



United States Army  
Recruiting Command

USAREC-SR-85-2

**DEVELOPMENT AND VALIDATION  
OF PREENLISTMENT  
SCREENING COMPOSITES  
FOR  
ARMY ENLISTED PERSONNEL**

BY

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July 1985

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Research and Studies Division  
Program Analysis and Evaluation Directorate  
Fort Sheridan, Illinois 60037



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by

Manpower Research Center  
Naval Postgraduate School  
Monterey, California

## DISCLAIMER

The views, opinions, and findings in this report are those of the authors and should not be construed as an official Department of the Army position, policy, or decision, unless so designated by other authorized documents.

## SUMMARY

Background: Military enlistment standards have been established as a means of evaluating the suitability of prospective military personnel. All Volunteer Force (AVF) standards are adjusted according to need to enlist individuals who will fill a variety of military occupations, and to exclude those with a likelihood of failure in completing training or first-term service. First-term attrition results in non-recoverable training expenditures, affects military readiness, and requires additional expenditure for personnel replacement.

Purpose: One purpose of the study was to identify important variables which may be used in preenlistment screening. The other was to develop and validate composites of the variables found to be most predictive of first-term attrition. Such composites could be used operationally to screen out applicants who are high risk individuals, in terms of first term attrition.

Procedure: Cross-tabulations of bio-demographic variables and attrition status were computed to determine the impact of the variables on first-term attrition. Candidate predictors included educational level, AFQT category, age at entry, race, term of enlistment, moral waivers, marital status, dependent status, geographic attrition code, and ASVAB-5 or other ASVAB form. A series of logistic regression models were computed using a forward selection procedure. The three male and three female models which showed the best fit to the data were then selected.

Individuals were assigned scores using the coefficients for each model. Validities and cross-validities were computed for each male and female composite to evaluate its explanatory strength and stability in cross-validation. The composite score distributions were cross-tabulated with actual first-term attrition for population subgroups, and were presented graphically. Composite efficiencies were compared at three selected cut-off points on the basis of minimizing the error in prediction of "stayers" who were actually first-term losses. The cumulative frequency distributions of the composites' scores were also examined to determine the number of enlistees who would have been eliminated at a given cut-off score.

Results: The most significant preenlistment predictors of attrition for males were educational level, AFQT category, age at entry, geographic attrition code, and race. Term of enlistment, AFQT category, and race were the most important predictors of first-term attrition for females. The composites which included race were the most valid predictors of first-term attrition.

Conclusions and Implications: The composite for males which included race as a predictor (Composite 2) provided better predictions, in general, than the other male composites. Also, the use of this composite in preenlistment screening would result in less adverse impact for population subgroups than would occur through the use of the other composites. The inclusion of race as a screening factor might be perceived negatively or as a source of discriminatory action. However, attrition rates for blacks are

considerably lower, on the average, than those of their non-black cohorts. It would, therefore, be more discriminatory to ignore these differences and thereby deny entry to black applicants who may appear to be higher attrition risks on the basis of other screening criteria.

Similar findings were obtained for the female composite including race (Composite 2). However, none of the composites for females provided the level of accuracy in predicting first-term attrition than was evident in the male composites. Thus, the examination of other variables predictive of female first-term attrition would be desirable, since the variables currently available for preenlistment screening do not provide as effectual attrition predictions for females as for males.

In addition, attrition may not be the sole criterion of interest for preenlistment screening. Therefore, a secondary screening criterion could be developed to estimate an individual's ability to achieve minimally acceptable performance. This scale could be developed on the basis of Skill Qualifications Test (SQT) performance, performance ratings, or attainment of the E-4 paygrade. Once a measure of expected performance was established, it could be used as a final filter in conjunction with the measure of expected attrition.

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## FOREWORD

The research reported here was sponsored by the U. S. Army Recruiting Command. The report provides information on development and validation of selection procedures which may be employed for suitability screening. These data may be updated and the procedures revised for operational use.

The Statistical Analysis System (SAS) software, used in this study, has been designed for use with an IBM computer. However, similar programming routines are available with packages such as SPSS-X for use on other computer systems.

File extractions, concatenations, and recoding procedures were done by William H. King of EDM Corporation, utilizing Defense Manpower Data Center (DMDC) software. Mary Ellen Lathrop assisted in the preparation of this report. Supplementary literature was provided by Mark J. Fitelberg.

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## I. INTRODUCTION

### A. Background

Military enlistment standards have been established as a means of evaluating the suitability of prospective military personnel. The screening procedure has been altered and has become more comprehensive over the years. Enlistment standards are adjusted according to wartime or peacetime needs. During wartime mobilization, manpower quantity is preferred to manpower quality. However, since the advent of the All Volunteer Force (AVF) in 1972, the focus has been on recruiting sufficient numbers of "quality" personnel. The Services set their entrance standards so as to enlist the largest number of individuals who will be eligible to fill a wide variety of military occupations and who will complete their first terms of service. Alternatively, entrance standards are set to eliminate applicants who have a strong likelihood of failure to complete training or a first term of service.

First-term attrition, i. e. failure to complete an initial term of active duty service, affects military readiness and necessitates additional expenditure for personnel replacement. Further, recruitment and training costs invested in those who separate early are non-recoverable (sunk costs). Therefore, it is advantageous to assess the utility of using pre-service factors related to first-term attrition to predict premature separation.

## B. Purpose

The purpose of this study was two-fold. First, preenlistment factors available for analysis were examined to identify important variables which could routinely be used in screening. Second, several screening composites were developed on an estimation sample and validated on other accession cohorts as well as on population subgroups. The composite with the best overall efficiency could then be used by the Army to improve recruit screening when supply exceeds demand and to aid in establishing the level of trade-off between recruiting resources and training costs. As an additional benefit, attrition forecasting, essential to controlling manpower strength, could also be improved.

A recent Rand Defense Manpower Research Center report reiterates the two types of employee attributes, screening or pre-service characteristics and performance measures. The ASVAB and preenlistment physical tests do not screen for important psychological adjustment to the military environment. Although this is true, a screening device can only be composed of information available at the time of application which is uniformly collected for all applicants. Therefore, this study was confined to the analysis of readily available biographic and demographic pre-enlistment data.

## II. CONCEPTUAL FRAMEWORK

Hand, Griffith and Mobley (1977) assert, "Pre-end of first term attrition cannot be evaluated in a vacuum. The cost and end-strength implications of attrition must be viewed in the context of: the size of the pool of potential accessions; success of recruiting efforts in attracting qualified accessions within the all volunteer environment; and, reenlistment rates. Further, evaluation of attrition depends upon, among other things, the performance of those being prematurely separated; whether attrition is occurring early in the term of enlistment when sunk costs are relatively low or later in the term when replacement costs are high; and the marginal costs of attempting to "salvage" a candidate for premature separation."

Several factors are related to first-term attrition which include pre-service biographic and demographic characteristics as well as military experiences. Lockman (1975), Greenberg and McConeghy (1977), Plag, Wilkins and Phelan (1968), and Guinn (1977) have found that formal educational level is the most important biographic variable related to first-term attrition. Matthews (1977) and Guinn (1977) identified mental categories as defined by the Armed Forces Qualification Test (AFQT) to be related to early attrition. Eitelberg, Laurence, Waters and Perelman (1984) have found that the annual proportion of examinees within each AFQT category has hardly varied over the past twenty years despite the switch from draft procedures to an all volunteer force. In fact, ". . . . changes in the economy,

recruiting incentives, and policy during the AVF have not operated to alter the "attractiveness" of military service for any one particular aptitude category over another; all categories have been equally affected by the influencing factors of the 1970s." (Fitelberg et al., 1984, p.47). Furthermore, test experts agree that the Armed Services Vocational Aptitude Battery (ASVAB), of which the AFQT is composed, is a valid predictor of in-service performance for all groups regardless of gender or race-ethnicity. A nonlinear age and attrition relationship has been reported by Plag, Goffman and Phelan (1970), Guinn (1977), Lockman (1975) and Matthews (1977). Lockman has incorporated these variables to form the SCREEN table used by the Navy for preenlistment screening of male applicants. These three key variables, highest level of education completed, AFQT category and age at service entry were used to develop new Navy screening composites (Flyer and Zimmerman, 1984).

Other preenlistment factors relating to satisfaction with military service and early separation have been investigated. These include occupational preferences and subsequent training (Katz and Schneider, 1972); preenlistment expectations; alternative civilian employment opportunity, attraction to a military role (Mcbley, Hard and Logan, 1977); and marriage and parents' socio-economic status (McDonald and Gunderson, 1974).

Moral waivers have been studied in relation to enlisted military performance. Means (1983) notes that differences in waiver policies across Services likely reflect the Services' experiences with attrition rates and waivers rather than differing



concepts of moral fitness. Since the late 1970s, twelve to eighteen percent of all non-prior-service (NPS) accessions have entered with moral waivers. Current analysis indicates that repeated minor offenses may be predictive of misconduct during one's term of enlistment and of subsequent premature discharge. Means (1983) also claims that those entering service with a moral waiver are only slightly more likely to be separated from service for failure to meet minimum behavioral or performance standards. This indicates that either offense history is irrelevant for predicting success in the military or that the screening process successfully bars unrehabilitated people from service. Probably those with the greatest likelihood of failure are screened out.

In addition to criminal convictions, histories of discipline or adjustment problems not resulting in a criminal record may be predictive of early attrition. Several emotional adjustment and background scales have been developed and studied which have aimed at identifying personality traits associated with emotional instability. Some of these scales and subscales are Prediction of Emotional Instability (PEI), Prediction of Drug Use Admission (PDA) of the History Opinion Inventory (HOI), Delinquent Behavior Inventory (DBI), California Psychological Inventory (CPI) and the Educational and Biographical Information Survey (EBIS). Differences in responses to these inventory items have been shown to be statistically significant for first-term stayers and leavers.

Numerous pre-service demographic variables related to attrition have been studied by Flyer and Elster (1983) who discovered

that race, geographic area of residence and the amount of time spent in the Delayed Entry Program (DEP) are also predictors of early attrition. They provide descriptive statistics for over two million male and female accessions during fiscal years (FY) 1973 to 1978.

One major finding is that black males, in general, had lower attrition rates than non-black males. Similarly, attrition rates for black females were lower than those of non-black females in all services. The relationship between AFQT scores and attrition is weaker for black males than for non-blacks. Black women were less often discharged for pregnancy or performance reasons than non-black women.

Secondly, geographic area of residence was also examined by aggregating states into census regions. Composites of race, gender and geographic regions were formed indicating differences in regional attrition rates. Flyer and Elster (1983) cited the following differences: lower non-black male attrition in the West North Central and Western District; higher non-black male attrition in the East and West South Central Regions; low black male attrition in the South Atlantic Region; and higher black male attrition in the East and West North Central Regions. Similar patterns emerged for women.

Finally, cross-tabular computations have shown that the amount of time spent in a Delayed Entry Program is a predictor of early separation. The relationship appears to be linear and negative, with those participating in the DEP for several months more likely to remain in the service. Several possible

explanations exist for this finding. One explanation may be that individuals who enter the DEP as high school seniors (and are permitted to remain in the DEP up to one year) are expressing interest in military careers or desire military occupational training. Another explanation could be that pre-indoctrination and exposure to military organizational practices are beneficial to individuals who are forming perceptions and expectations of future military life. Grissmer and Kirby (1984) posit that a better job search process and an informed enlistment decision will result in fewer negative experience attributes.

To summarize, a number of pre-accession variables have been shown to be predictive of premature first-term separation. These include educational level, AFQT category, age at entry, race, term of enlistment, ASVAB test taken for entry, dependent status, marital status, time spent in the Delayed Entry Program, waiver explanation, and geographic attrition code based on the enlistee's area of residence prior to enlistment.

### III. METHOD

#### A. Data

The data were obtained from the Cohort File and the Master and Loss Edits maintained by the Defense Manpower Data Center (DMDC) in Monterey, California. These records are updated with data from the Military Entrance and Processing Command (MEPCOM) on a quarterly basis. All of the biographic and demographic data used in this study are maintained in these two files.

#### B. Population

The population consisted of approximately 307,000 Army male accessions from FY 1979 to FY 1982 and over 51,000 Army female accessions from FY 1979 to FY 1982. Table 1 shows the overall male and female attrition rates by fiscal year and term of enlistment. The population was initially divided into male and female estimation samples of FY 1979 and FY 1980 accession cohorts. The screening composites developed for this sample were cross-validated on FY 1981 and FY 1982 cohorts, and compared to each other to examine their stability over time.

#### C. Variables

Cross-tabular analysis of each potential composite variable (predictor) and three-year attrition status (criterion) was

TABLE 1  
 OVERALL MALE AND FEMALE ATTRITION RATES  
 BY FISCAL YEAR AND TERM OF ENLISTMENT

Term of Enlistment	Accession Fiscal Year			
	FY79	FY80	FY81	FY82
<u>Females</u>				
2	41.4 (232)*	40.8 (218)	41.2 (401)	39.7 (380)
3	42.0 (10375)	47.3 (13011)	45.6 (11844)	**
4	48.9 (6154)	57.7 (8359)	**	**
<u>Males</u>				
2	17.2 (1170)	18.3 (2019)	17.7 (3320)	20.2 (6526)
3	35.5 (71264)	41.5 (91234)	34.5 (58274)	**
4	36.1 (34760)	43.0 (38101)	**	**

\* Numbers of observations inside parentheses.

\*\* The data have not matured.

performed to detect whether or not the variable had a substantial impact on attrition. These variables included:

- 1) age at service entry<sup>1</sup> (17, 18 and 19, and 20 or over)<sup>2</sup>
- 2) highest level of education completed (high school diploma graduate, non-high school graduate)<sup>3</sup>
- 3) AFQT category (I, II, IIIA, IIIB and IV)
- 4) race (black, non-black)
- 5) term of enlistment (2,3 or 4 years)
- 6) geographic code based on state groupings (high attrition states, above-average attrition states, average attrition states, below-average attrition states, and low attrition states)
- 7) waiver experience or explanation (category 1 -- no waiver, minor traffic offense, pre-service alcohol abuse, pre-service drug use, adult felony and juvenile felony; category 2 --

---

<sup>1</sup>The categories employed for each variable appear in parentheses.

<sup>2</sup>Independent variable categorization for age at service entry and highest level of education attained was studied in order to establish discriminating categories, while minimizing the number of cells or conditions. Since these two variables will be included in all male enlistees' composites, the collapsed categories will be used to alleviate the likely occurrence of empty cells. The age categories found to be most discriminant are seventeen years of age, eighteen and nineteen year olds, and twenty years old or more. Age was not a statistically significant variable for female enlistees, and was not included in the basic set of variables for the female enlistment screens.

<sup>3</sup>The educational levels which have been shown to be important distinguish high school diploma graduates from non-graduates. Therefore, high school diploma graduate (HSG) and non-graduate (NHSG) categories will be used. Tables 2 and 3 illustrate the impact of these variables on first-term attrition separately for males and females in FY 1979 and 1980.

- misdemeanor, other, and less than 3 non-traffic offenses;  
and category 3 -- 3 or more minor non-traffic offenses)
- 8) waiver approval level (no waiver, CG, EEA, TAG (RCPAC),  
USAREC, DRC commander, area commander, MEPS commander)
  - 9) months spent in the Delayed Entry Program (0, 1-2, 3-4,  
5-6, 7 or more)
  - 10) marital status (single, married)
  - 11) number of dependents at accession (0, 1, 2 and 3) and
  - 12) ASVAB test form (ASVAB - 5, other ASVAB forms).

Tables 2 and 3 illustrate the impact of these variables on first-term attrition separately for males and females in FY 1979 and 1980.

The criterion, three-year attrition/non-attrition status was assigned by considering the Total Active Federal Military Service (TAFMS) and the interservice separation code (ISC) on the individual's loss record. To establish a three-year non-attrition criterion designation, an individual would have to complete thirty-five or more months of active duty or show less active duty but a normal separation code. Conversely, a failure to complete a term of service with a normal separation code resulted in an attrition designation.

#### D. Composite Development

Logistic regression analyses were performed using the Statistical Analysis System (SAS) FUNCAT procedure. This procedure provides maximum likelihood estimates of the regression weights for the categories of each predictor variable. In addition,

TABLE 2  
 CROSS-TABULATIONS OF SELECTED BIO-DEMOGRAPHIC  
 VARIABLES AND FIRST-TERM COMPLETION/ATTRITION  
 STATUS FOR FEMALE ARMY ENLISTEES

(FY 1979 and FY 1980 Accessions)

<u>Variable</u>	<u>Categories</u>	<u>Percent</u> <u>First-Term Attrition</u>
Age at Service Entry	17	49
	18	43
	19	46
	20	47
	21+	43
Highest Level of Education Completed	Less Than 11 years	69
	GED	64
	11-12 Years	58
	High School Diploma	44
	13 or More Years	33
AFQT Mental Category	IV	44
	IIIB	46
	IIIA	46
	II	43
	I	36
Race	Black	35
	Non-black	51
Geographic Area of Residence	Low Attrition	35
	Below Average Attrition	45
	Average Attrition	47
	Above Average Attrition	50
Term of Enlistment	2 Years	41
	3 Years	42
	4 Years	49



TABLE 2 (CONTINUED)  
 CROSS-TABULATIONS OF SELECTED BIO-DEMOGRAPHIC  
 VARIABLES AND FIRST-TERM COMPLETION/ATTRITION  
 STATUS FOR FEMALE ARMY ENLISTEES

<u>Variable</u>	<u>Categories</u>	<u>Percent</u> <u>First-Term Attrition</u>
Waiver Explanation	No Waiver	44
	Misdemeanor	50
	Pre-service Alcohol Abuse	40
Waiver Level	CG, USAREC (usually pre- service drug use)	47
	Cdr, DRC	50
	Area Cdr	53
	Cdr, MEPS	46
	Other	44
	Not applicable (often dependency)	44
Marital Status	Single	44
	Married	49
Months Spent in the Delayed Entry Program	Less Than 1 Month	52
	1-2 Months	47
	3-4 Months	41
	5-6 Months	39
	7 or More Months	38
	Number of Dependents	0
1		49
2		52
3		50
ASVAB Test Form Used	High School (ASVAB-5)	38
	Other Operational Forms	45

Note: Categories with fewer than 100 observations have been omitted.

TABLE 3  
 CROSS-TABULATIONS OF SELECTED BIO-DEMOGRAPHIC  
 VARIABLES AND FIRST-TERM COMPLETION/ATTRITION  
 STATUS FOR MALE ARMY ENLISTEES

(FY 1979 and FY 1980 Accessions)

<u>Variable</u>	<u>Categories</u>	<u>Percent</u> <u>First-Term Attrition</u>
Age at Service Entry	17	45
	18	34
	19	33
	20	35
	21+	37
Highest Level of Education Completed	Less Than 11 years	52
	GED	44
	11-12 Years	49
	High School Diploma	24
	13 or More Years	20
AFQT Mental Category	IV	37
	IIIB	39
	IIIA	35
	II	28
	I	21
Race	Black	31
	Non-black	38
Geographic Area of Residence	Low Attrition	29
	Below Average Attrition	33
	Average Attrition	38
	Above Average Attrition	39
	High Attrition	40
Term of Enlistment	2 Years	18
	3 Years	39
	4 Years	41

TABLE 3 (CONTINUED)  
 CROSS-TABULATIONS OF SELECTED BIO-DEMOGRAPHIC  
 VARIABLES AND FIRST-TERM COMPLETION/ATTRITION  
 STATUS FOR MALE ARMY ENLISTEES

<u>Variable</u>	<u>Categories</u>	<u>Percent</u> <u>First-Term Attrition</u>
Waiver Explanation	No Waiver	35
	Minor Traffic Offense	38
	Less Than 3 Minor Non-Traffic Violations	44
	3 or More Minor Non-Traffic Violations	46
	Misdemeanor	43
	Adult Felony	23
	Juvenile Felony	37
	Other	44
Waiver Level	CG,EAA,JAG,RCPAC (medical)	29
	CG,USAREC (usually pre-service drug use)	35
	Cdr, DRC	43
	Area Cdr	42
	Cdr, MEPS	41
	Other	42
	Not applicable (usually dependency)	48
Marital Status	Single	35
	Married	42
Months Spent in the Delayed Entry Program	Less Than 1 Month	48
	1-2 Months	39
	3-4 Months	26
	5-6 Months	22
	7 or More Months	21
Number of Dependents	0	35
	1	42
	2	43
	3	44
ASVAB Test Form Used	High School (ASVAB-5)	20
	Other Operational Forms	37

Note: Categories with fewer than 100 observations have been omitted.

FUNCAT provides the estimated attrition rates, based on the regression weights, for each population subgroup representing a specific combination of predictor categories. For example, an attrition rate estimate is generated for seventeen-year old graduates in AFQT category IIIA. Thus, the likelihood of attrition for any individual is determined by the predicted attrition rate for the population subgroup to which he or she belongs. These predicted attrition rates for the subgroups become the attrition probability scores assigned to every person in the group. The screening composites or indices are comprised of all the attrition probability scores obtained for each model.

A number of regression models were developed with different combinations of predictors. Several criteria were used in selecting the final models.

#### E. Composite Selection

Three criteria were established for model selection and evaluation. Goodness of fit, the initial criterion, was evaluated by comparing F statistics for each new set of models. The F statistic for lack of fit is given by the likelihood ratio Chi-square statistic divided by its degrees of freedom. An F value of one would indicate a perfect fit (Haberman, 1978). This F statistic was employed in a forward selection procedure for developing the regression models. At each step the model with an F statistic nearest one was selected for inclusion as a basic variable for the next series of models.

Restriction of range was used as a second criterion for model selection or exclusion. Any model with a restricted range of composite scores was eliminated because of its failure to differentiate between groups of accessions on the basis of attrition score predictions.

The educational levels which have been shown to be important distinguish high school diploma graduates from non-graduates. Therefore, high school graduate (HSG) and non-graduate (NHSG) categories were used. Tables 2 and 3 illustrate the impact of these variables on first-term attrition separately for males and females in FY 1979 and 1980.

The third criterion was the accuracy of the model in making predictions. Point biserial correlations were computed for the models which were selected on the basis of the lack-of-fit F statistic. Model accuracy was also evaluated by examining cross-tabulations of actual attrition and retention rates compared with predicted attrition rates at several "cut-off" scores. The results are shown in two-by-two tables consisting of true positives and negatives and false positives and negatives resulting from employment of a particular "cut-off" score in screening applicants.

In addition to the three criteria used to evaluate the predictive models, subgroup analyses and cumulative frequency distributions permitted more detailed examination of how well each composite performed. Actual versus predicted attrition rates for members of various population subgroups were examined to determine the impact each composite has on subgroups. Cumulative

frequency tables were employed to illustrate the relative effectiveness of the composites on the basis of the percents of stayers, leavers and total accessions eliminated at a given cutting score. These analyses are essential to the appropriate selection of an Army preenlistment screening device.

