Robert P., "The Estimation and Interpretation of Several Selectivity Models," 37 pp., Jun 1979, AD A075 941
- PP 252  
Nunn, Walter R., "Position Finding with Prior Knowledge of Covariance Parameters," 5 pp., Jun 1979 (Published in IEEE Transactions on Aerospace & Electronic Systems, Vol. AES-15, No. 3, Mar 1979)
- PP 253  
Glasser, Kenneth S., "The d-Choice Secretary Problem," 32 pp., Jun 1979, AD A075 225
- PP 254  
Mangel, Marc and Quenbeck, David B., "Integration of a Bivariate Normal Over an Offset Circle," 14 pp., Jun 1979, AD A096 471
- PP 255 - Classified, AD B051 441L
- PP 256  
Maurer, Donald E., "Using Personnel Distribution Models," 27 pp., Feb 1980, AD A082 218
- PP 257  
Thaler, R., "Discounting and Fiscal Constraints: Why Discounting Is Always Right," 10 pp., Aug 1979, AD A075 224
- PP 258  
Mangel, Marc S. and Thomas, James A., Jr., "Analytical Methods in Search Theory," 86 pp., Nov 1979, AD A077 832
- PP 259  
Glass, David V.; Hau, Ih-Ching; Munn, Walter R., and Perlin, David A., "A Class of Commutative Markov Matrices," 17 pp., Nov 1979, AD A077 833
- PP 260  
Mangel, Marc S. and Cope, Davis K., "Detection Rate and Sweep Width in Visual Search," 14 pp., Nov 1979, AD A077 834
- PP 261  
Vila, Carlos L.; Zvijac, David J. and Ross, John, "Frank-Condon Theory of Chemical Dynamics. VI. Angular Distributions of Reaction Products," 14 pp., Nov 1979 (Reprinted from Journal Chemical Phys. 70(12), 15 Jun 1979), AD A076 287
- PP 262  
Petersen, Charles C., "Third World Military Elites in Soviet Perspective," 50 pp., Nov 1979, AD A077 835
- PP 263  
Robinson, Kathy L., "Using Commercial Tankers and Container-ships for Navy Underway Replenishment," 23 pp., Nov 1979, AD A077 836

- PP 264  
Weinland, Robert G., "The U.S. Navy in the Pacific: Past, Present, and Glissades of the Future," 31 pp., Nov 1979 (Delivered at the International Symposium on the Sea, sponsored by the International Institute for Strategic Studies, The Brookings Institution and the Yomiuri Shimbun, Tokyo, 16-20 Oct 1978) AD A066 837
- PP 265  
Weinland, Robert G., "War and Peace in the North: Some Political Implications of the Changing Military Situation in Northern Europe," 18 pp., Nov 1979 (Prepared for presentation to the Conference of the Nordic Balance in Perspective: The Changing Military and Political Situation, Center for Strategic and International Studies, Georgetown University, Jun 15-16, 1978) AD A077 838
- PP 266  
Utgoff, Kathy Classen, and Brechling, Frank, "Taxes and Inflation," 23 pp., Nov 1979, AD A061 194
- PP 267  
Trust, Robert P., and Vogel, Robert C., "The Response of State Government Receipts to Economic Fluctuations and the Allocation of Counter-Cyclical Revenue Sharing Grants," 12 pp., Dec 1979 (Reprinted from the Review of Economics and Statistics, Vol. LXI, No. 3, August 1979)
- PP 268  
Thomson, James S., "Seaport Dependence and Inter-State Cooperation: The Case of Sub-Saharan Africa," 141 pp., Jan 1980, AD A081 193
- PP 269  
Weiss, Kenneth G., "The Soviet Involvement in the Ogaden War," 42 pp., Jan 1980 (Presented at the Southern Conference on Slavic Studies in October, 1979), AD A082 219
- PP 270  
Rasmek, Richard, "Soviet Policy in the Horn of Africa: The Decision to Intervene," 52 pp., Jan 1980 (To be published in "The Soviet Union in the Third World: Success or Failure," ed. by Robert M. Donaldson, Westview Press, Boulder, Co., Summer 1980), AD A081 195
- PP 271  
McConnell, James, "Soviet and American Strategic Doctrines: One More Time," 43 pp., Jan 1980, AD A081 192
- PP 272  
Weiss, Kenneth G., "The Azores in Diplomacy and Strategy, 1940-1945," 46 pp., Mar 1980, AD A085 094
- PP 273  
Makoda, Michael K., "Labor Supply of Wives with Husbands Employed Either Full Time or Part Time," 39 pp., Mar 1980, AD A082 220
- PP 274  
Hunn, Walter R., "A Result in the Theory of Spiral Search," 9 pp., Mar 1980