## IV. RESULTS

### A. Selection of Models

As indicated in Table 4, the model including AFQT category, age at service entry, educational level and geographic attrition code yielded the best F statistic in the first set of models evaluated for male enlisted accessions. Race was then added to the three original variables to form a new basic model. Race was considered in Composite 2 to compare the model's ability to accurately predict attrition for blacks and non-blacks with that of other models which do not include race as a predictor. As seen in Table 4, the best F statistic for the second set of models was 4.69 and included the three basic variables and race. The third set of models which included AFQT category, age at service entry, educational level, and geographic attrition code as a basis, yielded the models with the best overall fit. The model composed of these basic variables plus waiver explanation code appeared to be the best fitting model for males on the basis of the F statistic and was, thus, selected as the third composite.

Similarly, the predictive models for females were selected at each step as shown in Table 5. One of the female enlistment models provided only five attrition prediction scores within a limited range. Therefore, although the model's F statistic was .84, the scores did not discriminate well enough and the model was abandoned. The Model 1 basis consisted solely of AFQT category, since only female high school graduates were evaluated and age at

TABLE 4  
MEASURES EMPLOYED IN FORWARD SELECTION  
OF MODEL VARIABLES FOR MALES

<u>Model Variables</u>	<u>Number of Cells</u>	<u>Average N per Cell</u>	<u>F</u>
Model 1 (AFQT Category, Age at Service Entry, Level of Formal Education)	30	7965	22.48
Model 1 + Geographic Attrition Code	150	1593	6.41
Model 1 + Waiver Explanation Code	88	2715	7.05
Model 1 + Marital Status	75	3186	8.82
Model 1 + Dependent Status	59	4050	10.99
Model 1 + ASVAB Form Used at Entry	59	4050	8.78
Model 1 + Term of Enlistment	58	4120	10.90
Model 2 (AFQT Category, Age at Service Entry, Level of Formal Education, and Race)	60	3982	12.37
Model 2 + Geographic Attrition Code	291	821	4.69
Model 2 + Waiver Explanation Code	164	1457	4.92
Model 2 + Marital Status	141	1695	5.79
Model 2 + Dependent Status	113	2115	6.95
Model 2 + ASVAB Form Used a Entry	113	2115	6.06
Model 2 + Term of Enlistment	113	2115	6.83
Model 3 (AFQT Category, Age at Service Entry, Level of Formal Education, and Geographic Attrition Code assigned on the basis of enlistees' home states)	150	1593	6.41
Model 3 + Waiver Explanation Code	403	593	3.00
Model 3 + Marital Status	328	728	3.52
Model 3 + Dependent Status	285	838	3.86
Model 3 + ASVAB Form Used at Entry	285	838	3.41
Model 3 + Term of Enlistment	264	905	4.04



TABLE 5  
 MEASURES EMPLOYED IN FORWARD SELECTION  
 OF MODEL VARIABLES FOR FEMALES

<u>Model Variables</u>	<u>Number of Cells</u>	<u>Average N per Cell</u>	<u>F</u>
Model 1 (AFQT Category)	5	7093	undefined
Model 1 + Age at Service Entry	15	2364	0.65
Model 1 + Geographic Attrition Code	25	1419	1.83
Model 1 + Waiver Explanation Code	15	2533	1.69
Model 1 + Marital Status	15	2533	1.93
Model 1 + Dependent Status	10	3547	2.21
Model 1 + Race	10	3547	4.39
Model 1 + ASVAB Form Used at Entry	10	3547	1.83
Model 1 + Term of Enlistment	10	3547	0.84
Model 2 (AFQT Category and Race)	10	3547	4.39
Model 2 + Geographic Attrition Code	49	724	2.17
Model 2 + Waiver Explanation Code	27	1314	1.86
Model 2 + Marital Status	25	1419	2.72
Model 2 + Dependent Status	20	1773	2.45
Model 2 + ASVAB Form Used at Entry	19	1867	2.11
Model 2 + Term of Enlistment	20	1773	1.82
Model 3 (AFQT Category and Term of Enlistment)	10	3547	0.84
Model 3 + Geographic Attrition Code	49	724	1.34
Model 3 + Waiver Explanation Code	28	1267	1.15
Model 3 + Marital Status	25	1419	1.18
Model 3 + Dependent Status	20	1773	1.11
Model 3 + ASVAB Form Used at Entry	20	1773	1.11

service entry was not statistically significant. Term of enlistment improved the F statistic most in the first step (although the model provided a range of screening scores that were severely restricted). Therefore, term of enlistment was added to AFQT category as the Model 3 basis. Composites 1 and 3 were selected from among the third set of models. They consist of the basis (AFQT category and term of enlistment) and dependent status and ASVAB form, respectively. Again, race was included in the second composite to compare the accuracy and "fairness" of the attrition predictions to those of the other composites.

For both male and female enlistees, the two models with the best fit which did not include race were selected. Subsequently, the best fitting male and female composites which include race as a predictor were selected as a basis of comparison for subgroup analyses. The models selected for males include the variables listed below:

Composite 1 - educational level, AFQT category, age at service entry, geographic attrition code, and waiver explanation code;

Composite 2 - educational level, AFQT category, age at service entry, geographic attrition code, and race; and

Composite 3 - educational level, AFQT category, age at service entry, geographic attrition code, and ASVAB form used for entry.

## B. Composite Validation

The maximum likelihood attrition predictions from the selected composites were then assigned to individuals in both estimation and cross-validation samples. The point-biserial correlations, shown in Table 6, indicate that about thirty percent of the variance in first-term attrition may be accounted for by the bio-demographic variables available for prescreening. The second composite for males and females showed the least shrinkage and conversely the greatest stability in cross-validation of later accession cohorts. These composites included race as a predictor.

## C. Composite Efficiencies

Further comparison of the composites consisted of evaluating each composite's efficiency in screening out leavers instead of those who actually completed their first terms of service. Minimizing error in predicting stayers who actually leave during training or first-term of service was assumed to be a more costly error than the overprediction of first-term attrition because of the non-recoverable costs incurred and the effects on manpower planning and readiness. On this basis three cut-off scores were used to determine whether or not one composite performed consistently better than the others.

Tables 7 and 8 show that the three male composites predict attrition and retention equally well for the estimation sample (FY 1979 and 1980 accessions). However, Composite 1 performs

TABLE 6  
POINT ESTERIAL MODEL VALIDITIES FOR ESTIMATION  
AND CROSS-VALIDATION SAMPLES

<u>Model Description</u>	$R_{pb}$	<u>Model Description</u>	$R_{pb}$
FY 1979 and 1980 (Estimation Sample)			
Male Accessions		Female Accessions*	
Model 1 (AFQT Category, Age at Service Entry, Education Level and Geographic Attrition Code)	.27	Model 1 (AFQT Category, Term of Enlistment, and Dependent Status)	.04
Model 2 (AFQT Category, Age at Service Entry, Education Level, Geographic Attrition Code, and Race)	.28	Model 2 (AFQT Category, Term of Enlistment, and Race)	.18
Model 3 (AFQT Category, Age at Service Entry, Education Level, Geographic Attrition Code, and ASVAB Test Form Use at Entry)	.28	Model 3 (AFQT Category, Term of Enlistment, and ASVAB Test Form)	.03

FY 1981 and 1982  
(Cross-Validation Sample)

Males		Females	
Model 1	.23	Model 1	.03
Model 2	.24	Model 2	.10
Model 3	.23	Model 3	.04

\* female high school graduates

TABLE 7  
COMPARISON OF PREDICTIVE EFFICIENCIES OF  
SELECTED MODELS FOR FISCAL YEARS 1979 AND 1980  
MALE ARMY ACCESSIONS

Out-off Score = 40*											
Model 1				Model 2				Model 3			
Actual Retention and Loss		Actual Retention and Loss		Actual Retention and Loss		Actual Retention and Loss		Actual Retention and Loss		Actual Retention and Loss	
Leavers	Stayers	Leavers	Stayers	Leavers	Stayers	Leavers	Stayers	Leavers	Stayers	Leavers	Stayers
22.24	22.91	21.88	21.18	21.88	21.18	22.27	22.85	22.27	22.85	22.27	22.85
N = 53,133	N = 54,749	N = 52,290	N = 53,008	N = 52,290	N = 53,008	N = 53,204	N = 54,587	N = 53,204	N = 54,587	N = 53,204	N = 54,587
Predicted Retention and Loss		Predicted Retention and Loss		Predicted Retention and Loss		Predicted Retention and Loss		Predicted Retention and Loss		Predicted Retention and Loss	
Leavers	Stayers	Leavers	Stayers	Leavers	Stayers	Leavers	Stayers	Leavers	Stayers	Leavers	Stayers
13.51	41.34	13.86	42.07	13.86	42.07	13.48	41.41	13.48	41.41	13.48	41.41
N = 32,278	N = 98,785	N = 33,121	N = 100,526	N = 33,121	N = 100,526	N = 32,207	N = 98,947	N = 32,207	N = 98,947	N = 32,207	N = 98,947
Out-off Score = 45											
Model 1				Model 2				Model 3			
Actual Retention and Loss		Actual Retention and Loss		Actual Retention and Loss		Actual Retention and Loss		Actual Retention and Loss		Actual Retention and Loss	
Leavers	Stayers	Leavers	Stayers	Leavers	Stayers	Leavers	Stayers	Leavers	Stayers	Leavers	Stayers
18.65	18.42	17.60	16.88	17.60	16.88	17.73	17.28	17.73	17.28	17.73	17.28
N = 44,571	N = 44,005	N = 42,050	N = 40,328	N = 42,050	N = 40,328	N = 42,368	N = 41,296	N = 42,368	N = 41,296	N = 42,368	N = 41,296
Predicted Retention and Loss		Predicted Retention and Loss		Predicted Retention and Loss		Predicted Retention and Loss		Predicted Retention and Loss		Predicted Retention and Loss	
Leavers	Stayers	Leavers	Stayers	Leavers	Stayers	Leavers	Stayers	Leavers	Stayers	Leavers	Stayers
17.09	45.84	18.15	47.38	18.15	47.38	18.01	46.97	18.01	46.97	18.01	46.97
N = 40,840	N = 109,529	N = 43,361	N = 113,206	N = 43,361	N = 113,206	N = 43,043	N = 112,238	N = 43,043	N = 112,238	N = 43,043	N = 112,238
Out-off Score = 50											
Model 1				Model 2				Model 3			
Actual Retention and Loss		Actual Retention and Loss		Actual Retention and Loss		Actual Retention and Loss		Actual Retention and Loss		Actual Retention and Loss	
Leavers	Stayers	Leavers	Stayers	Leavers	Stayers	Leavers	Stayers	Leavers	Stayers	Leavers	Stayers
9.57	8.64	10.84	9.67	10.84	9.67	8.61	7.58	8.61	7.58	8.61	7.58
N = 22,859	N = 20,634	N = 25,912	N = 23,105	N = 25,912	N = 23,105	N = 20,583	N = 18,114	N = 20,583	N = 18,114	N = 20,583	N = 18,114
Predicted Retention and Loss		Predicted Retention and Loss		Predicted Retention and Loss		Predicted Retention and Loss		Predicted Retention and Loss		Predicted Retention and Loss	
Leavers	Stayers	Leavers	Stayers	Leavers	Stayers	Leavers	Stayers	Leavers	Stayers	Leavers	Stayers
26.18	55.62	24.90	54.59	24.90	54.59	27.13	56.67	27.13	56.67	27.13	56.67
N = 62,552	N = 132,900	N = 59,499	N = 130,429	N = 59,499	N = 130,429	N = 64,828	N = 135,420	N = 64,828	N = 135,420	N = 64,828	N = 135,420

\* Persons assigned a predicted attrition score above 40, those with greater than forty percent likelihood of first-term attrition, would be denied entry into the Army.

TABLE 8  
COMPARISON OF PREDICTIVE EFFICIENCIES OF  
SELECTED MODELS FOR FISCAL YEARS 1981 AND 1982  
MALE ARMY ACCESSIONS

Out-off Score = 40*											
Model 1				Model 2				Model 3			
Predicted Retention and Loss	Leavers	Stayers	Actual Retention and Loss	Leavers	Stayers	Predicted Retention and Loss	Leavers	Stayers	Predicted Retention and Loss	Leavers	Stayers
	9.08	8.67		9.05	8.60		8.90	8.47		8.90	8.47
	N = 17,884	N = 17,081		N = 17,832	N = 16,941		N = 17,538	N = 16,677		N = 17,538	N = 16,677
Stayers	21.16	61.09	Stayers	21.18	61.16	Stayers	21.33	61.30	Stayers	21.33	61.30
	N = 41,675	N = 120,333		N = 41,727	N = 120,473		N = 42,021	N = 120,737		N = 42,021	N = 120,737
Out-off Score = 45											
Model 1				Model 2				Model 3			
Predicted Retention and Loss	Leavers	Stayers	Actual Retention and Loss	Leavers	Stayers	Predicted Retention and Loss	Leavers	Stayers	Predicted Retention and Loss	Leavers	Stayers
	7.21	6.67		6.83	6.23		6.77	6.18		6.77	6.18
	N = 14,195	N = 13,140		N = 13,450	N = 12,273		N = 13,343	N = 12,179		N = 13,343	N = 12,179
Stayers	23.03	63.09	Stayers	23.41	63.53	Stayers	23.46	63.58	Stayers	23.46	63.58
	N = 45,364	N = 124,274		N = 46,109	N = 125,141		N = 46,216	N = 125,235		N = 46,216	N = 125,235
Out-off Score = 50											
Model 1				Model 2				Model 3			
Predicted Retention and Loss	Leavers	Stayers	Actual Retention and Loss	Leavers	Stayers	Predicted Retention and Loss	Leavers	Stayers	Predicted Retention and Loss	Leavers	Stayers
	3.42	3.03		3.14	2.70		3.23	2.78		3.23	2.78
	N = 6,727	N = 5,964		N = 6,179	N = 5,316		N = 6,361	N = 5,476		N = 6,361	N = 5,476
Stayers	26.82	66.74	Stayers	27.10	67.06	Stayers	27.01	66.98	Stayers	27.01	66.98
	N = 52,832	N = 131,450		N = 53,380	N = 132,098		N = 53,198	N = 131,938		N = 53,198	N = 131,938

\*Persons assigned a predicted attrition score above 40, those with greater than forty percent likelihood of first-term attrition, would be denied entry into the Army.

slightly better than Composites 2 and 3 for the FY 1981 and 1982 accessions. This difference is miniscule and offers little or no favor of Composite 1. Note that by using a cut-off score of forty (forty percent likelihood of attrition) the three composites falsely predicted stayers about twenty-one percent of the time. The error rate gradually increased as the cut-off score became less restrictive.

A clear pattern is not visible for the female composites (see Tables 9 and 10), although Composite 1 appeared to effectively minimize the error in predicting false positives, those predicted to stay who were discharged prematurely, when the cut-off score was set at forty. Composite 2 produced a smaller error than Composites 1 and 3 at the higher cut-off, less restrictive, scores.

#### D. Population Subgroup Analyses

The final method used to compare the composites involved graphical analyses of predicted and actual attrition within population subgroups. This kind of evaluation is important in identifying potentially undesired discriminatory screening procedures. The use of "insensitive" screening procedures has and will continue to deny enlistment of persons with a fairly reasonable likelihood of successful completion of their terms of service.

The actual attrition rates have been plotted on the Y-axis against those predicted by each composite, while controlling for

TABLE 9  
COMPARISON OF PREDICTIVE EFFICIENCIES OF  
SELECTED MODELS FOR FISCAL YEARS 1979 AND 1980  
FEMALE ARMY ACCESSIONS

Out-off Score = 40 <sup>a</sup>					
Model 1		Model 2		Model 3	
Predicted Retention and Loss	Leavers	Predicted Retention and Loss	Leavers	Predicted Retention and Loss	Leavers
Leavers	42.09	Leavers	27.98	Leavers	38.88
N = 14,928	N = 19,978	N = 9922	N = 10,005	N = 13,789	N = 18,133
Stayers	0.54	Stayers	14.66	Stayers	3.75
N = 192	N = 369	N = 5,198	N = 10,342	N = 1,331	N = 2,214
Out-off Score = 44					
Model 1		Model 2		Model 3	
Predicted Retention and Loss	Leavers	Predicted Retention and Loss	Leavers	Predicted Retention and Loss	Leavers
Leavers	2.55	Leavers	24.54	Leavers	00.00 <sup>b</sup>
N = 906	N = 998	N = 8,705	N = 8,420	N = 0	N = 0
Stayers	40.08	Stayers	18.09	Stayers	42.63
N = 14,214	N = 19,349	N = 6,415	N = 11,927	N = 15,120	N = 20,347
Out-off Score = 45					
Model 1		Model 2		Model 3	
Predicted Retention and Loss	Leavers	Predicted Retention and Loss	Leavers	Predicted Retention and Loss	Leavers
Leavers	1.90	Leavers	24.54	Leavers	00.00
N = 675	N = 719	N = 8,705	N = 8,420	N = 0	N = 0
Stayers	40.73	Stayers	18.09	Stayers	42.63
N = 14,445	N = 19,628	N = 6,415	N = 11,927	N = 15,120	N = 20,347

<sup>a</sup>Persons assigned a predicted attrition score above 40, those with greater than forty percent likelihood of first-term attrition, would be denied entry into the Army.  
<sup>b</sup>The highest attrition prediction score for Model 3 was 44; therefore, a cut-off score of 44 yields no leaver predictions.



TABLE 10  
COMPARISON OF PREDICTIVE EFFICIENCIES OF  
SELECTED MODELS FOR FISCAL YEARS 1981 AND 1982  
FEMALE ARMY ACCESSIONS

Out-off Score = 40 <sup>a</sup>											
Model 1				Model 2				Model 3			
Predicted Retention and Loss	Leavers	Stayers	Actual Retention and Loss	Leavers	Stayers	Predicted Retention and Loss	Leavers	Stayers	Actual Retention and Loss	Leavers	Stayers
Leavers	40,43	57,12	Leavers	29,91	32,85	Leavers	37,54	52,20	Leavers	11,775	16,372
N = 12,679	N = 17,913	N = 10,304	N = 9,380	N = 10,304	N = 16,372	N = 11,775	N = 16,372	N = 16,372	N = 11,775	N = 16,372	N = 16,372
Stayers	0.82	1.64	Stayers	11.34	25.90	Stayers	3.70	61.30	Stayers	1,160	2,056
N = 256	N = 515	N = 8,124	N = 3,555	N = 8,124	N = 2,056	N = 1,160	N = 2,056	N = 2,056	N = 1,160	N = 2,056	N = 2,056
Out-off Score = 44											
Model 1				Model 2				Model 3			
Predicted Retention and Loss	Leavers	Stayers	Actual Retention and Loss	Leavers	Stayers	Predicted Retention and Loss	Leavers	Stayers	Actual Retention and Loss	Leavers	Stayers
Leavers	47.75	3.23	Leavers	25.65	27.24	Leavers	00.00 <sup>b</sup>	00.00	Leavers	0	0
N = 925	N = 1,013	N = 8,543	N = 8,044	N = 8,543	N = 0	N = 0	N = 0	N = 0	N = 0	N = 0	N = 0
Stayers	38.29	55.53	Stayers	15.59	31.52	Stayers	41.24	58.76	Stayers	12,935	18,428
N = 12,010	N = 17,415	N = 9,885	N = 4,891	N = 9,885	N = 18,428	N = 12,935	N = 18,428	N = 18,428	N = 12,935	N = 18,428	N = 18,428
Out-off Score = 45											
Model 1				Model 2				Model 3			
Predicted Retention and Loss	Leavers	Stayers	Actual Retention and Loss	Leavers	Stayers	Predicted Retention and Loss	Leavers	Stayers	Actual Retention and Loss	Leavers	Stayers
Leavers	2.78	3.02	Leavers	25.65	27.24	Leavers	00.00	00.00	Leavers	0	0
N = 873	N = 948	N = 8,543	N = 8,044	N = 8,543	N = 0	N = 0	N = 0	N = 0	N = 0	N = 0	N = 0
Stayers	38.46	55.73	Stayers	15.59	31.52	Stayers	41.23	58.76	Stayers	12,935	18,428
N = 12,062	N = 17,480	N = 9,885	N = 4,891	N = 9,885	N = 18,428	N = 12,935	N = 18,428	N = 18,428	N = 12,935	N = 18,428	N = 18,428

<sup>a</sup>Persons assigned a predicted attrition score above 40, those with greater than forty percent likelihood of first-term attrition, would be denied entry into the Army.  
<sup>b</sup>The highest attrition prediction score for Model 3 was 44; therefore, a cut-off score of 44 yields no leaver predictions.

educational level<sup>4</sup>, AFQT category, age at service entry, geographic area of residence, and race. Figures 1-6 illustrate how accurately Composite 1 predicted attrition for the various population subgroups of FY 1979 and 1980 male accessions. Figures 7-12 and Figures 13-18 provide comparable analyses of Composites 2 and 3 for FY 1979 and 1980 male accessions. The graphs of overall accuracy did not differ markedly, except that Composite 2 was smoother over the entire range of scores than the other composites. The three composites similarly predicted attrition for educational level groups, age groups, and geographic groups. However, AFQT groups and racial groups were predicted most accurately by Composite 2.

These subgroup analyses were repeated for the cross-validation sample, consisting of FY 1981 and 1982 male accessions, to examine the composites' predictive stability (see Figures 19 through 36). Composite 2, again, provided the smoothest predictions overall. Non-high school graduate attrition was underpredicted by all three composites. Composites 1 and 3 underpredicted attrition for seventeen year old and twenty year old and above age groups, while Composite 2 predictions for the twenty-year and above group were more accurate. The attrition rates tended to be underestimated for non-blacks and overestimated for blacks. Figure 30 shows that Composite 2, which included race as a predictor, accurately predicted attrition for both racial groups, as well as

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<sup>4</sup>Figures of educational levels were not generated for female accessions since non-high school graduate females were not evaluated in this study.