- PP 275  
Goldberg, Lawrence, "Recruiters Advertising and Navy Enlistments," 34 pp., Mar 1980, AD A082 221
- PP 276  
Goldberg, Lawrence, "Delaying on Overhaul and Ship's Equipment," 40 pp., May 1980, AD A085 095
- PP 277  
Mangel, Marc, "Small Fluctuations in Systems with Multiple Limit Cycles," 19 pp., Mar 1980 (Published in SIAM J. Appl. Math., Vol. 38, No. 1, Feb 1980) AD A086 229
- PP 278  
Mizrahi, Maurice, "A Targeting Problem: Exact vs. Expected-Value Approaches," 23 pp., Apr 1980, AD A085 096
- PP 279  
Weit, Stephen M., "Causal Inferences and the Use of Force: A Critique of Force Without War," 50 pp., May 1980, AD A085 097
- PP 280  
Goldberg, Lawrence, "Estimation of the Effects of A Ship's Steaming on the Failure Rate of Its Equipment: An Application of Econometric Analysis," 23 pp., Apr 1980, AD A085 098
- PP 281  
Mizrahi, Maurice M., "Comment on 'Discretization Problems of Functional Integrals in Phase Space'," 2 pp., May 1980, published in "Physical Review D", Vol. 22 (1980), AD A094 994
- PP 283  
Dismukes, Bradford, "Expected Demand for the U.S. Navy to Serve as An Instrument of U.S. Foreign Policy: Thinking About Political and Military Environmental Factors," 30 pp., Apr 1980, AD A085 099
- PP 284  
J. Kellison, W. Munn, and U. Sumita, "The Laguerre Transform," 119 pp., May 1980, AD A085 100  
\*The Graduate School of Management, University of Rochester and the Center for Naval Analyses  
\*\*The Graduate School of Management, University of Rochester
- PP 285  
Rasmek, Richard B., "Superpower Security Interests in the Indian Ocean Area," 26 pp., Jun 1980, AD A087 113
- PP 286  
Mizrahi, Maurice M., "On the WKB Approximation to the Propagator for Arbitrary Hamiltonians," 23 pp., Aug 1980 (Published in Journal of Math. Phys., 22(1) Jan 1981), AD A091 307
- PP 287  
Cope, Davis, "Limit Cycle Solutions of Reaction-Diffusion Equations," 35 pp., Jun 1980, AD A087 114
- PP 288  
Gelman, Walter, "Don't Let Your Slides Flip You: A Painless Guide to Visuals That Really Aid," 26 pp., (revised Aug 1982), AD A092 732
- PP 289  
Robinson, Jack, "Adequate Classification Guidance - A Solution and a Problem," 7 pp., Aug 1980, AD A091 212
- PP 290  
Watson, Gregory H., "Evaluation of Computer Software in an Operational Environment," 17 pp., Aug 1980, AD A091 213
- PP 291  
Maddala, G. S., and Trust, R. P., "Some Extensions of the Marlove Press Model," 17 pp., Oct 1980, AD A091 946  
\*University of Florida

- PP 292  
Thomas, James A., Jr., "The Transport Properties of Binary Gas Mixtures in Applied Magnetic Fields," 10 pp., Sept 1980 (Published in Journal of Chemical Physics 72(10), 15 May 1980)
- PP 293  
Thomas, James A., Jr., "Evaluation of Kinetic Theory Collision Integrals Using the Generalized Phase Shift Approach," 12 pp., Sept 1980 (Printed in Journal of Chemical Physics 72(10), 15 May 1980)
- PP 294  
Roberts, Stephen S., "French Naval Policy Outside of Europe," 30 pp., Sept 1980 (Presented at the Conference of the Section on Military Studies, International Studies Association Kilauea Island, S.C.), AD A091 306
- PP 295  
Roberts, Stephen S., "An Indicator of Informal Empire: Patterns of U.S. Navy Cruising on Overseas Stations, 1869-1897," 40 pp., Sept 1980 (Presented at Fourth Naval History Symposium, US Naval Academy, 26 October 1979, AD A091 316)
- PP 296  
Dismukes, Bradford and Petersen, Charles C., "Maritime Factors Affecting Iberian Security," (Factores Maritimos que Afectan la Seguridad Iberica) 14 pp., Oct 1980, AD A092 735
- PP 297 - Classified
- PP 298  
Mizrahi, Maurice M., "A Markov Approach to Large Missile Attacks," 31 pp., Jan 1981, AD A096,159
- PP 299  
Jondrow, James M. and Levy, Robert A., "Wage Leadership in Construction," 19 pp., Jan 1981, AD A094 797
- PP 300  