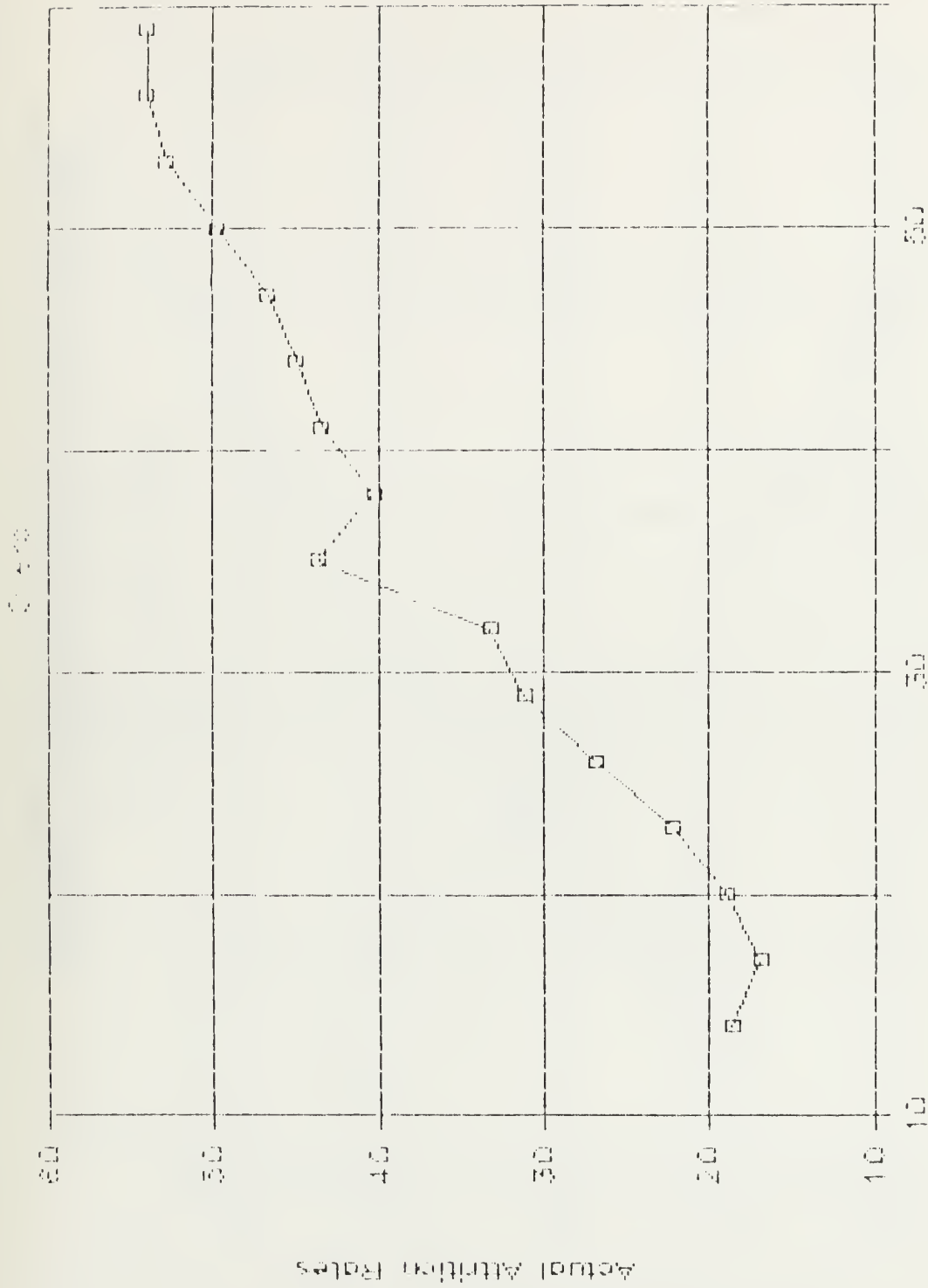


Figure 1. MALE ARMY ENLISTED PERSONNEL: RELATIONSHIP BETWEEN COMPOSITE 1 SCORES AND ACTUAL ATTRITION RATES FOR FY 1979 AND 1980 ACCESSIONS

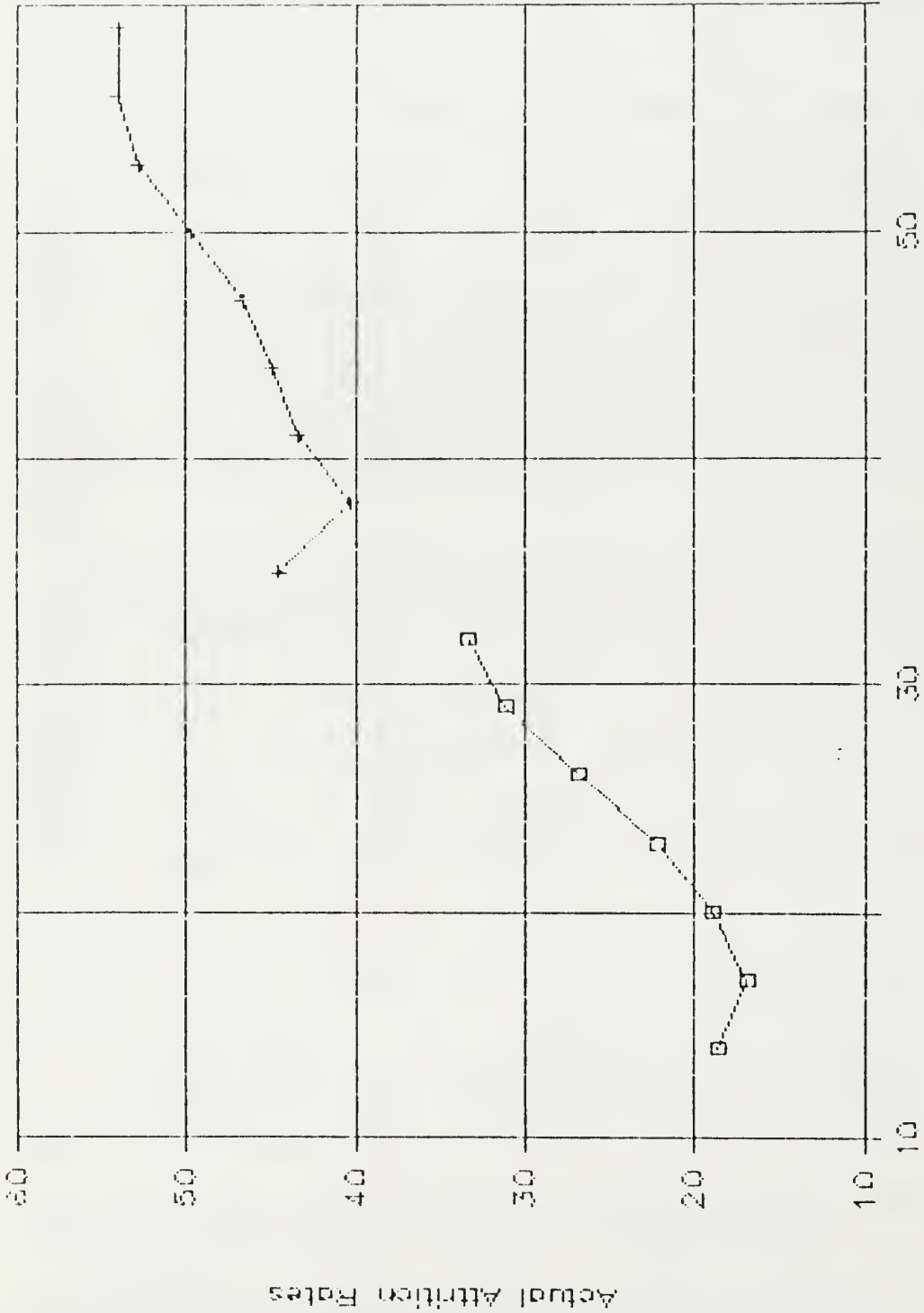


Figure 2. MALE ARMY ENLISTED PERSONNEL: RELATIONSHIP BETWEEN COMPOSITE I SCORES AND ACTUAL ATTRITION RATES BY EDUCATIONAL LEVEL FOR FY 1979 AND 1980 ACCESSIONS

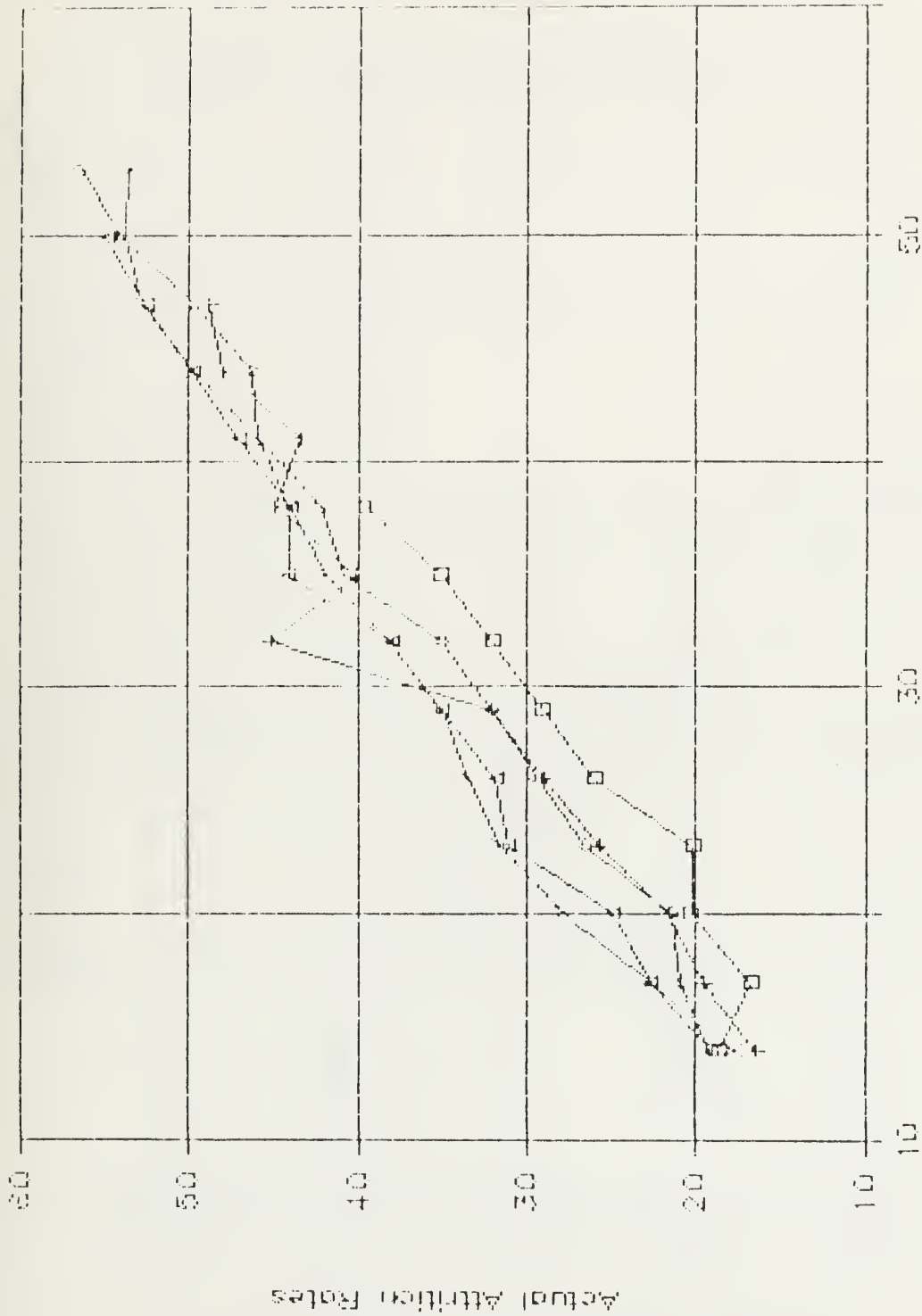


Figure 3. MALE ARMY ENLISTED PERSONNEL: RELATIONSHIP BETWEEN COMPOSITE I SCORES AND ACTUAL ATTRITION RATES BY AFQT CATEGORY FOR FY 1979 AND 1980 ACCESSIONS

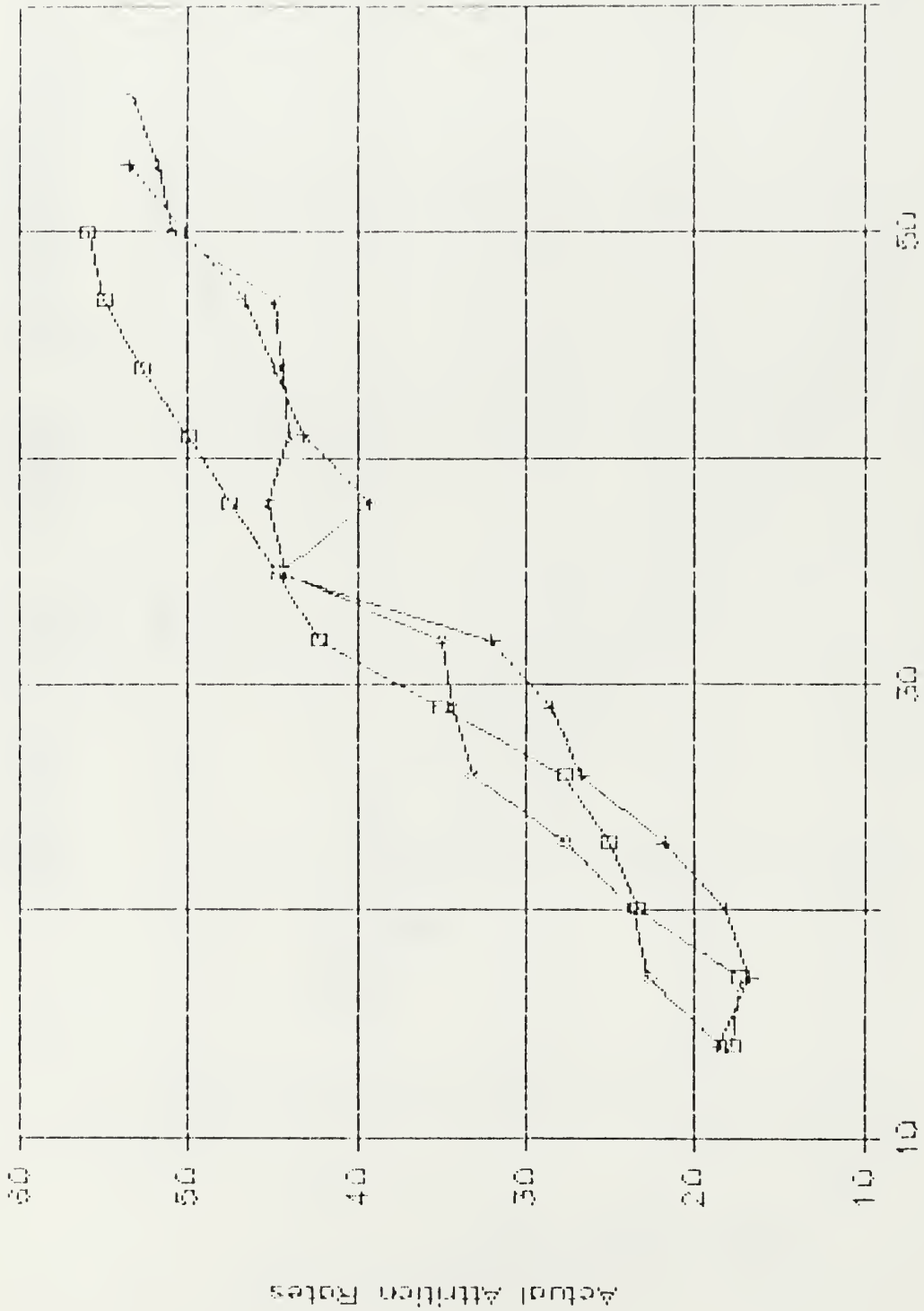


Figure 4. Male Army Enlisted Personnel: Relationship Between Composite I Scores and Actual Attrition Rates by Age at Service Entry for FY 1979 and 1980 Accessions

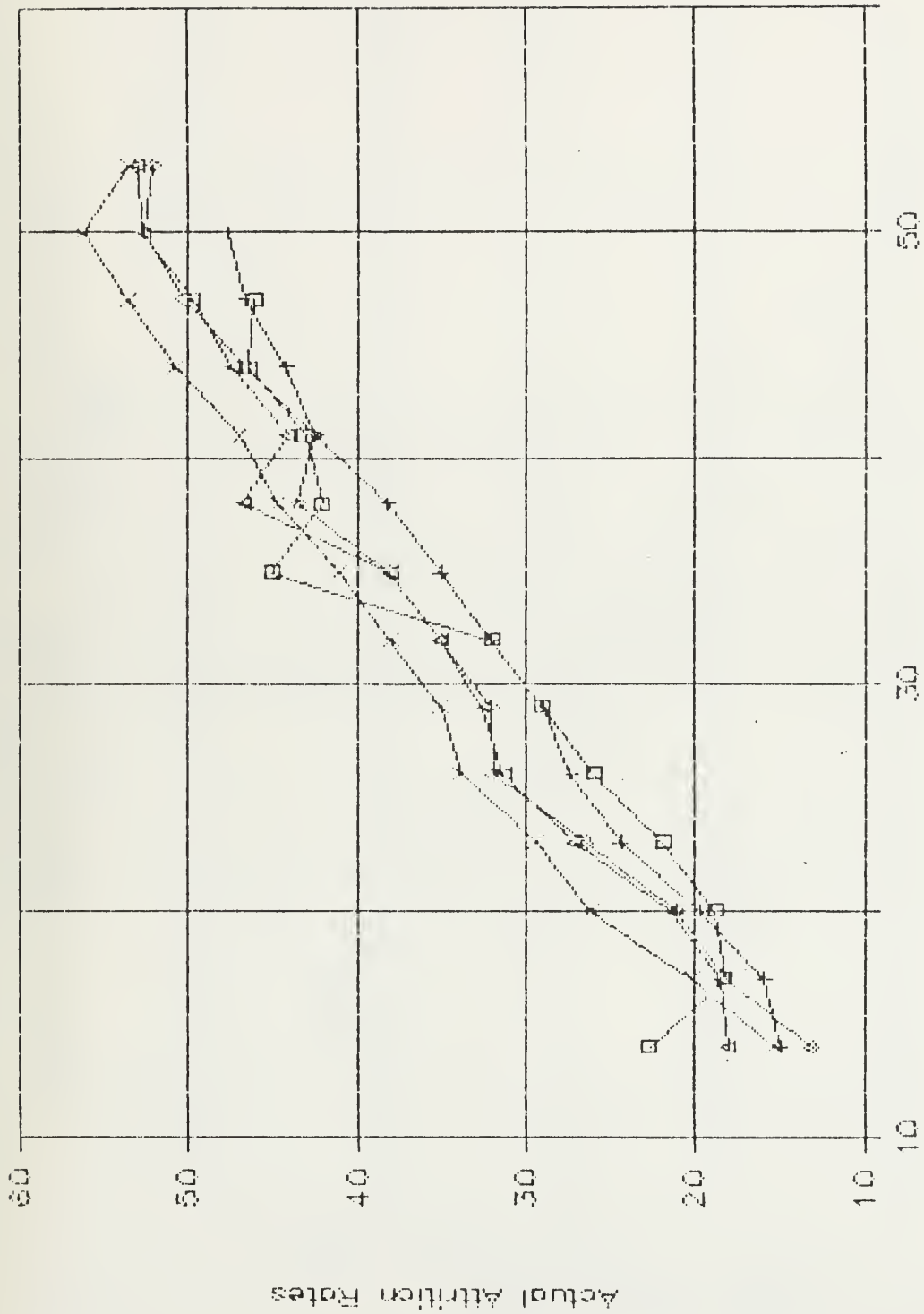


Figure 5. MALE ARMY ENLISTED PERSONNEL: RELATIONSHIP BETWEEN COMPOSITE I SCORES AND ACTUAL ATTRITION RATES BY GEOGRAPHIC ATTRITION CODE FOR FY 1979 AND 1980 ACCESSIONS

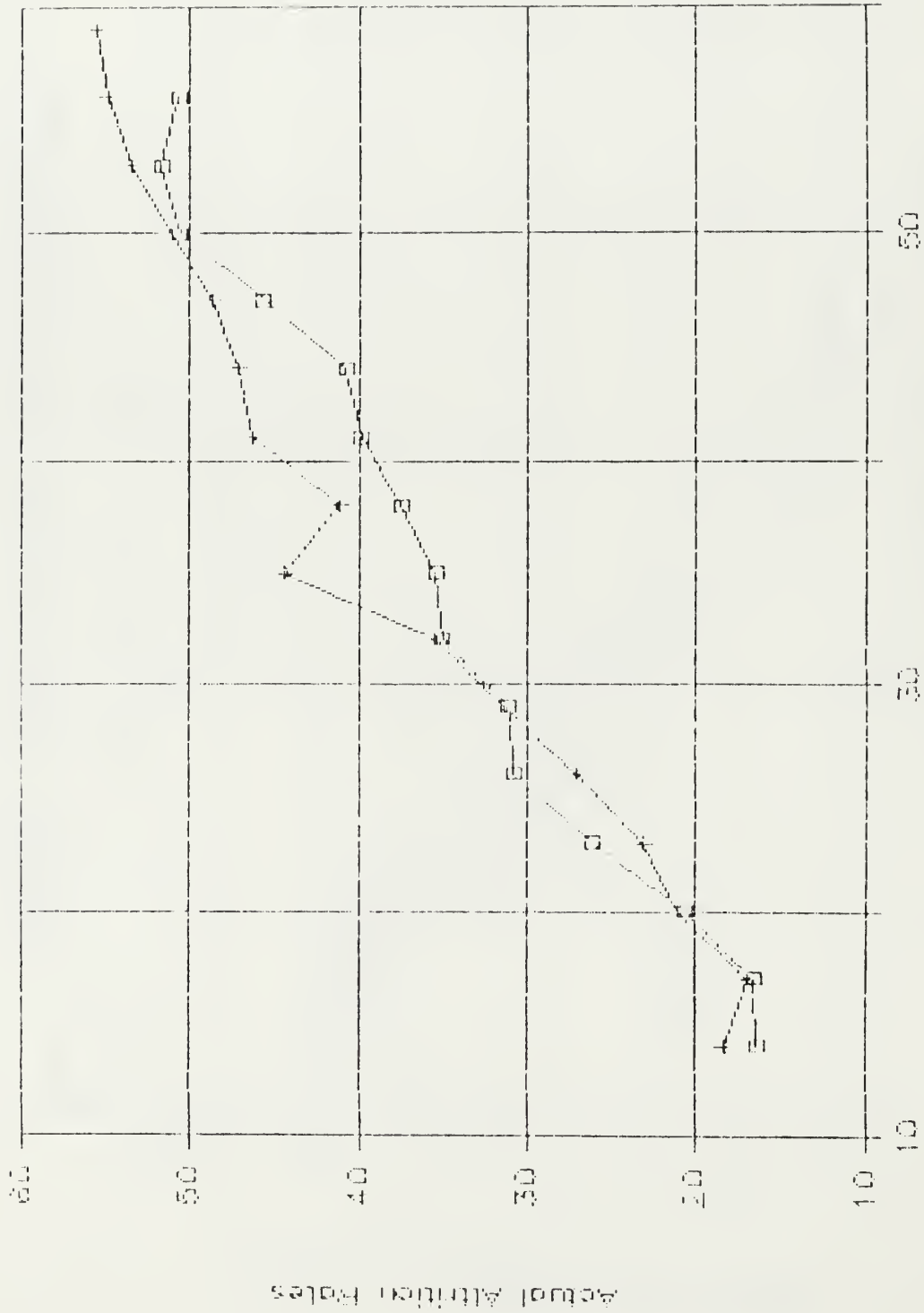


Figure 6. MALE ARMY ENLISTED PERSONNEL: RELATIONSHIP BETWEEN COMPOSITE 1 SCORES AND ACTUAL ATTRITION RATES BY RACE FOR FY 1979 AND 1980 ACCESSIONS



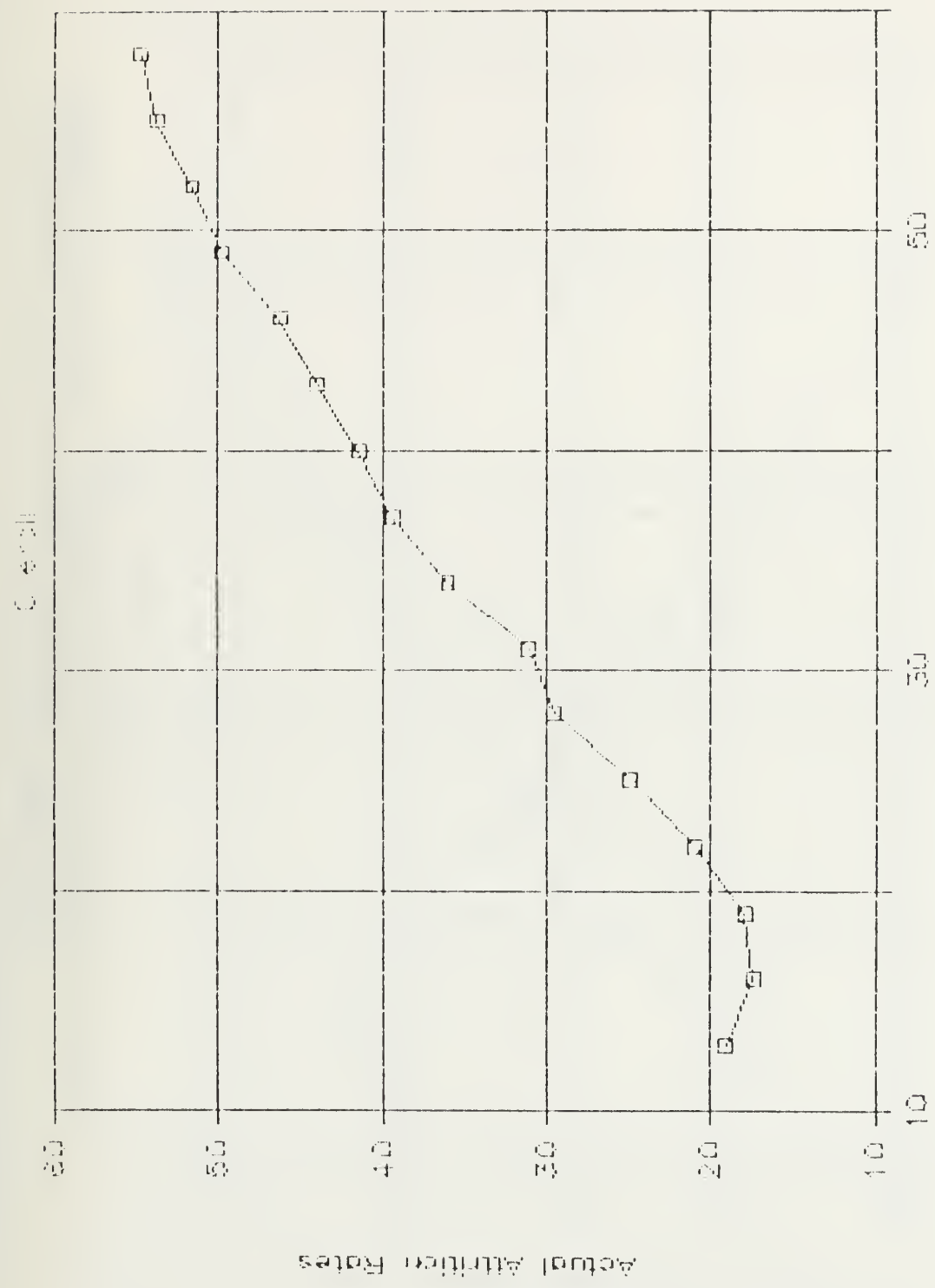


Figure 7. MALE ARMY ENLISTED PERSONNEL: RELATIONSHIP BETWEEN COMPOSITE 2 SCORES AND ACTUAL ATTRITION RATES FOR FY 1979 AND 1980 ACCESSIONS

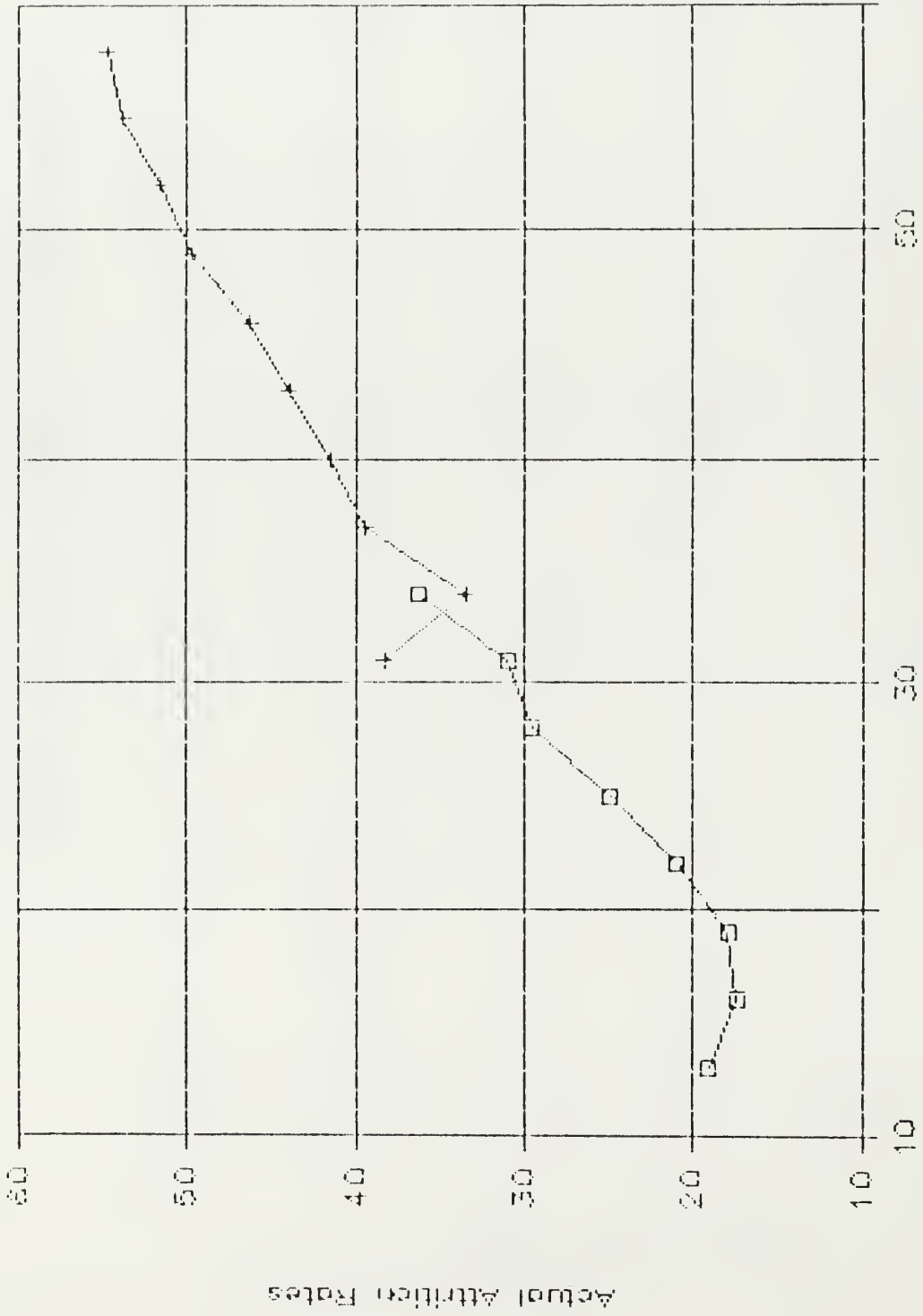
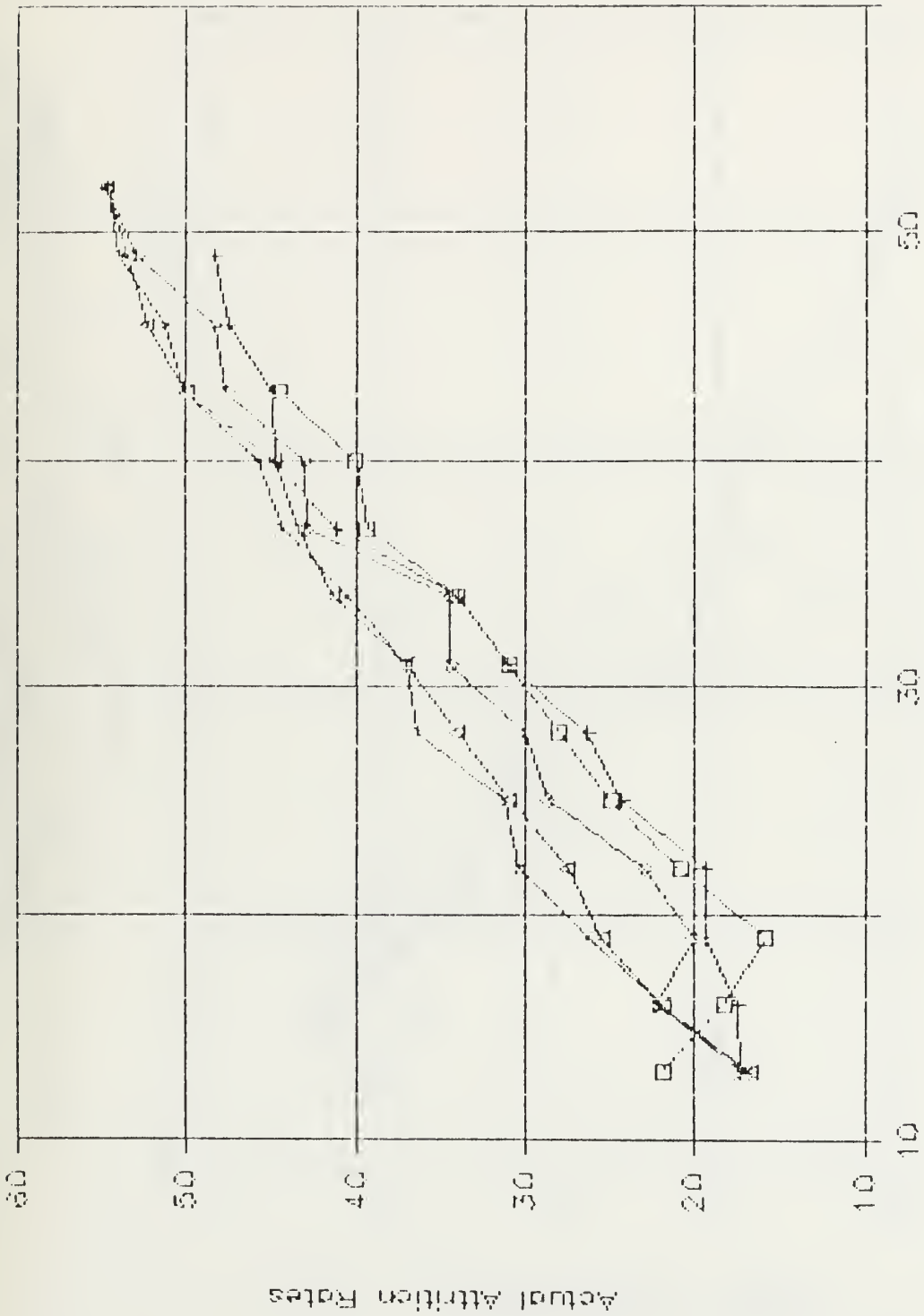


Figure 8. MALE ARMY ENLISTED PERSONNEL: RELATIONSHIP BETWEEN COMPOSITE 2 SCORES AND ACTUAL ATTRITION RATES BY EDUCATIONAL LEVEL FOR FY 1979 AND 1980 ACCESSIONS



□ I + || Predicted Attrition Rates  
 v IIIA Δ IIIB  
 x IV  
 Figure 9. MALE ARMY ENLISTED PERSONNEL: RELATIONSHIP BETWEEN COMPOSITE 2 SCORES AND ACTUAL ATTRITION RATES BY AFQT CATEGORY FOR FY 1979 AND 1980 ACCESSIONS

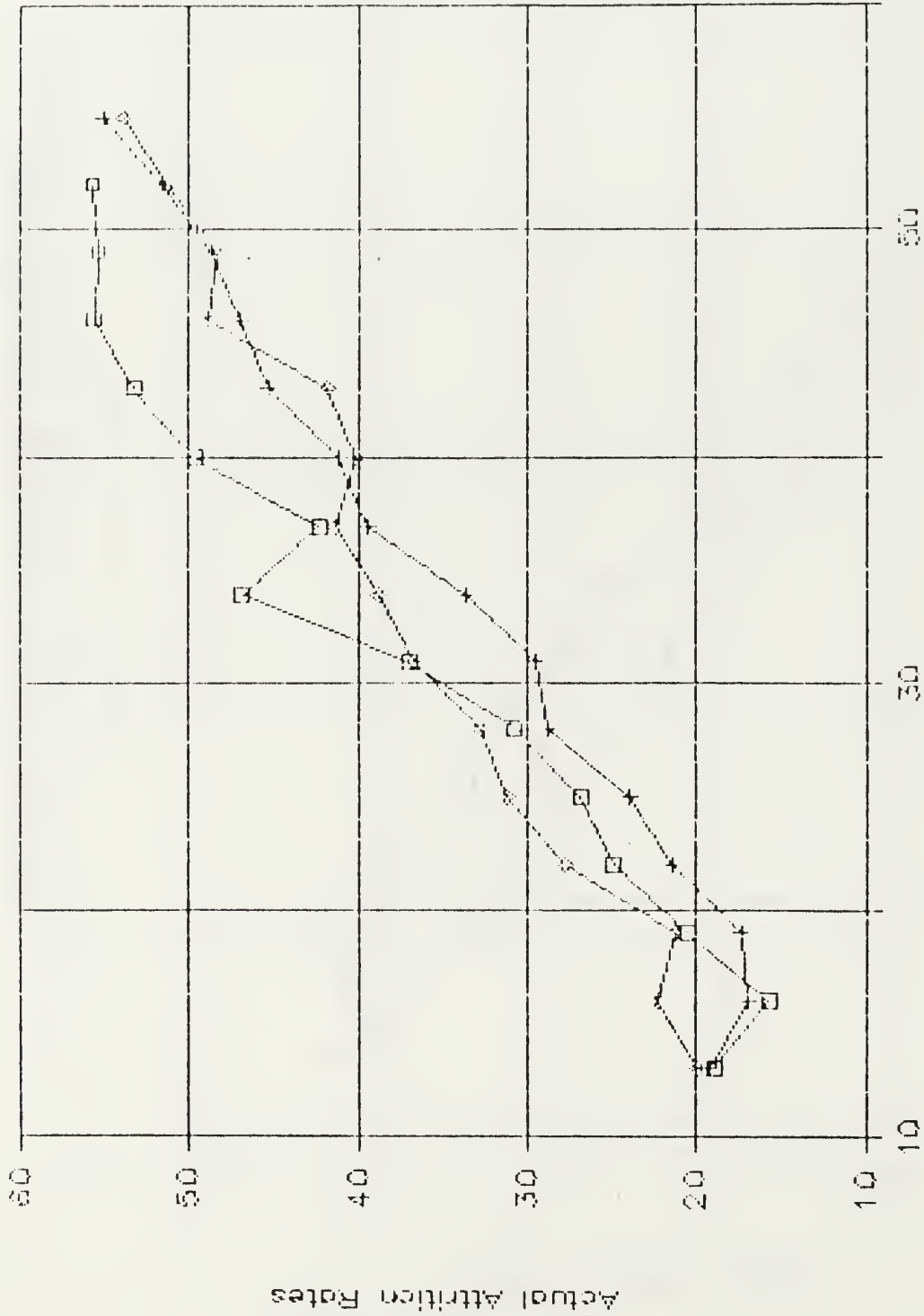


Figure 10. MALE ARMY ENLISTED PERSONNEL: RELATIONSHIP BETWEEN COMPOSITE 2 SCORES AND ACTUAL ATTRITION RATES BY AGE AT SERVICE ENTRY FOR FY 1979 AND 1980 ACCESSIONS

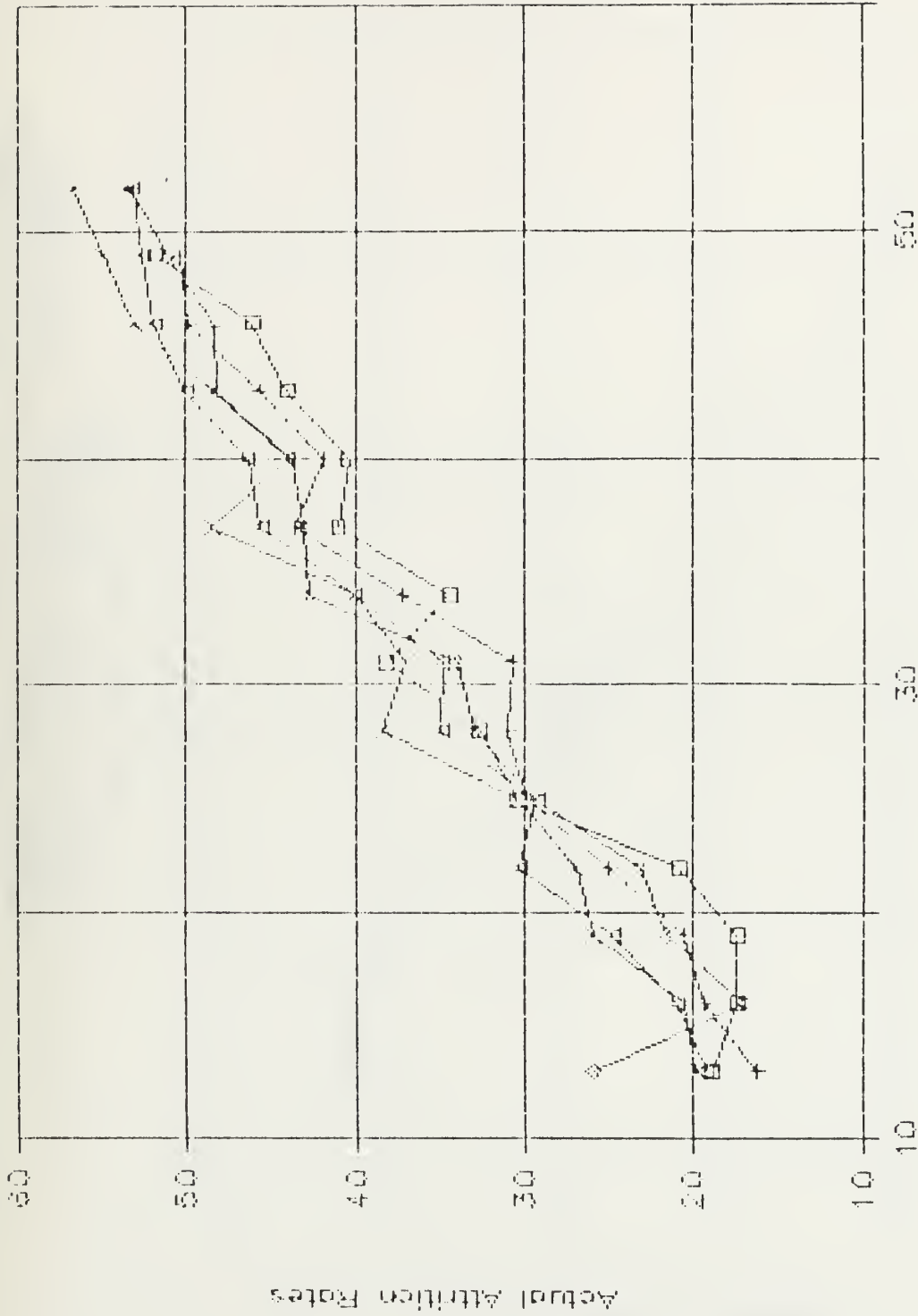


Figure 11. MALE ARMY ENLISTED PERSONNEL: RELATIONSHIP BETWEEN COMPOSITE 2 SCORES AND ACTUAL ATTRITION RATES BY ACCESSIONS GEOGRAPHIC ATTRITION CODE FOR FY 1979 AND 1980