Jondrow, James and Schaidt, Peter, "On the Estimation of Technical Inefficiency in the Stochastic Frontier Production Function Model," 11 pp., Jan 1981, AD A096 160  
\*Michigan State University
- PP 301  
Jondrow, James M.; Levy, Robert A. and Hughes, Claire, "Technical Change and Employment in Steel, Autos, Aluminum, and Iron Ore," 17 pp., Mar 1981, AD A099 394
- PP 302  
Jondrow, James M. and Levy, Robert A., "The Effect of Imports on Employment Under Rational Expectations," 19 pp., Apr 1981, AD A099 392
- PP 303  
Thomson, James, "The Rarest Commodity in the Coming Resource Wars," 3 pp., Aug 1981 (Published in the Washington Star, April 13, 1981), AD A104 221
- PP 304  
Duffy, Michael K.; Greenwood, Michael J., and McDowell, John M., "A Cross-Sectional Model of Annual Interregional Migration and Employment Growth: Intertemporal Evidence of Structural Change, 1958-1975," 31 pp., Apr 1981, AD A099 393  
\*University of Colorado  
\*\*Arizona State University
- PP 305  
Nunn, Laura H., "An Introduction to the Literature of Search Theory," 32 pp., Jun 1981, AD A100 420
- PP 306  
Anger, Thomas E., "What Good Are Warfare Models?" 7 pp., May 1981, AD A100 421
- PP 307  
Thomson, James, "Dependence, Risk, and Vulnerability," 43 pp., Jun 1981, AD A102 698
- PP 308  
Mizrahi, M.M., "Correspondence Rules and Path Integrals," Jul 1981, Published in "Nuovo Cimento B", Vol. 61 (1981), AD A102 699
- PP 309  
Weinland, Robert G., "An (The?) Explanation of the Soviet Invasion of Afghanistan," 44 pp., May 1981, AD A100 422
- PP 310  
Stanford, Janette M. and Tai Te Wu, "A Predictive Method for Determining Possible Three-dimensional Foldings of Immunoglobulin Backbones Around Antibody Combining Sites," 19 pp., Jun 1981 (Published in J. theor. Biol. (1981) 88, 421-439, AD A100 423  
\*Northwestern University, Evanston, IL
- PP 311  
Boves, Marianne, Brechling, Frank P. R., and Utgoff, Kathleen P. Ciessen, "An Evaluation of UI Funds," 13 pp., May 1981 (Published in National Commission on Unemployment Compensation's Unemployment Compensation: Studies and Research, Volume 2, July 1980), AD A100 424
- PP 312  
Jondrow, James; Boves, Marianne and Levy, Robert, "The Optimum Speed Limit," 23 pp., May 1981, AD A 100 425
- PP 313  
Roberts, Stephen S., "The U.S. Navy in the 1980s," 36 pp., Jul 1981, AD A 102 696
- PP 314  
Jehn, Christopher; Horowitz, Stanley A. and Lockman, Robert F., "Examining the Draft Debate," 20 pp., Jul 1981, AD A106 192
- PP 315  
Buck, Ralph V., Capt., "Le Catastrophe by any other name...", 4 pp., Jul 1981, AD A102 697
- PP 316  
Roberts, Stephen S., "Western European and NATO Navies, 1980," 20 pp., Aug 1981, AD A104 223
- PP 317  
Roberts, Stephen S., "Superpower Naval Crisis Management in the Mediterranean," 35 pp., Aug 1981, AD A104 222
- PP 318  
Vego, Milan N., "Yugoslavia and the Soviet Policy of Force in the Mediterranean Since 1961," 187 pp., Aug 1981

- PP 319  
Smith, Michael W., "Anti-Air Warfare Defense of Ships at Sea," 46 pp., Sep 1981 (This talk was delivered at the Naval Warfare System and Technology Conference of the American Institute of Aeronautics and Astronautics in Washington on December 12, 1980; in Boston on January 20, 1981; and in Los Angeles on June 12, 1981.), AD A106 191
- PP 320  
Trost, R. P., Lurie, Philip and Berger, Edward, "A Note on Estimating Continuous Time Decision Models," 15 pp., Sep 1981, AD A106 193
- PP 321  
Duffy, Michael K. and Ladman, Jerry R., "The Simultaneous Determination of Income and Employment in United States--Mexico Border Region Economies," 34 pp., Sep 1981  
Associate Professor of Economics, Arizona State University, Tempe, AZ., AD A106 540
- PP 322  
Warner, John T., "Issues in Navy Manpower Research and Policy: An Economist's Perspective," 66 pp., Dec 1981, AD A110 221
- PP 323  
Bosse, Frederick M., "Generation of Correlated Log-Normal Sequences for the Simulation of Clutter Echoes," 33 pp., Dec 1981.
- PP 324  
Horowitz, Stanley A., "Quantifying Seapower Readiness," 6 pp., Dec 1981 (Published in Defense Management Journal, Vol. 18, No. 2), AD A 110 220
- PP 326  
Roberts, Stephen S., "Western European and NATO Navies, 1981," 27 pp., Jul 1982, AD A118 703
- PP 327  
Hammon, Collin, Capt., USN and Graham, David R., Dr., "Estimation and Analysis of Navy Shipbuilding Program Disruption Costs," 12 pp., Mar 1980, AD A112 514
- PP 328  
Inland, Robert G., "Northern Waters: Their Strategic Significance," 27 pp., Dec 1980, AD A112 509
- PP 329  
Mangel, Marc, "Applied Mathematicians And Naval Operators," 40 pp., Mar 1982 (Revised), AD A116 598
- PP 330  
Lockman, Robert F., "Alternative Approaches to Attrition Management," 30 pp., Jan 1982, AD A112 510
- PP 331  
Roberts, Stephen S., "The Turkish Straits and the Soviet Navy in the Mediterranean," 15 pp., Mar 1982 (Published in Navy International)
- PP 332  
Jenn, Christopher, "The RDF and Amphibious Warfare," 36 pp., Mar 1982, AD A 113 592
- PP 333  
Lee, Lung-Fel and Trost, Robert P., "Estimation of Some Limited Dependent Variable Models with Application to Housing Demand," 26 pp., Jan 1982. (Published in Journal of Econometrics 8 (1978) 357-382), AD A 112 536
- PP 334  
Kenny, Lawrence W., Lee, Lung-Fel, Maddala, G. S., and Trost R. P., "Returns to College Education: An Investigation of Self-Selection Bias Based on the Project Talent Data," 15 pp., Jan 1982. (Published in International Economic Review, Vol. 20, No. 3, October 1979), AD A112 480
- PP 335  
Lee, Lung-Fel, G.S. Maddala, and R. P. Trost, "Asymptotic Covariance Matrices of Two-Stage Probit and Two-Stage Tobit Methods for Simultaneous Equations Models with Selectivity," 13 pp., Jan 1982. (Published in Econometrica, Vol. 48, No. 2 March, 1980), AD A112 483
- PP 336  
O'Neill, Thomas, "Mobility Fuels for the Navy," 13 pp., Jan 1982. (Accepted for publication in Naval Institute Proceedings), AD A112 511
- PP 337  
Warner, John T. and Goldberg, Matthew S., "The Influence of Non-Pecuniary Factors on Labor Supply," 23 pp., Dec 1981, AD A113 094
- PP 339  
Wilson, Desmond P., "The Persian Gulf and the National Interest," 11 pp., Feb 1982, AD A112 505
- PP 340  
Lurie, Philip, Trost, R. P., and Berger, Edward, "A Method for Analyzing Multiple Spell Duration Data," 34 pp., Feb 1982, AD A112 504
- PP 341  
Trost, Robert P. and Vogel, Robert C., "Prediction with Pooled Cross-Section and Time-Series Data: Two Case Studies," 6 pp., Feb 1982, AD A112 503
- PP 342  
Lee, Lung-Fel, Maddala, G. S., and Trost, R. P., "Testing for Structural Change by D-Methods in Switching Simultaneous Equations Models," 5 pp., Feb 1982, AD A112 482
- PP 343  
Goldberg, Matthew S., "Projecting the Navy Enlisted Force Level," 9 pp., Feb 1982, AD A112 484
- PP 344  
Fletcher, Jean, W., "Navy Quality of Life and Reenlistment," 13 pp., Nov 1981, AD A113 095
- PP 345  
Utgoft, Kathy and Thaler, Dick, "The Economics of Multi Year Contracting," 47 pp., Mar 1982. (Presented at the 1982 Annual Meeting of the Public Choice Society, San Antonio, Texas, March 5-7, 1982), AD A114 732
- PP 346  
Rostker, Bernard, "Selective Service and the All-Volunteer Force," 23 pp., Mar 1982, AD A113 096
- PP 347  
McConnell, James, M., "A Possible Counterforce Role for the Typhoon," 24 pp., Mar 1982, AD A116 601