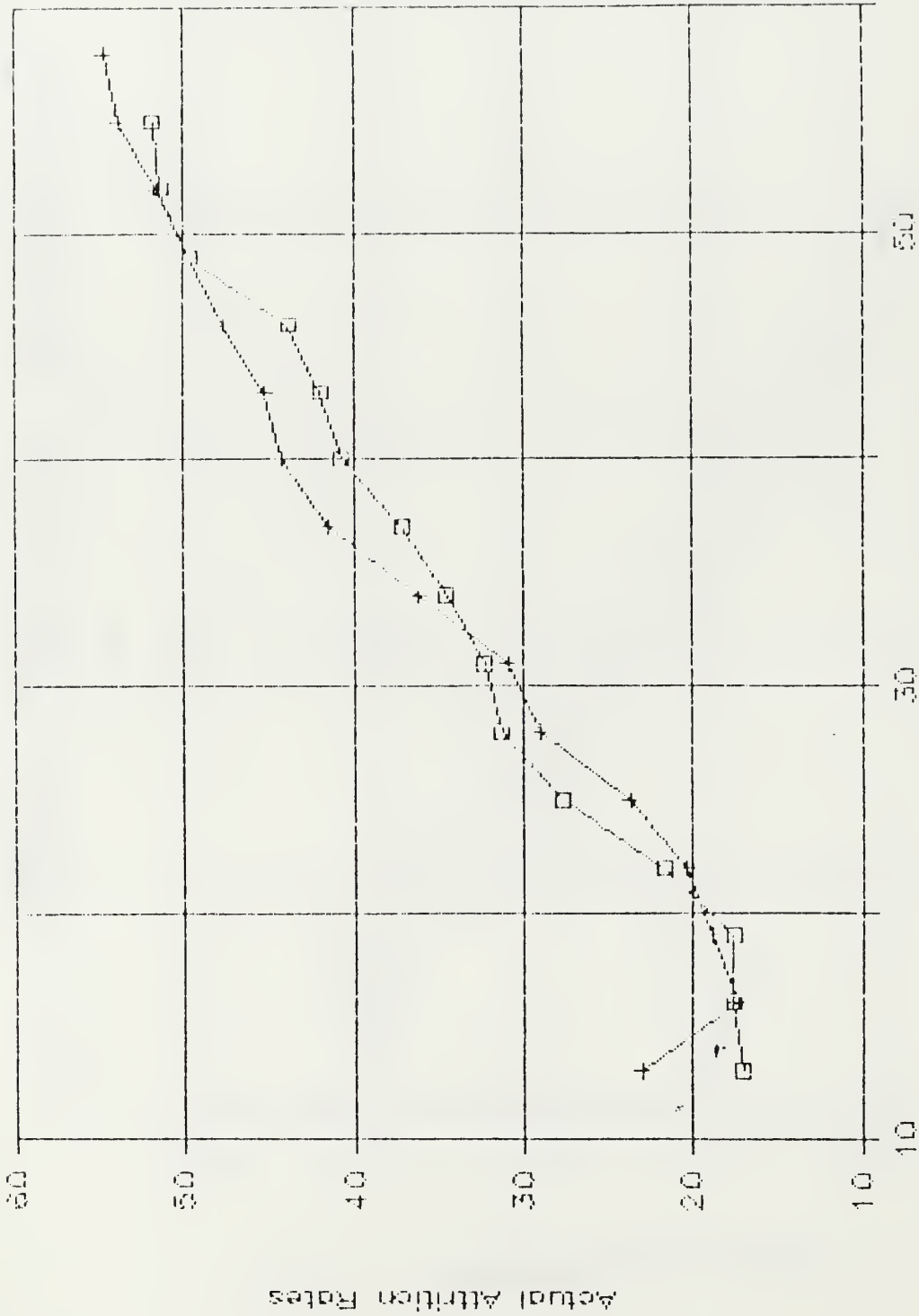


Figure 12. MALE ARMY ENLISTED PERSONNEL: RELATIONSHIP BETWEEN COMPOSITE 2 SCORES AND ACTUAL ATTRITION RATES BY RACE FOR FY 1979 AND 1980 ACCESSIONS

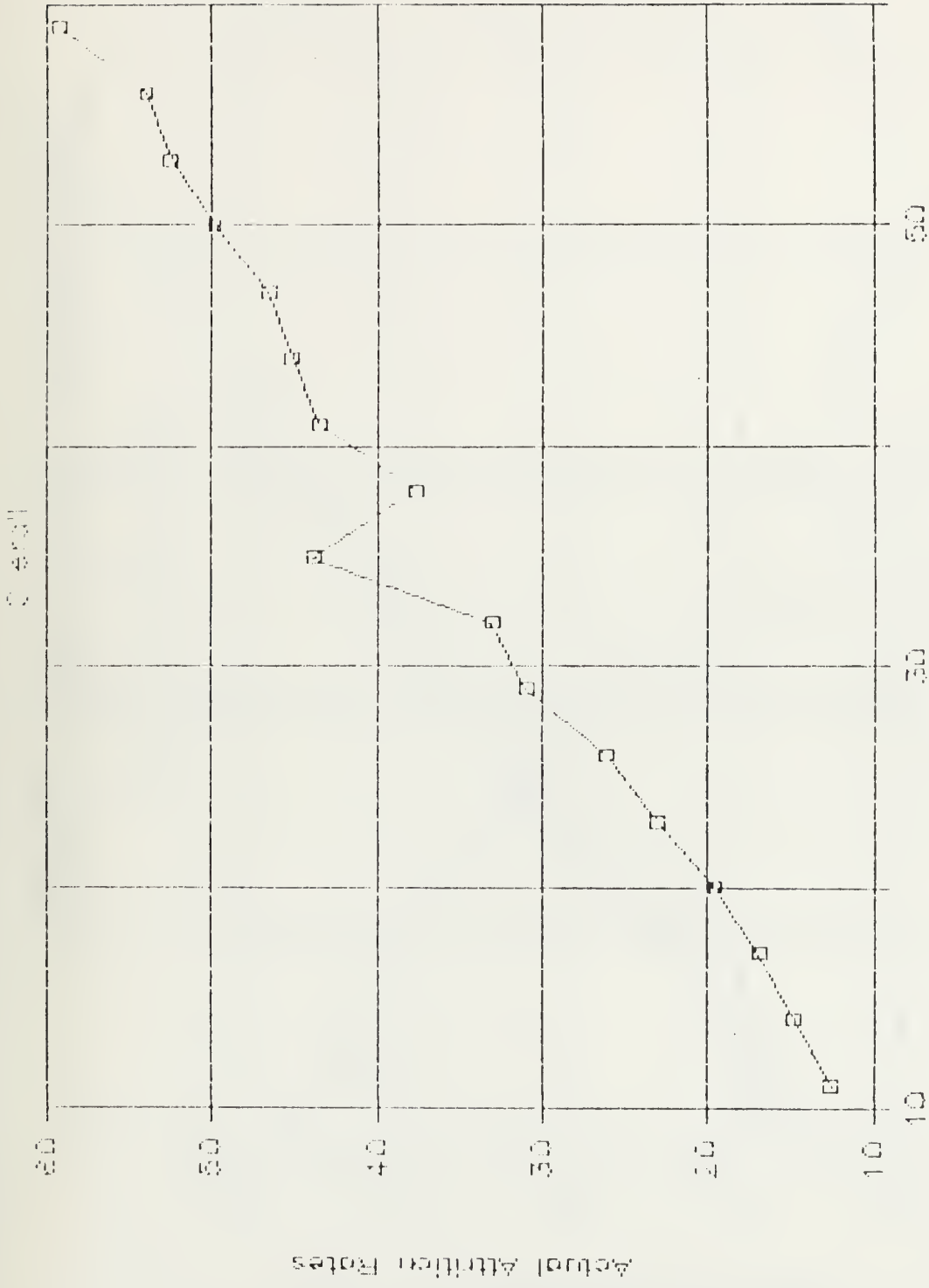


Figure 13. MALE ARMY FFLIATED PERSONNEL: RELATIONSHIP BETWEEN COMPOSITE 3 SCORES AND ACTUAL ATTRITION RATES FOR FY 1979 AND 1980 ACCESSIONS

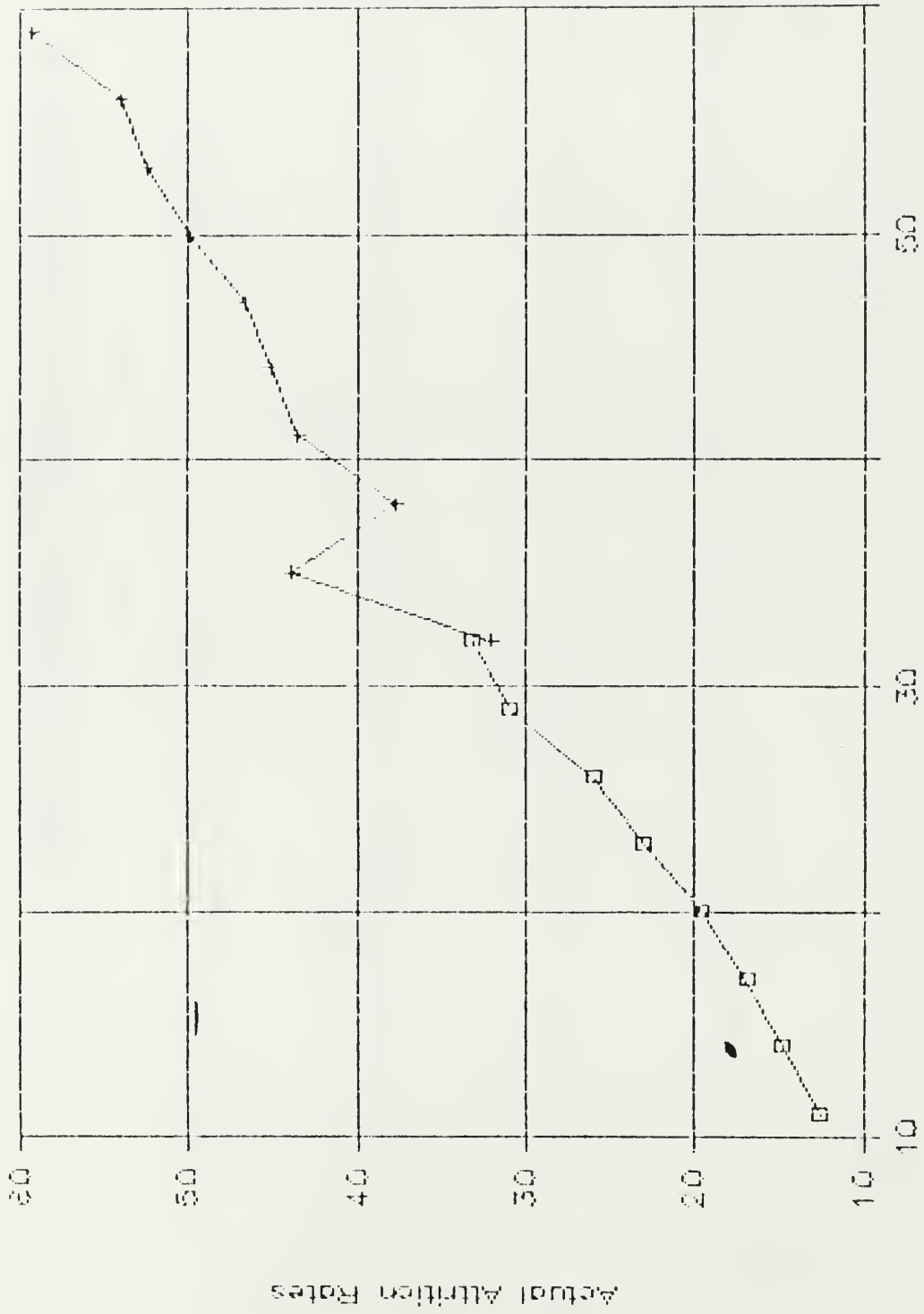


Figure 14. MALE ARMY ENLISTED PERSONNEL: RELATIONSHIP BETWEEN COMPOSITE 3 SCORES AND ACTUAL ATTRITION RATES BY EDUCATIONAL LEVEL FOR FY 1979 AND 1980 ACCESSIONS



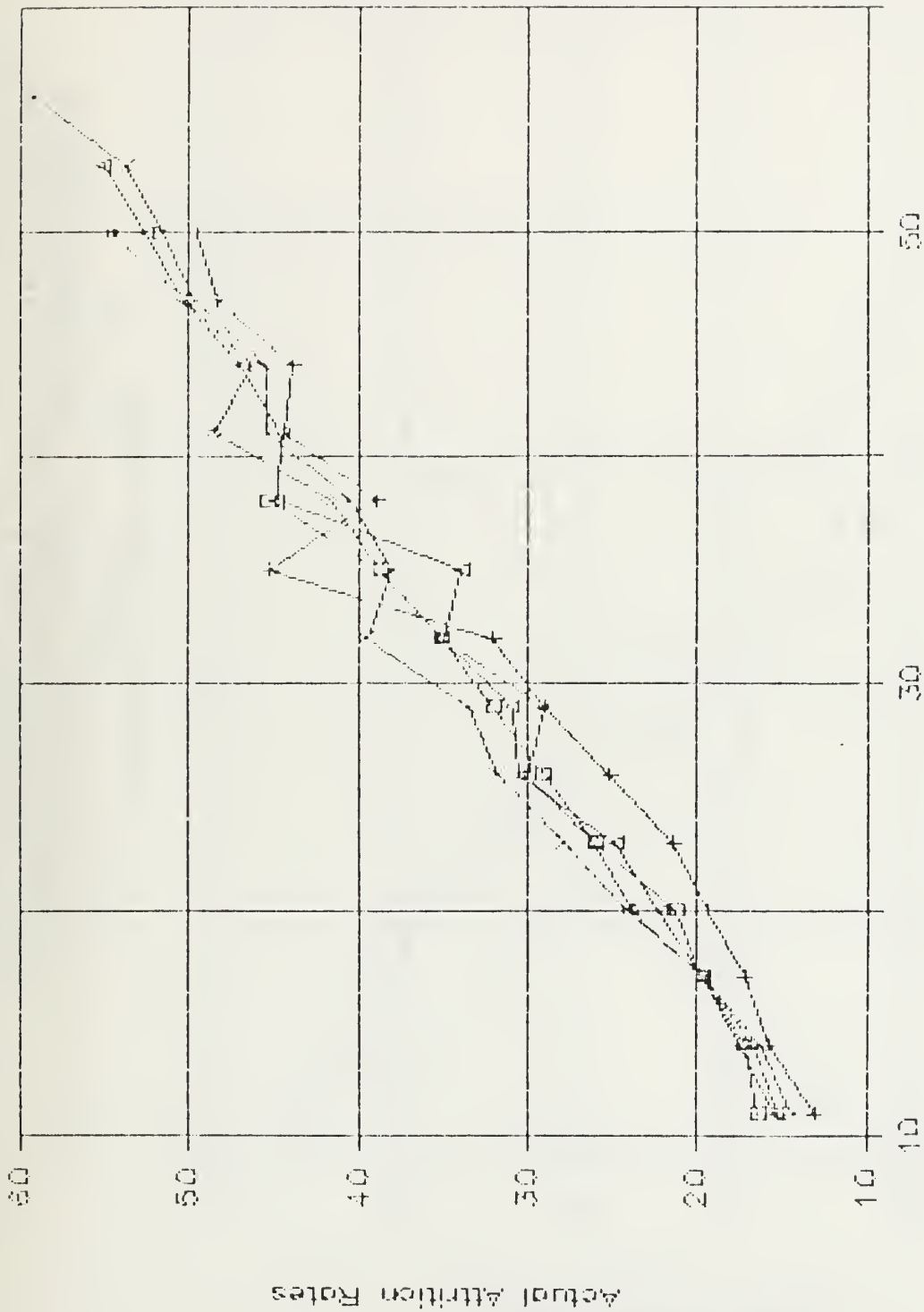


Figure 15. MALE ARMY ENLISTED PERSONNEL: RELATIONSHIP BETWEEN COMPOSITE 3 SCORES AND ACTUAL ATTRITION RATES BY AFQT CATEGORY FOR FY 1979 AND 1980 ACCESSIONS

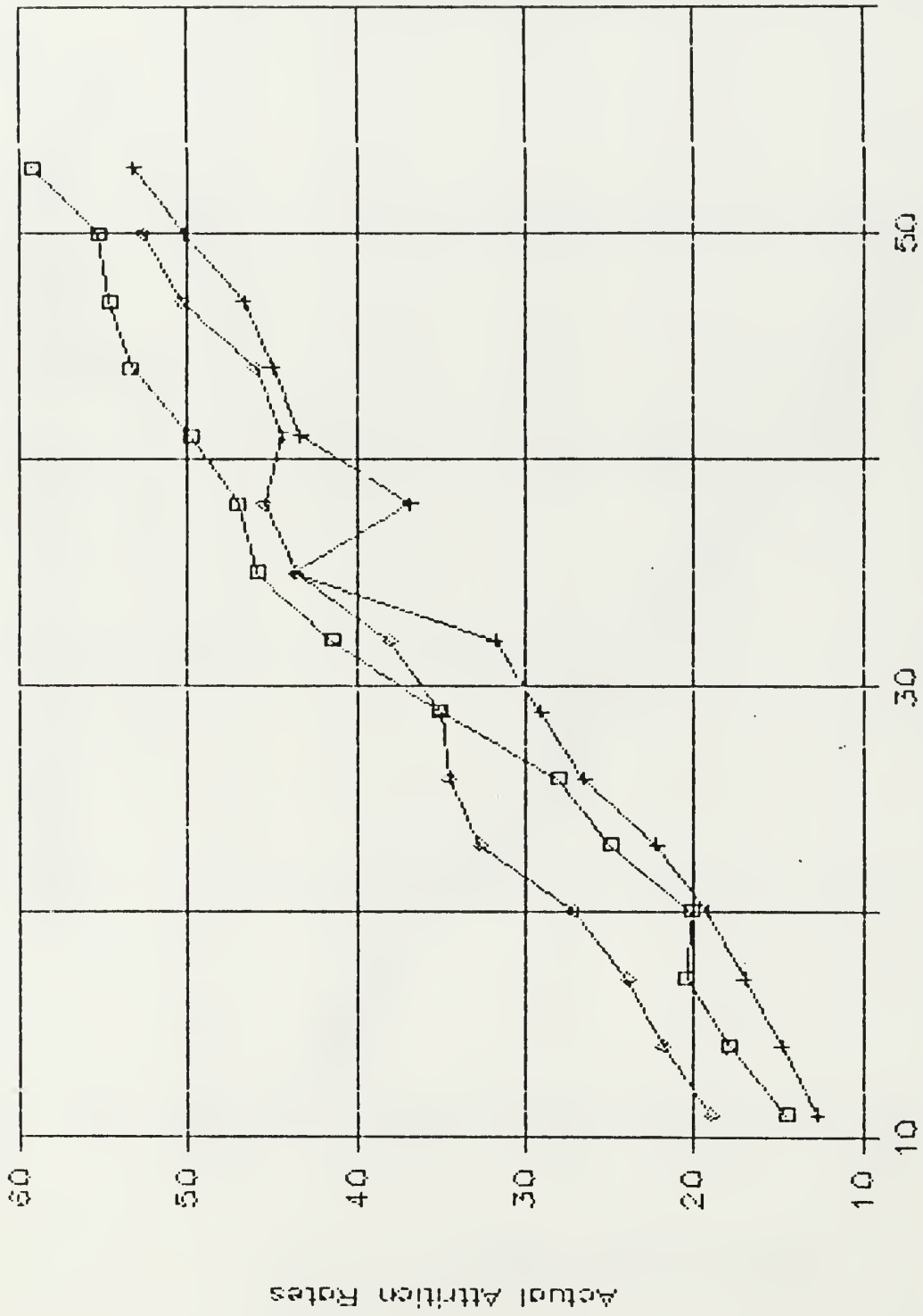
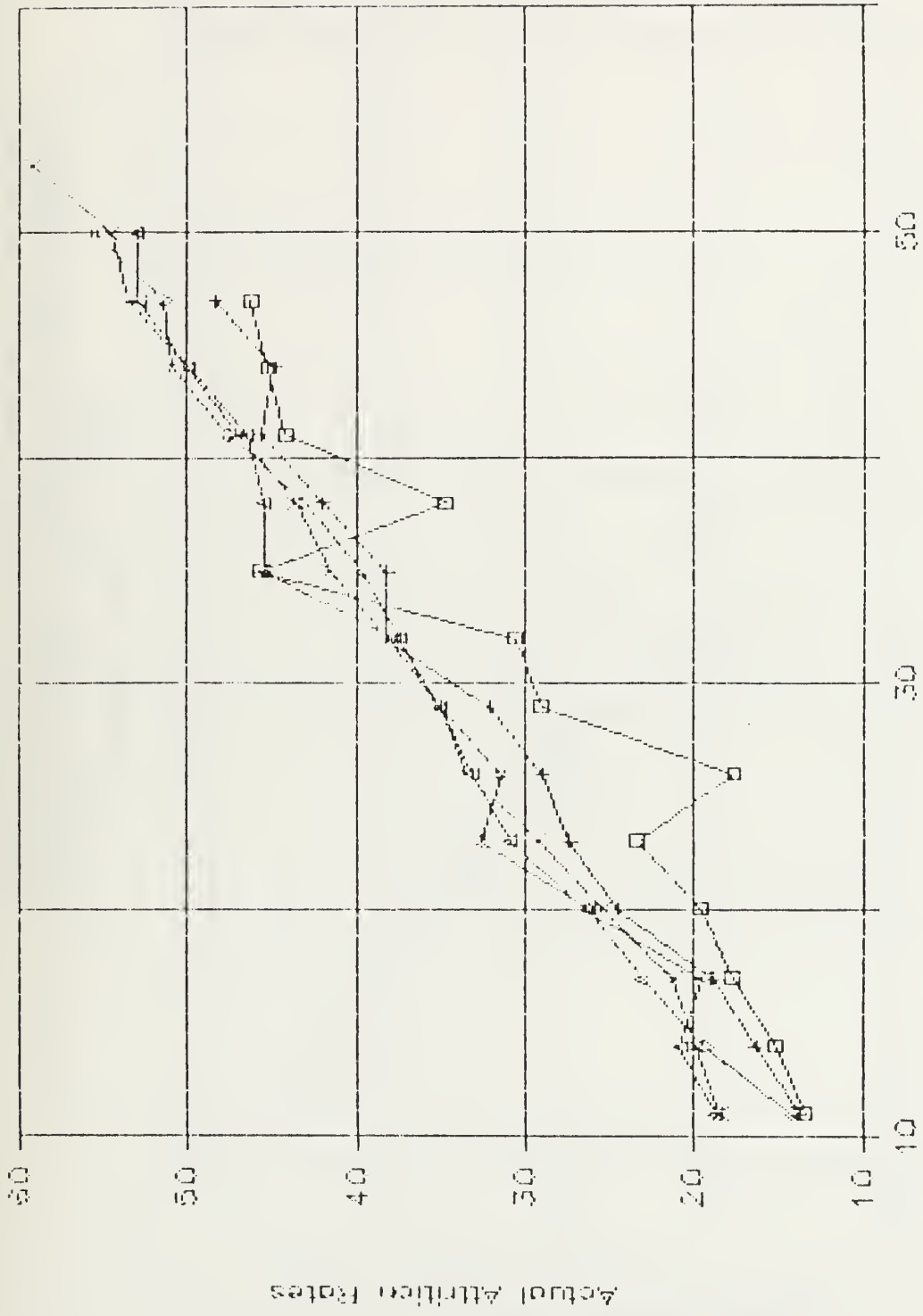


Figure 16. MALE ARMY ENLISTED PERSONNEL: RELATIONSHIP BETWEEN COMPOSITE 3 SCORES AND ACTUAL ATTRITION RATES BY AGE AT SERVICE ENTRY FOR FY 1979 AND 1980 ACCESSIONS



□ O + | Predicted Attrition Rates X IV  
 Figure 17. MALE ARMY ENLISTED PERSONNEL: RELATIONSHIP BETWEEN  
 COMPOSITE 3 SCORES AND ACTUAL ATTRITION RATES BY  
 GEOGRAPHIC ATTRITION CODE FOR FY 1979 AND 1980 ACCESSIONS