- PP 348  
Jondrow, James, Trost, Robert, "An Empirical Study of Production Inefficiency in the Presence of Errors-in-The-Variables," 14 pp., Feb 1982, AD A113 591

- PP 349  
W. M. Breckenridge, O. Kim Melvin, "Collisional Intra-multiplet Relaxation of  $Cd(5s5p^3P_{0,1,2})$  by Alkane Hydrocarbons," 7 pp., Jul 1981. (Published in Journal of Chemical Physics, 76(4), 15 Feb 1982), AD A113 093
- PP 350  
Levin, Marc, "A Method for Increasing the Firepower of Virginia Class Cruisers," 10 pp., Apr 1982. (To be published in U.S. Naval Institute Proceedings), AD A116 602
- PP 351  
Coutre, S. E.; Stanford, J. M.; Hovis, J. G.; Stevens, P. W.; Wu, T. T., "Possible Three-Dimensional Backbone Folding Around Antibody Combining Site of Immunoglobulin MOPC 167," 18 pp., Apr 1982. (Published in Journal of Theoretical Biology),
- PP 352  
Barfoot, C. Bernard, "Aggregation of Conditional Absorbing Markov Chains," 7 pp., June 1982 (Presented to the Sixth European Meeting on Cybernetics and Systems Research, held at the University of Vienna, Apr 1982.), AD A116 603
- PP 353  
Barfoot, C. Bernard, "Some Mathematical Methods for Modeling the Performance of a Distributed Data Base System," 18 pp., June 1982. (Presented to the International Working Conference on Model Realism, held at Bad Honnef, West Germany, Apr 1982.), AD A116 604
- PP 354  
Hall, John V., "Why the Short-War Scenario is Wrong for Naval Planning," 6 pp., Jun 1982., AD A118 702
- PP 356  
Cylke, Steven; Goldberg, Matthew S.; Hogan, Paul; Mairs, Lee; "Estimation of the Personal Discount Rate: Evidence from Military Reenlistment Decisions," 19 pp., Apr 1982., AD A122 419
- PP 357  
Goldberg, Matthew S., "Discrimination, Nepotism, and Long-Run Wage Differentials," 13 pp., Sep 1982. (Published in Quarterly Journal of Economics, May 1982.),
- PP 358  
Akst, George, "Evaluating Tactical Command And Control Systems--A Three-Tiered Approach," 12 pp., Sep 1982., AD A122 478
- PP 359  
Quester, Aline; Fletcher, Jean; Marcus, Alan; "Veteran Status As A Screening Device: Comment," 26 pp., Aug 1982.
- PP 361  
Quanbeck, David B., "Methods for Generating Aircraft Trajectories," 51 pp., Sep 1982., AD A122 386
- PP 362  
Horowitz, Stanley A., "Is the Military Budget Out of Balance?," 10 pp., Sep 1982., AD A122 368
- PP 363  
Marcus, A. J., "Personnel Substitution and Navy Aviation Readiness," 35 pp., 1982., AD A122 420
- PP 364  
Quester, Aline; Nakada, Michael; "The Military's Monopsony Power," 29 pp., Oct 1982., AD A123 657
- PP 366  
Sprulli, Nancy L., Gestwirth, Joseph L., "On the Estimation of the Correlation Coefficient from Grouped Data," 9 pp., Oct 1982. (Published in the Journal of the American Statistical Association, Sep 1982, Vol. 77, No. 379, Theory and Methods Section.), AD A122 382
- PP 368  
Weinland, Robert G., "The Evolution of Soviet Requirements for Naval Forces--Solving the Problems of the Early 1960s," 41 pp., Dec 1982.
- PP 369  
Quester, Aline; Lockman, Robert, "The All-Volunteer Force: A Positive Perspective," 29 pp., Nov 1982.
- PP 370  
Rostker, Bernard D., "Human Resource Models: An Overview," 17 pp., Nov 1982., AD A123 656
- PP 373  
Jacobson, Louis, "Research to Quantify the Effect of Permanent Change of Station Moves on Wives' Wages and Labor Supply," 35 pp., Jan 1983.