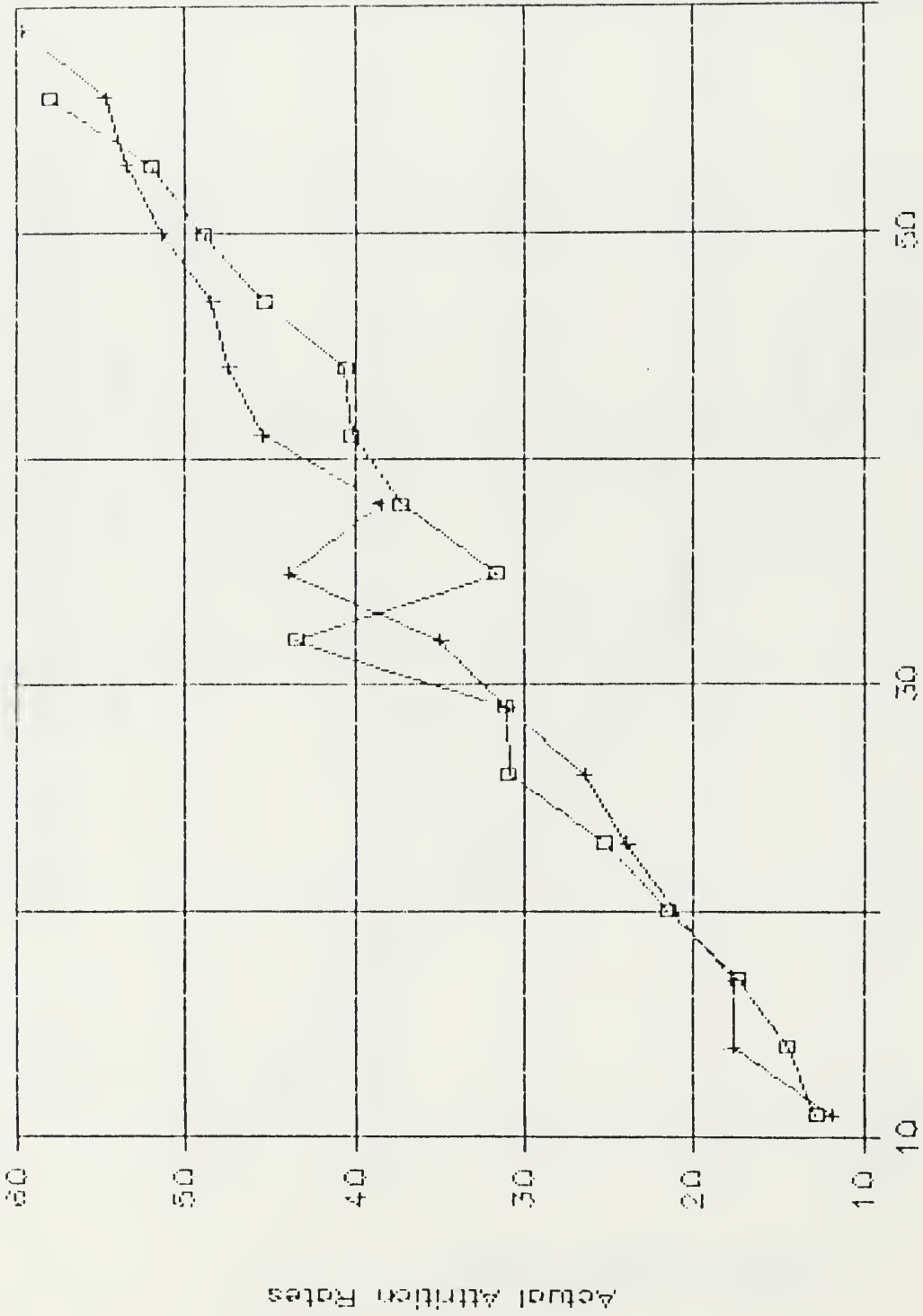


Figure 18. MALE ARMY ENLISTED PERSONNEL: RELATIONSHIP BETWEEN COMPOSITE 3 SCORES AND ACTUAL ATTRITION RATES BY RACE FOR FY 1979 AND 1980 ACCESSIONS

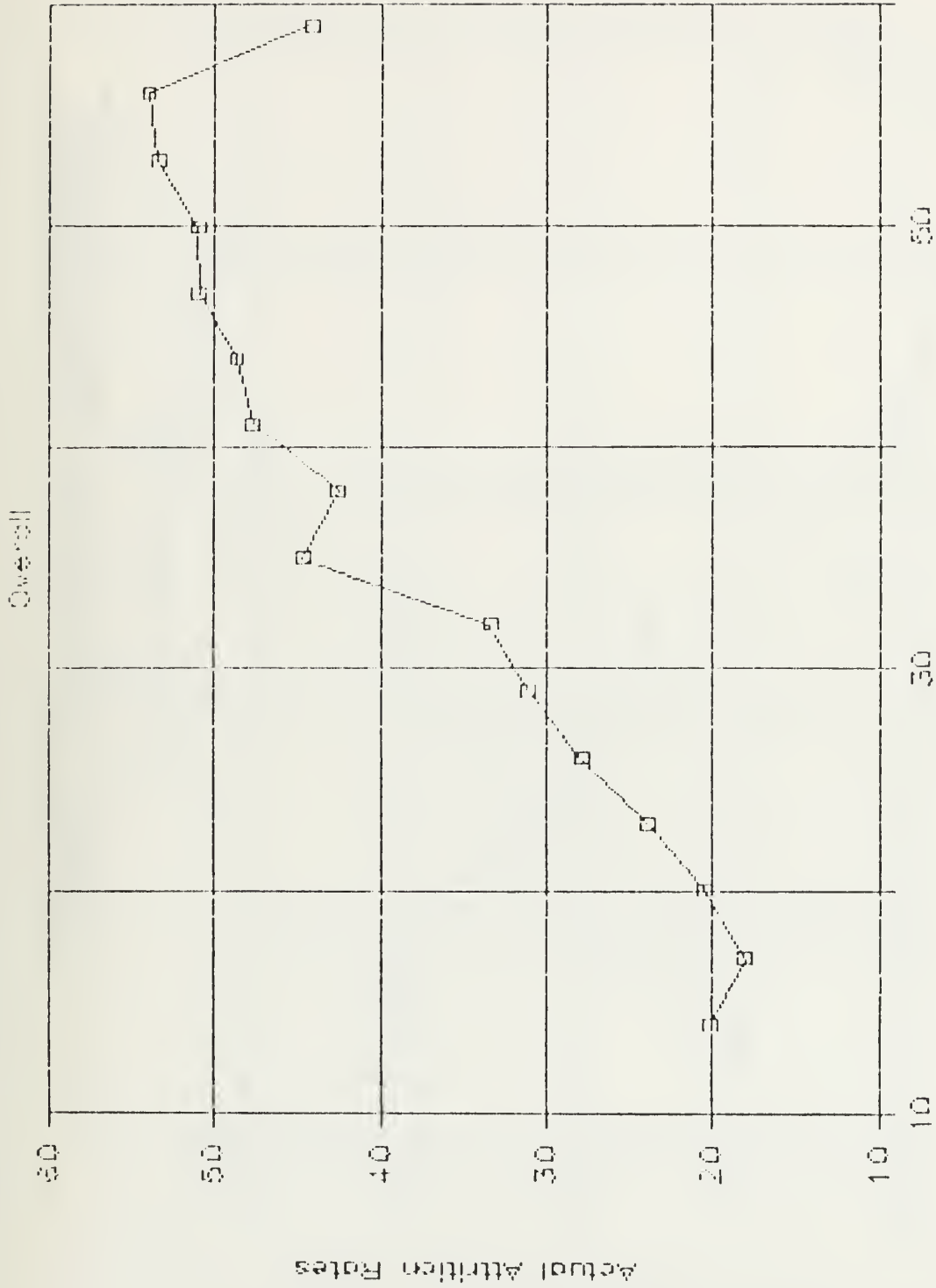


Figure 19. MAF ARMY ENLISTED PERSONNEL: RELATIONSHIP BETWEEN COMPOSITE I SCORES AND ACTUAL ATTRITION RATES FOR FY 1981 AND 1982 ACCESSIONS

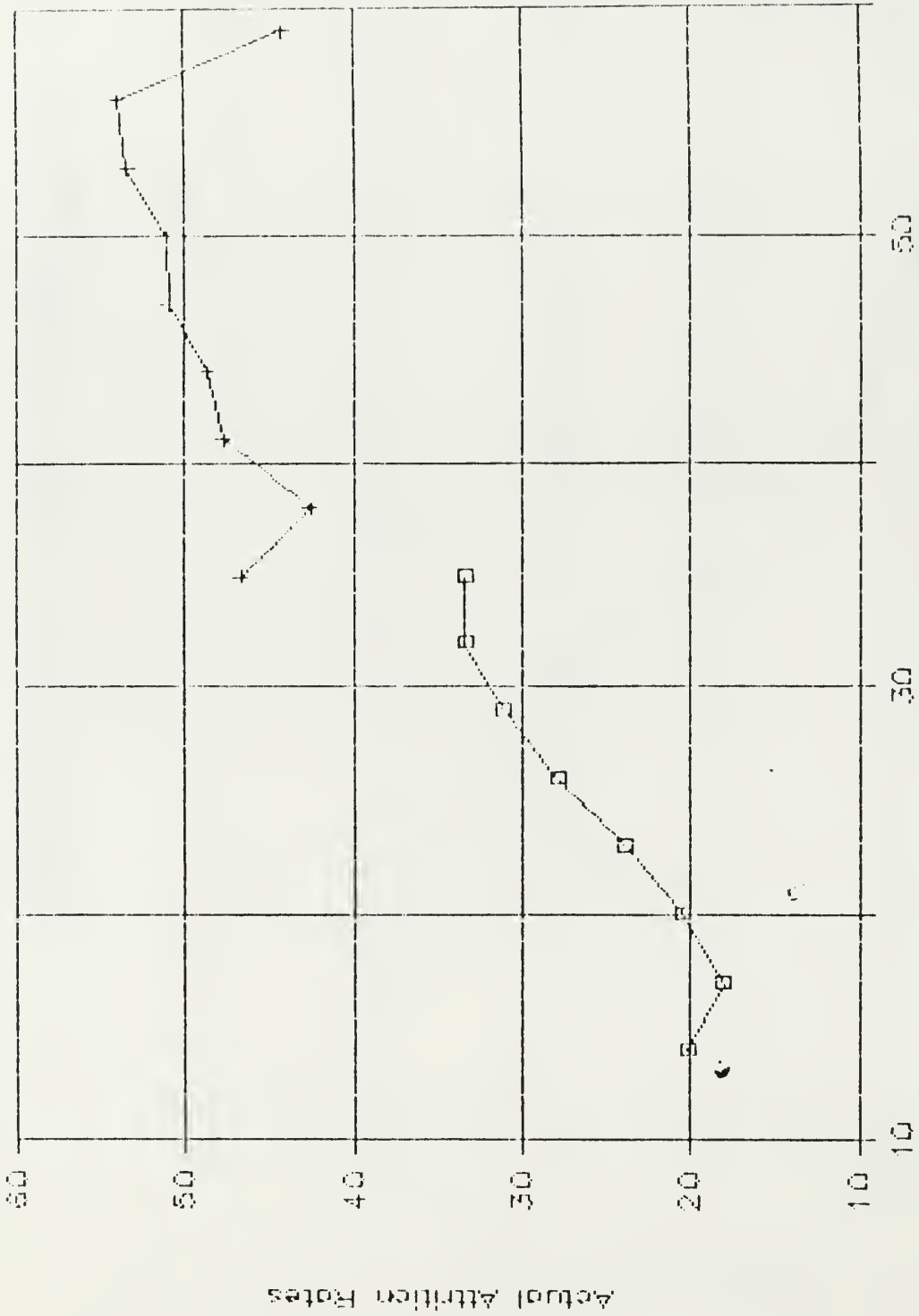
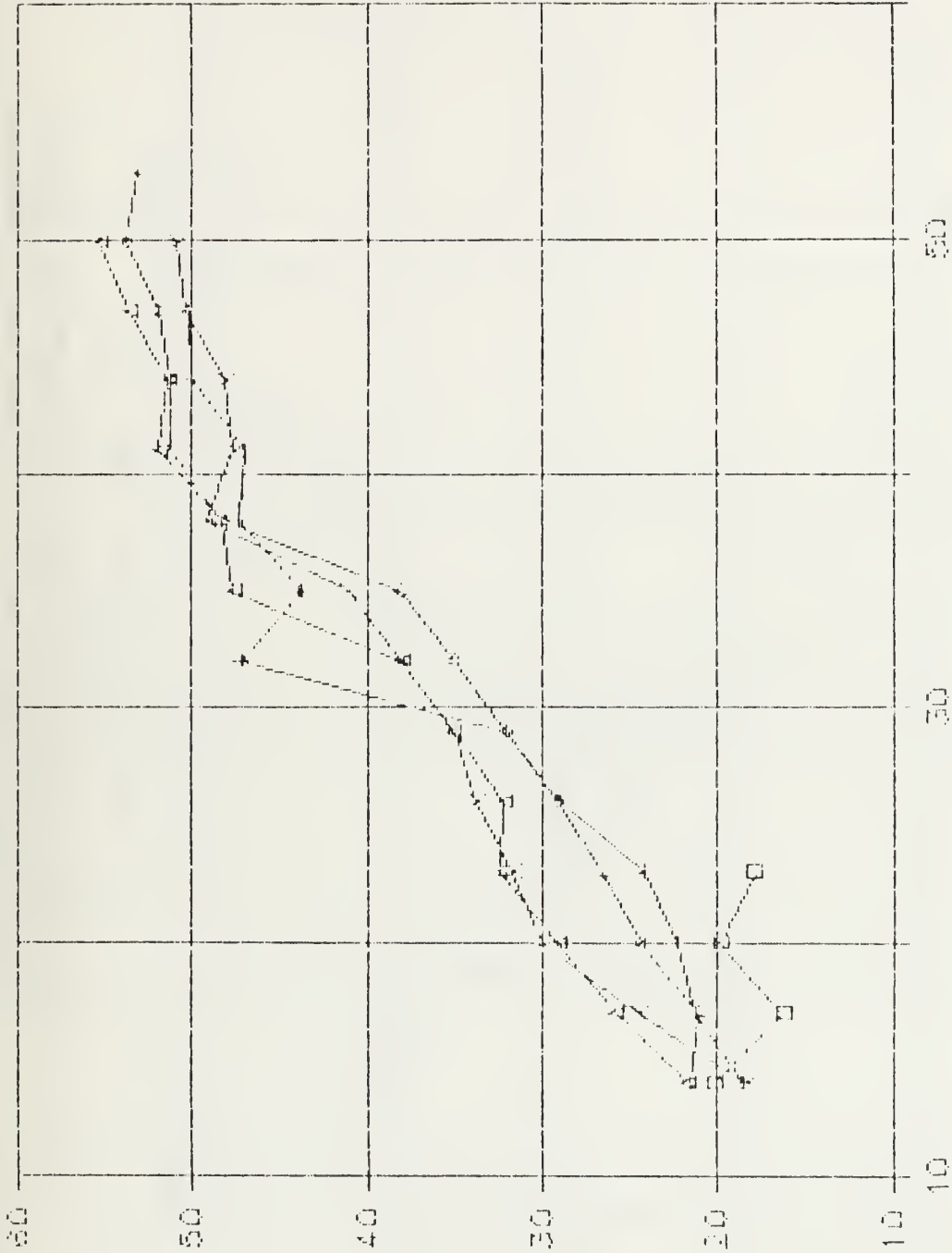


Figure 20. MALE ARMY ENLISTED PERSONNEL: RELATIONSHIP BETWEEN COMPOSITE I SCORES AND ACTUAL ATTRITION RATES BY EDUCATIONAL LEVEL FOR FY 1981 AND 1982 ACCESSIONS



□ I + II      Predicted Attrition Rates      Δ III • IV  
 Figure 21. MALE ARMY ENLISTED PERSONNEL: RELATIONSHIP BETWEEN  
 COMPOSITE I SCORES AND ACTUAL ATTRITION RATES BY  
 AFQT CATEGORY FOR FY 1981 AND 1982 ACCESSIONS

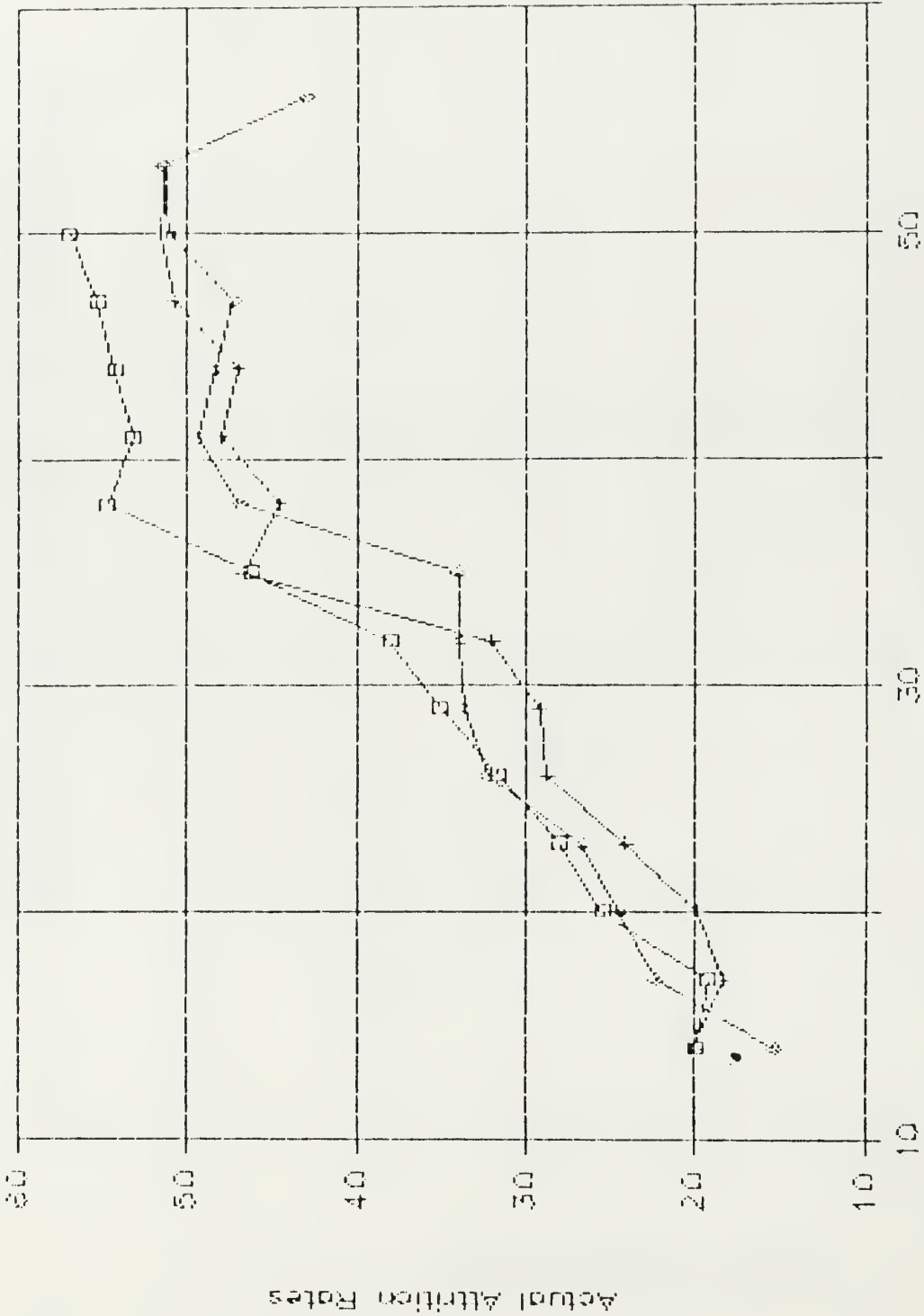


Figure 22. MALE ARMY ENLISTED PERSONNEL: RELATIONSHIP BETWEEN COMPOSITE I SCORES AND ACTUAL ATTRITION RATES BY AGE AT SERVICE ENTRY FOR FY 1981 AND 1982 ACCESSIONS



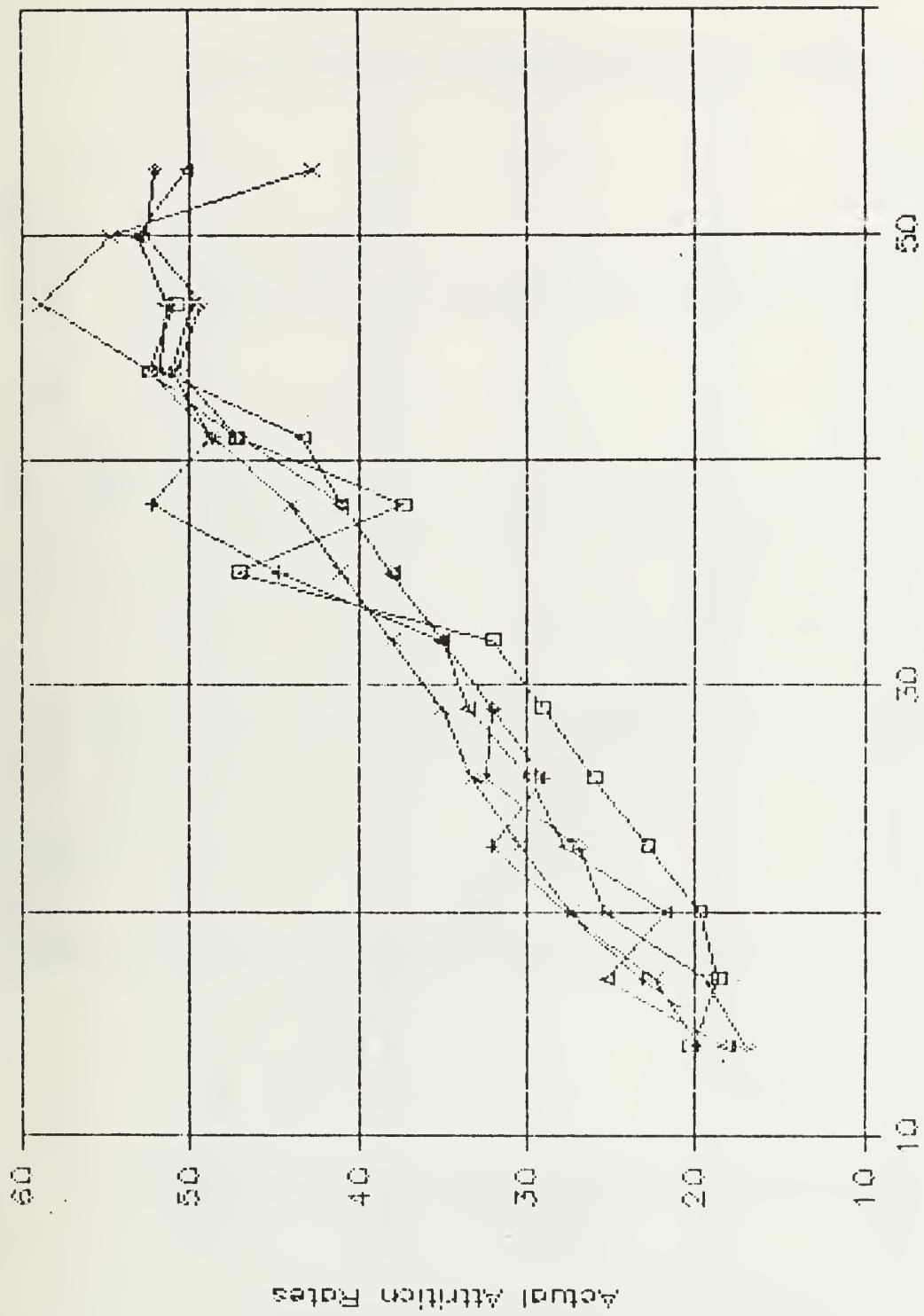


Figure 23. MALE ARMY ENLISTED PERSONNEL: RELATIONSHIP BETWEEN COMPOSITE I SCORES AND ACTUAL ATTRITION RATES BY GEOGRAPHIC ATTRITION CODE FOR FY 1981 AND 1982 ACCESSIONS

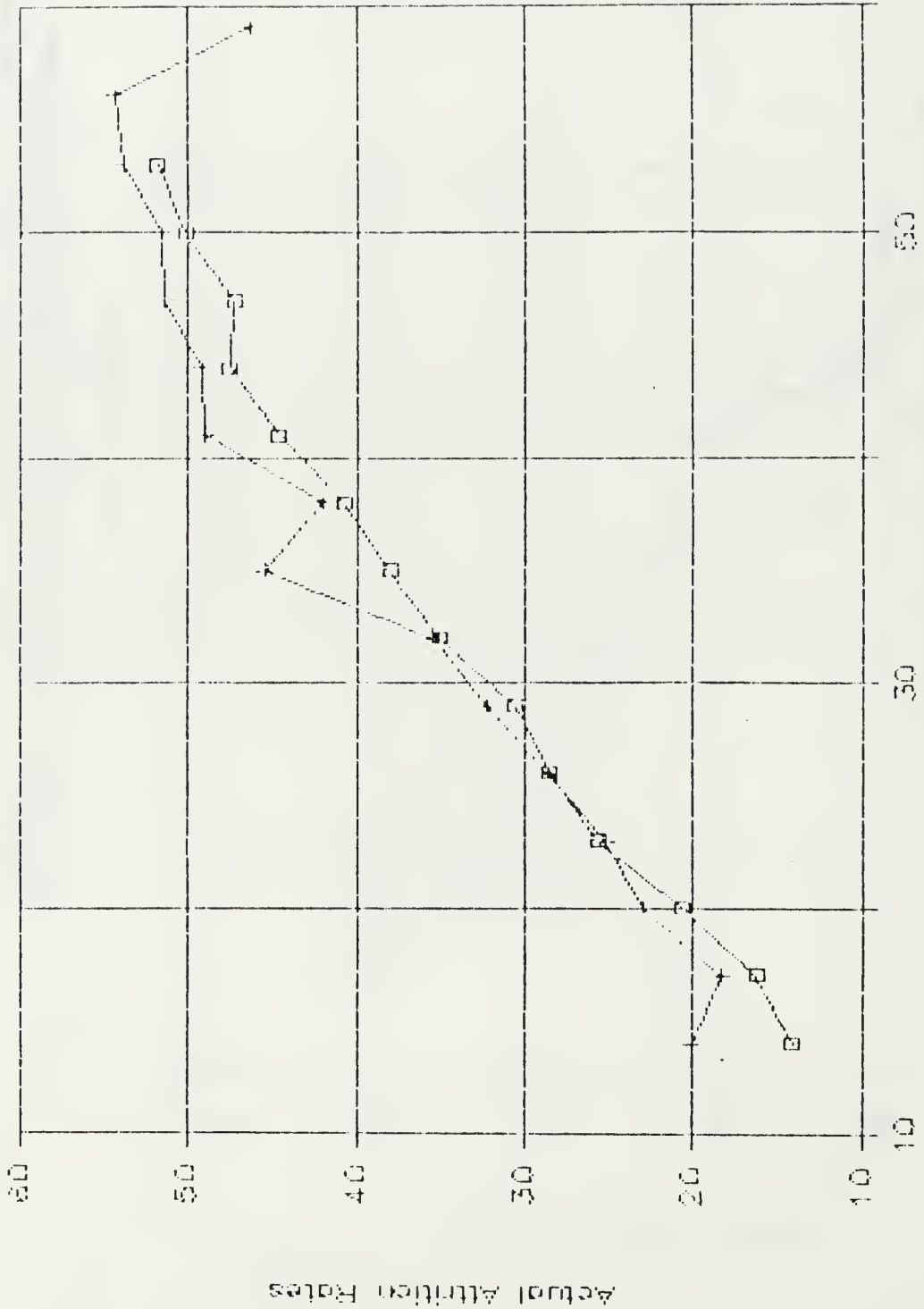


Figure 24. MALE ARMY ENLISTED PERSONNEL: RELATIONSHIP BETWEEN COMPOSITE 1 SCORES AND ACTUAL ATTRITION RATES BY RACE FOR FY 1981 AND 1982 ACCESSIONS

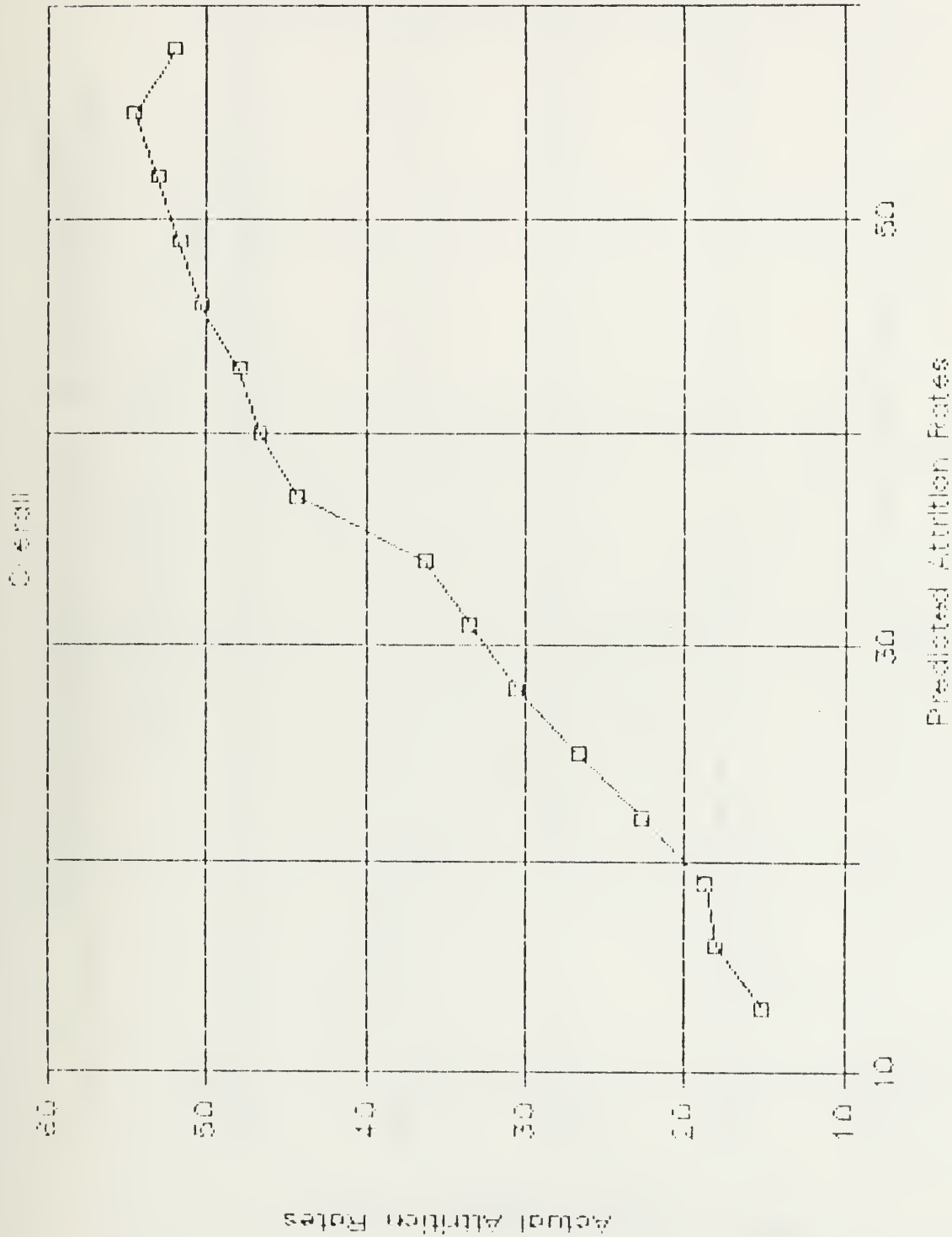
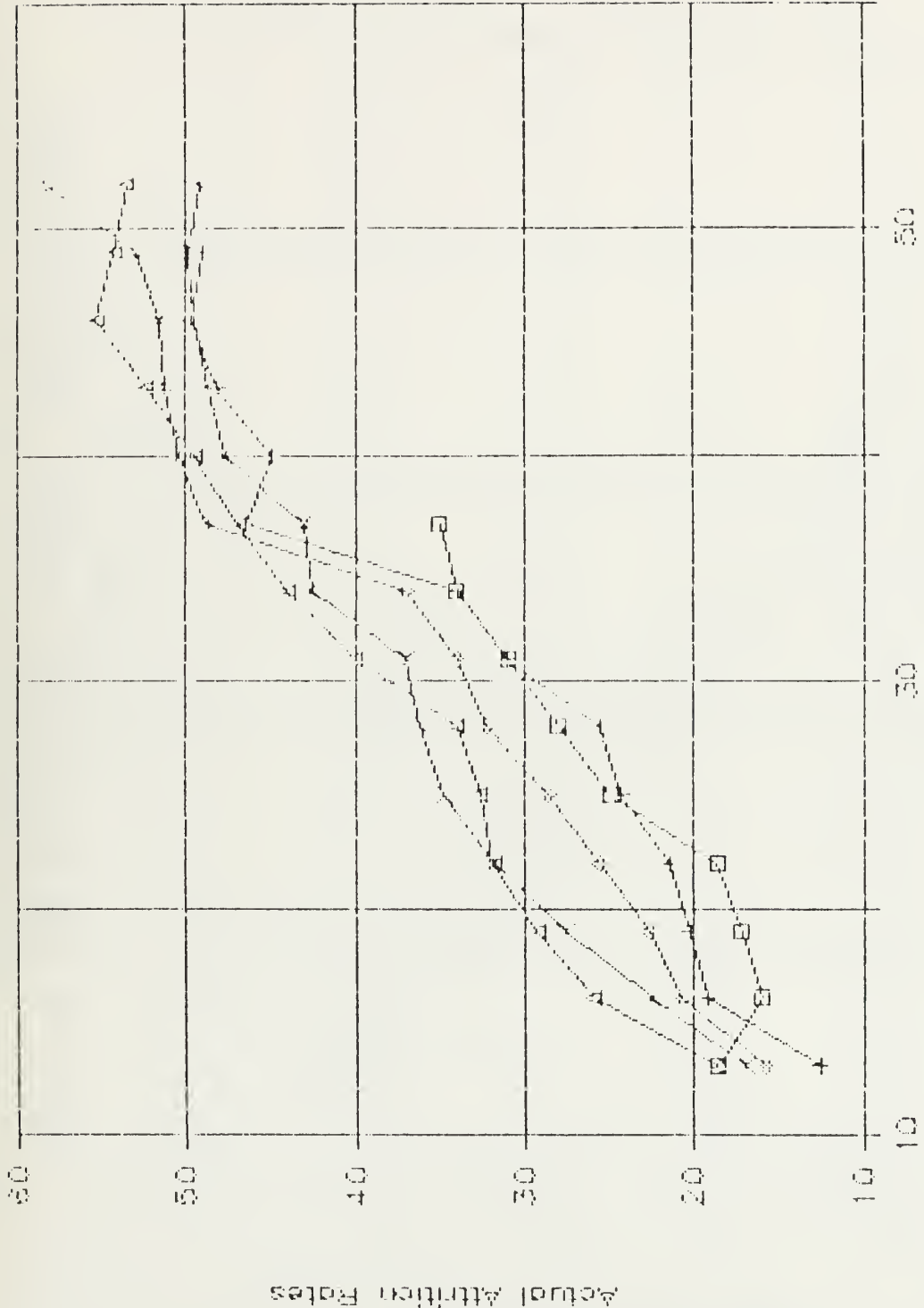


Figure 25. MALE ARMY ENLISTED PERSONNEL: RELATIONSHIP BETWEEN COMPOSITE 2 SCORES AND ACTUAL ATTRITION RATES FOR FY 1981 AND 1982 ACCESSIONS



Figure 26. MALE ARMY ENLISTED PERSONNEL: RELATIONSHIP BETWEEN COMPOSITE 2 SCORES AND ACTUAL ATTRITION RATES BY EDUCATIONAL LEVEL FOR FY 1981 AND 1982 ACCESSIONS



□ I    +    ||    o    IIIA    x    IIIB    △    IV  
 Predicted Attrition Rates

Figure 27. MALE ARMY ENLISTED PERSONNEL: RELATIONSHIP BETWEEN COMPOSITE 2 SCORES AND ACTUAL ATTRITION RATES BY AFQT CATEGORY FOR FY 1981 AND 1982 ACCESSIONS

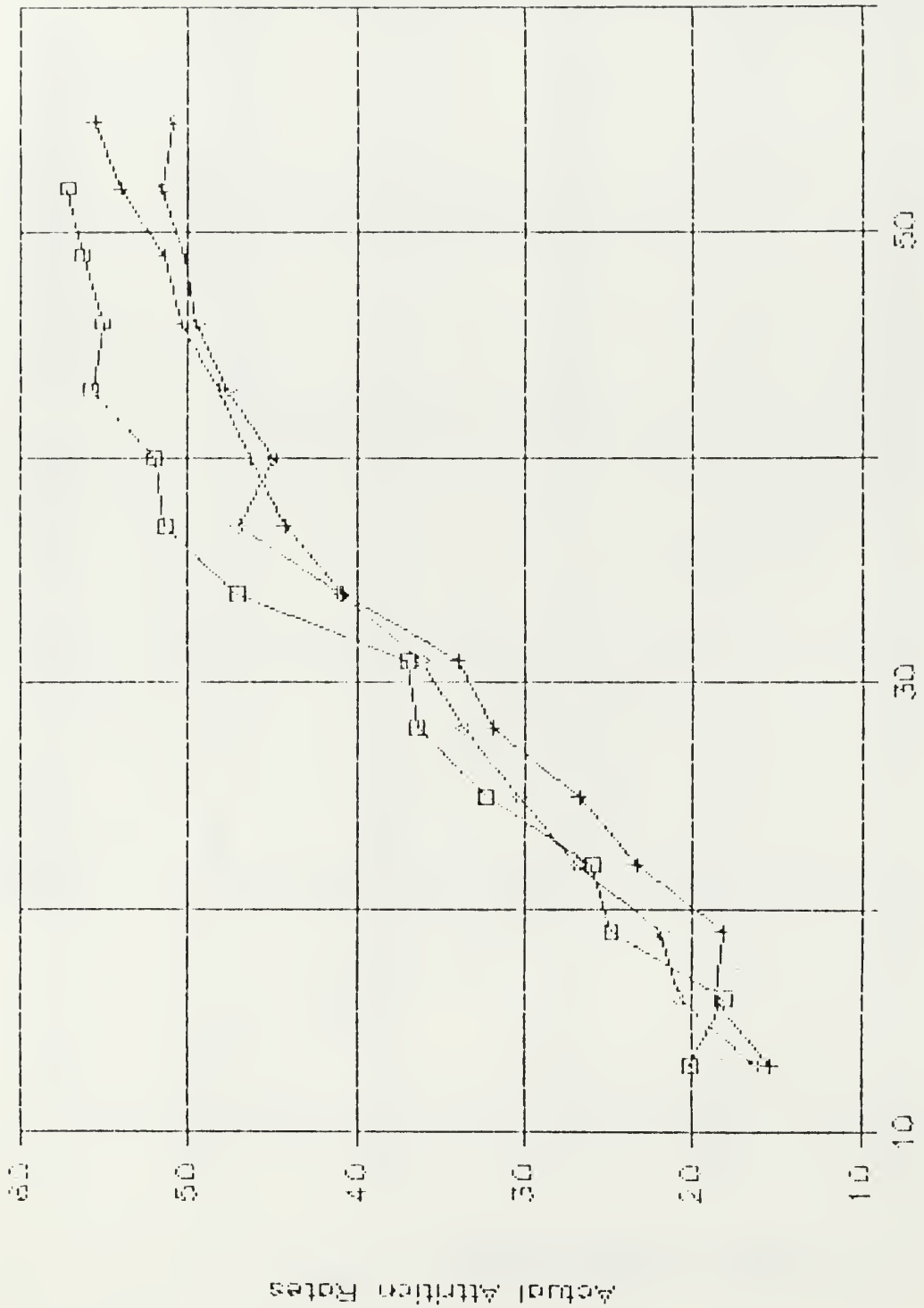


Figure 28. MALE ARMY ENLISTED PERSONNEL: RELATIONSHIP BETWEEN COMPOSITE 2 SCORES AND ACTUAL ATTRITION RATES BY AGE AT SERVICE ENTRY FOR FY 1981 AND 1982 ACCESSIONS

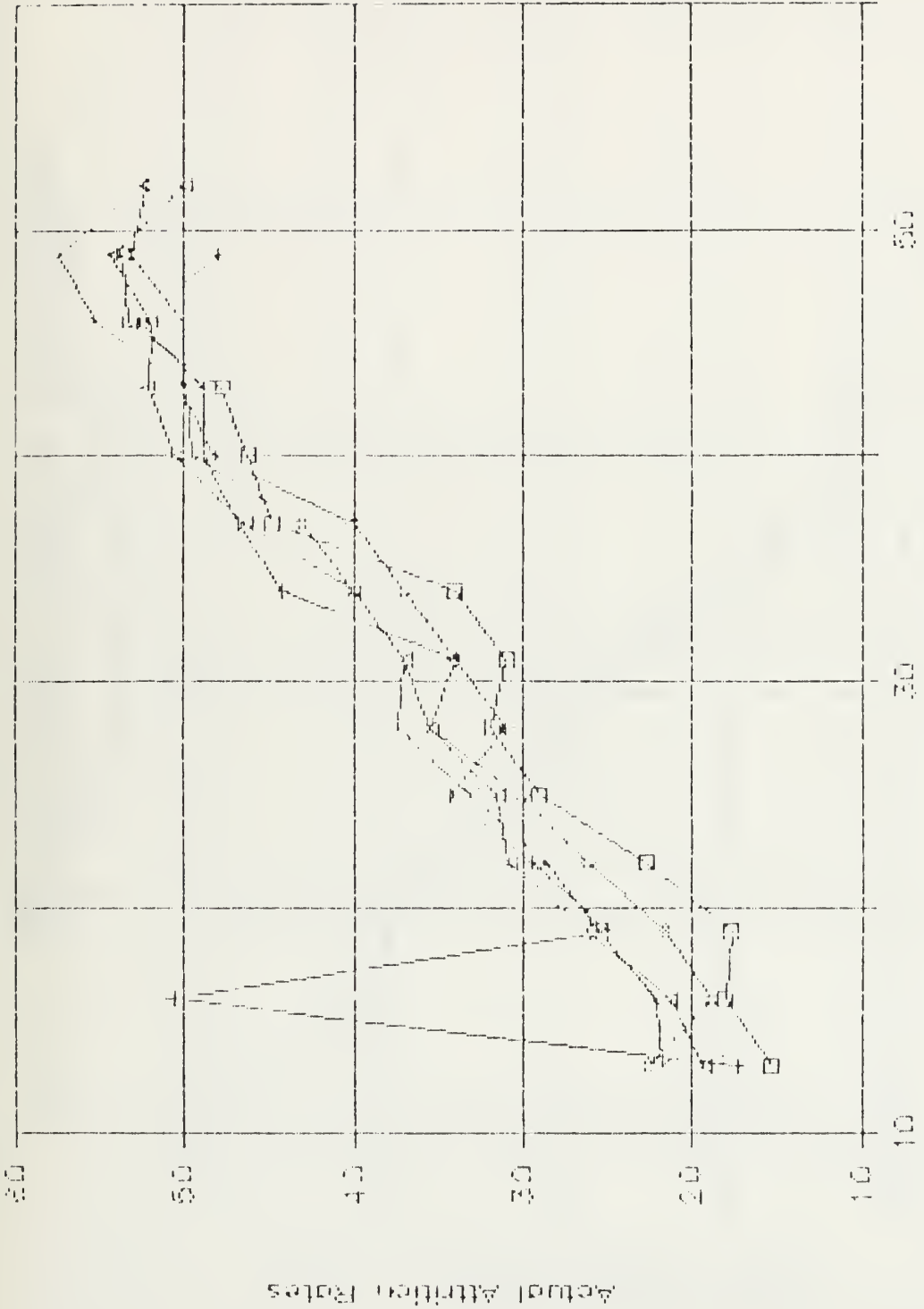


Figure 29. MALE ARMY ENLISTED PERSONNEL: RELATIONSHIP BETWEEN COMPOSITE 2 SCORES AND ACTUAL ATTRITION RATES BY GEOGRAPHIC ATTRITION CODE FOR FY 1981 AND 1982 ACCESSIONS

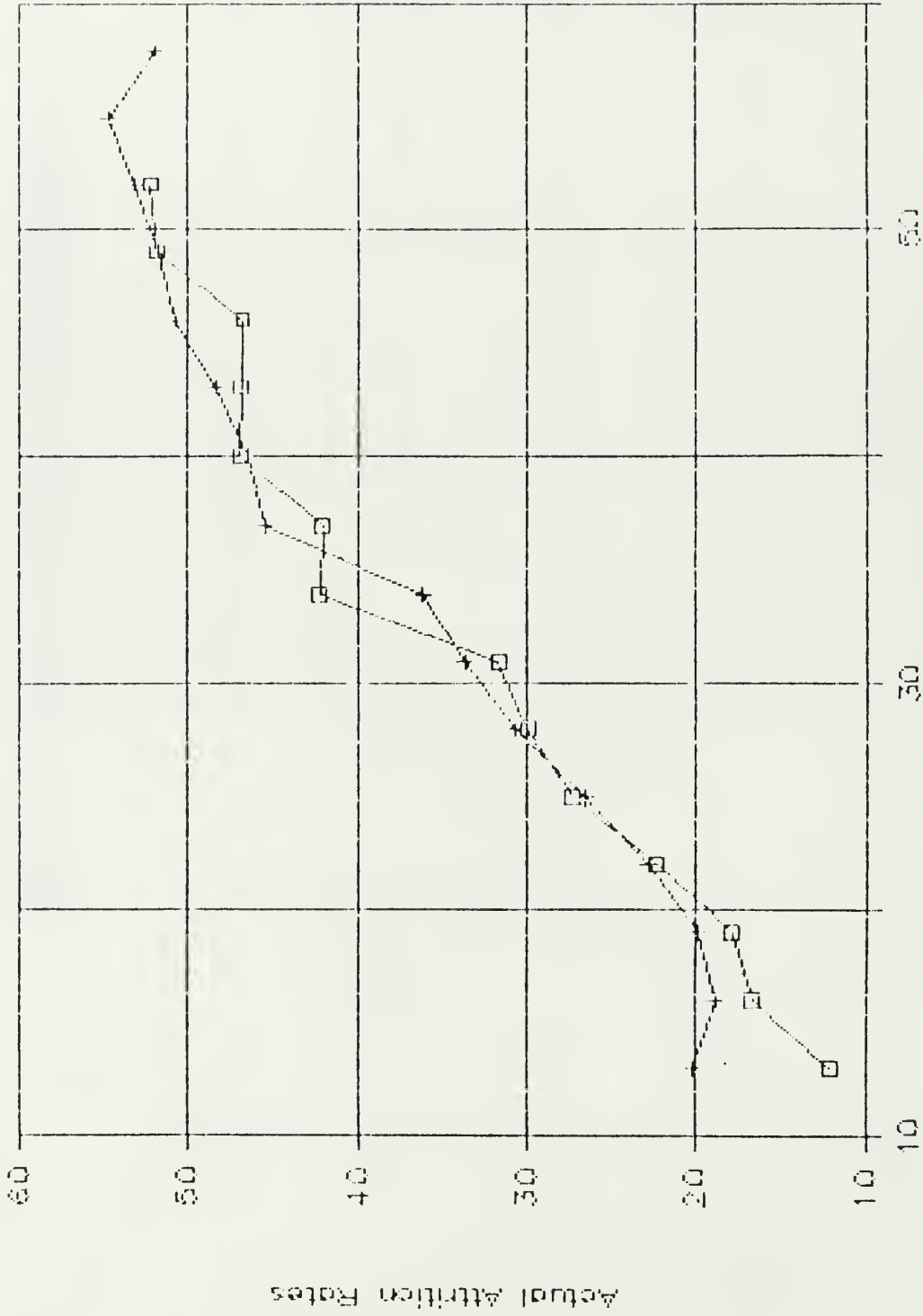


Figure 30. MALE ARMY ENLISTED PERSONNEL: RELATIONSHIP BETWEEN COMPOSITE 2 SCORES AND ACTUAL ATTRITION RATES BY RACE FOR FY 1981 AND 1982 ACCESSIONS



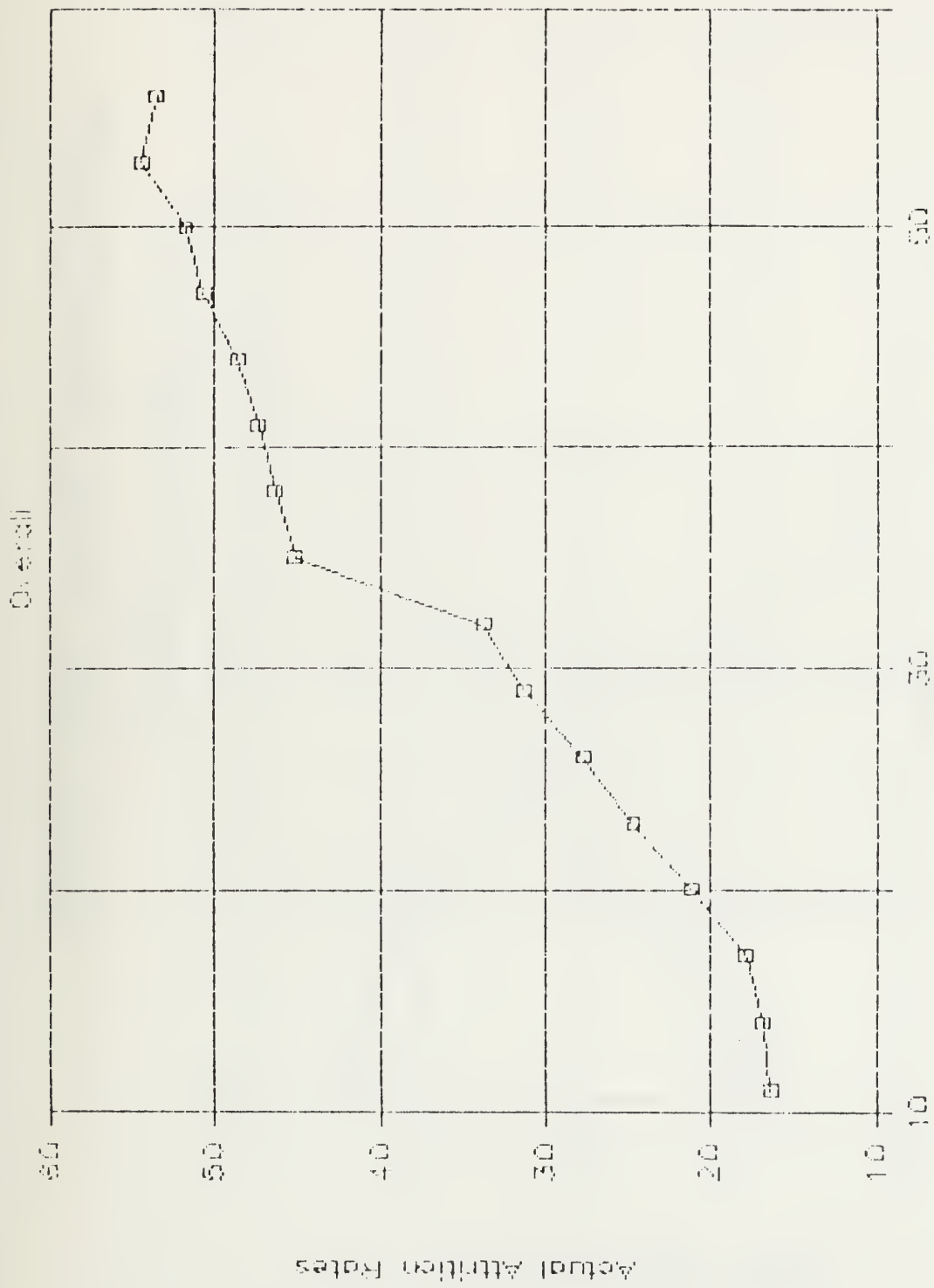


Figure 31. MALE ARMY ENLISTED PERSONNEL: RELATIONSHIP BETWEEN COMPOSITE 3 SCORES AND ACTUAL ATTRITION RATES FOR FY 1981 AND 1982 ACCESSIONS

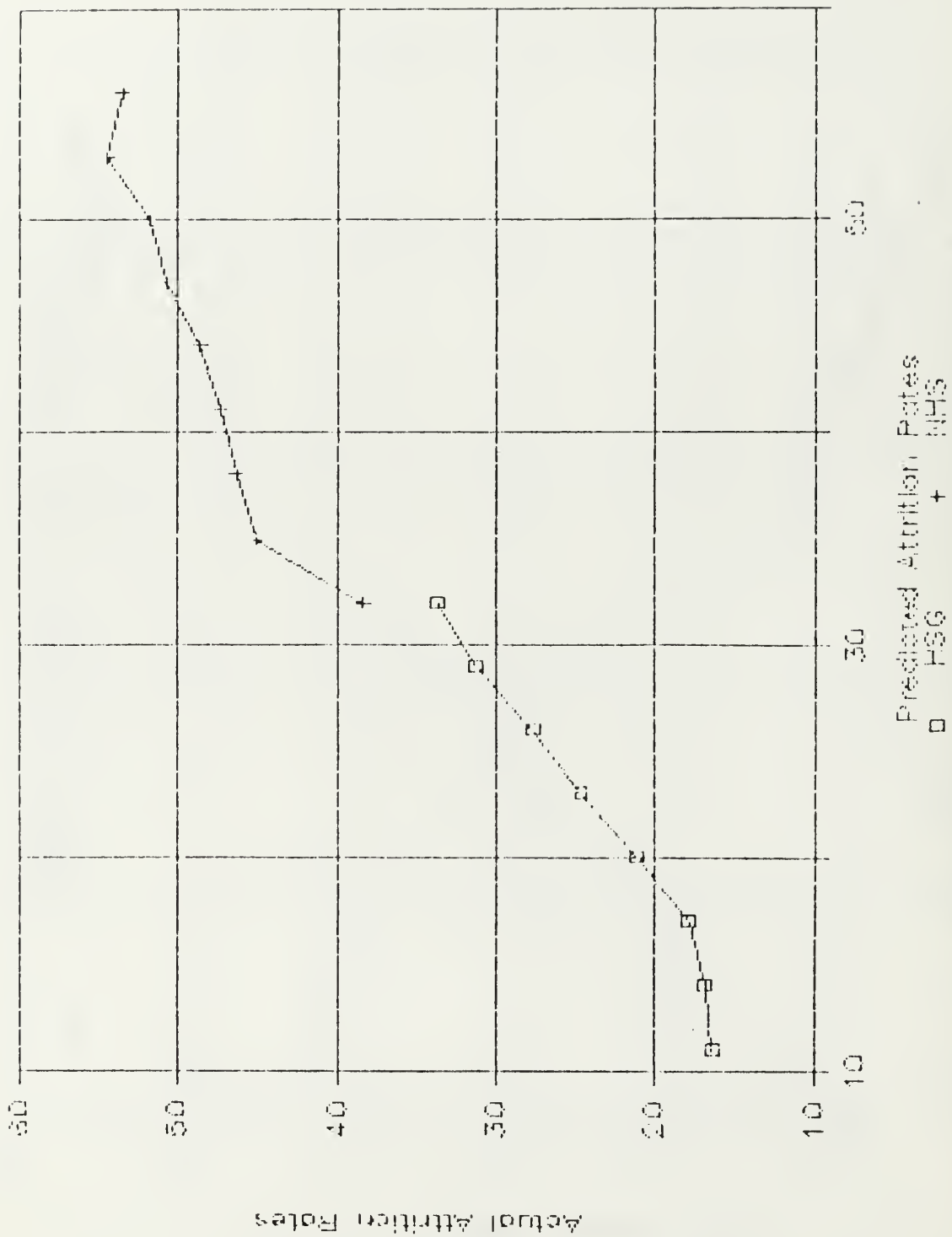


Figure 32. MALE ARMY ENLISTED PERSONNEL: RELATIONSHIP BETWEEN COMPOSITE 3 SCORES AND ACTUAL ATTRITION RATES BY EDUCATIONAL LEVEL FOR FY 1981 AND 1982 ACCESSIONS

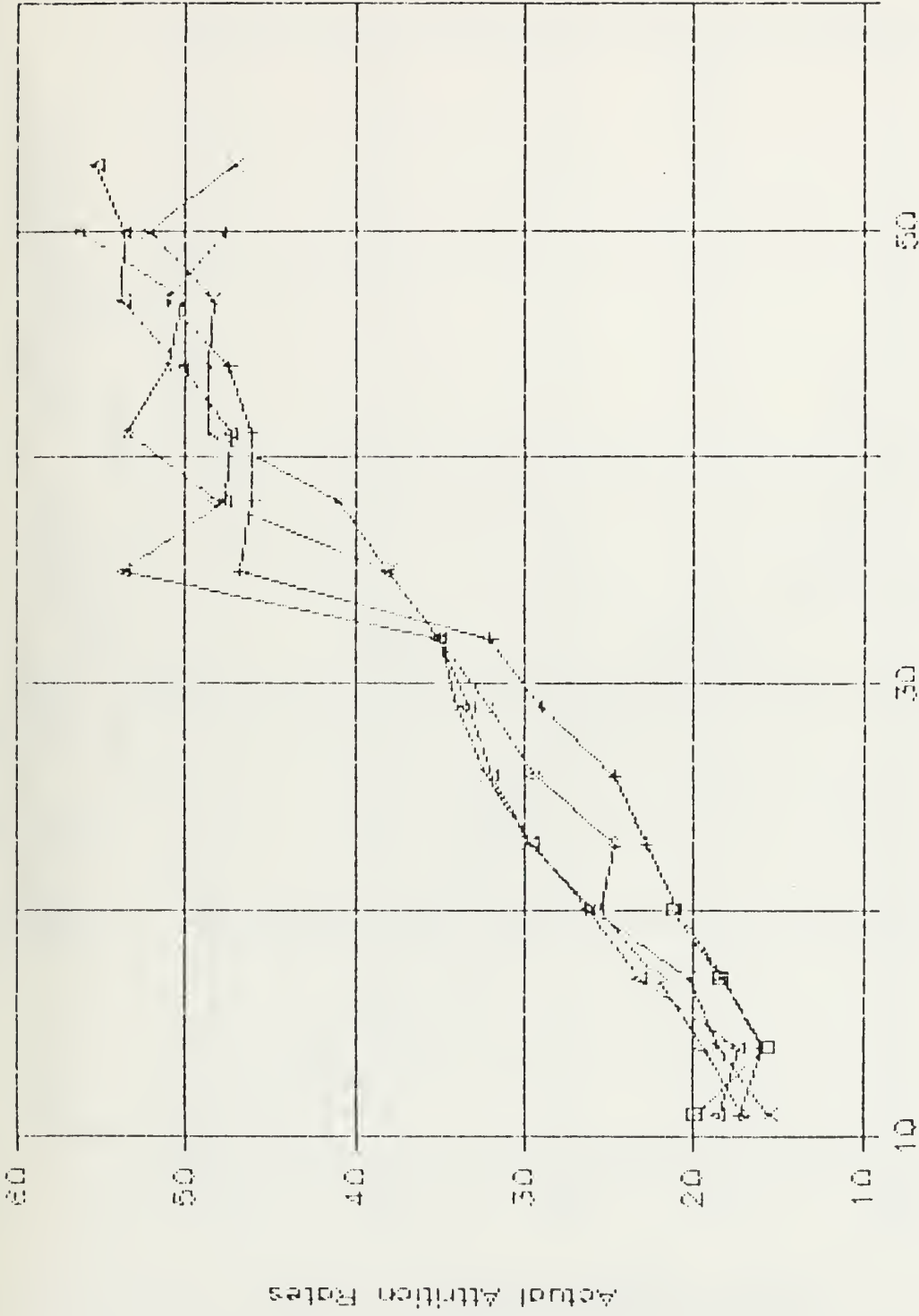


Figure 33. MALE ARMY ENLISTED PERSONNEL: RELATIONSHIP BETWEEN COMPOSITE 3 SCORES AND ACTUAL ATTRITION RATES BY AFQT CATEGORY FOR FY 1981 AND 1982 ACCESSIONS

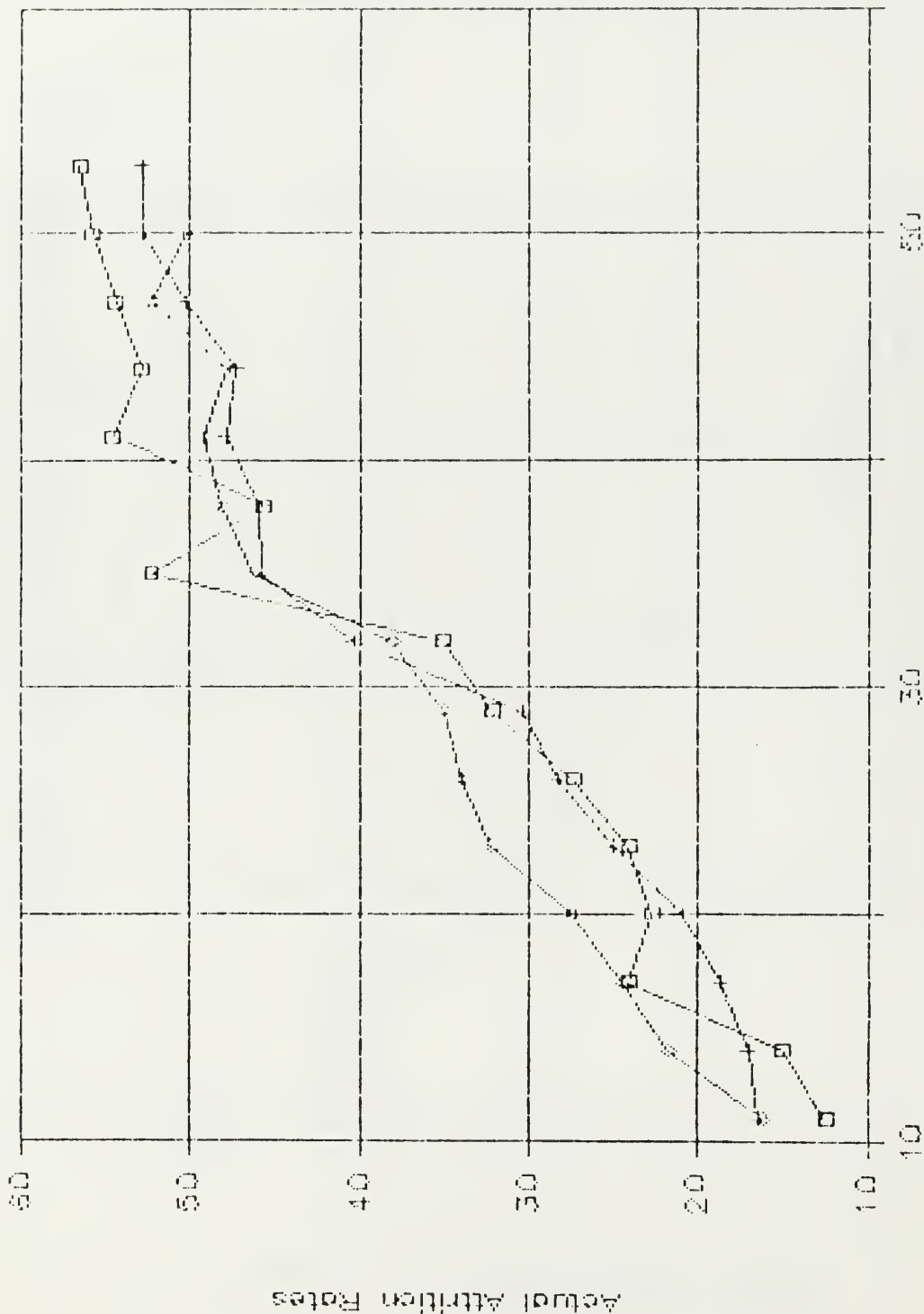


Figure 34. Male Army Enlisted Personnel: Relationship Between Composite 3 Scores and Actual Attrition Rates by Age at Service Entry for FY 1981 and 1982 Accessions

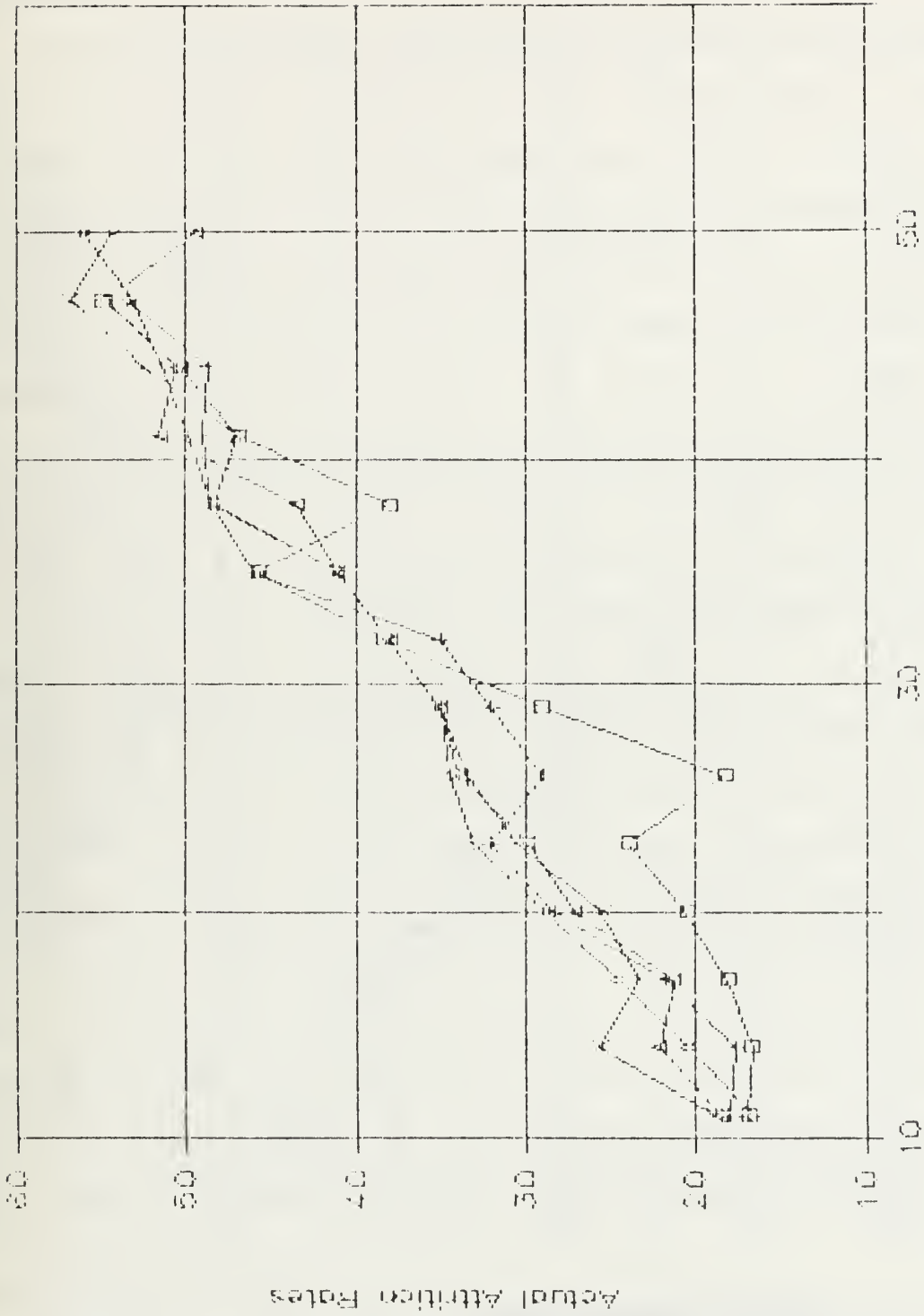


Figure 35. MALE ARMY ENLISTED PERSONNEL: RELATIONSHIP BETWEEN COMPOSITE 3 SCORES AND ACTUAL ATTRITION RATES BY GEOGRAPHIC ATTRITION CODE FOR FY 1981 AND 1982 ACCESSIONS

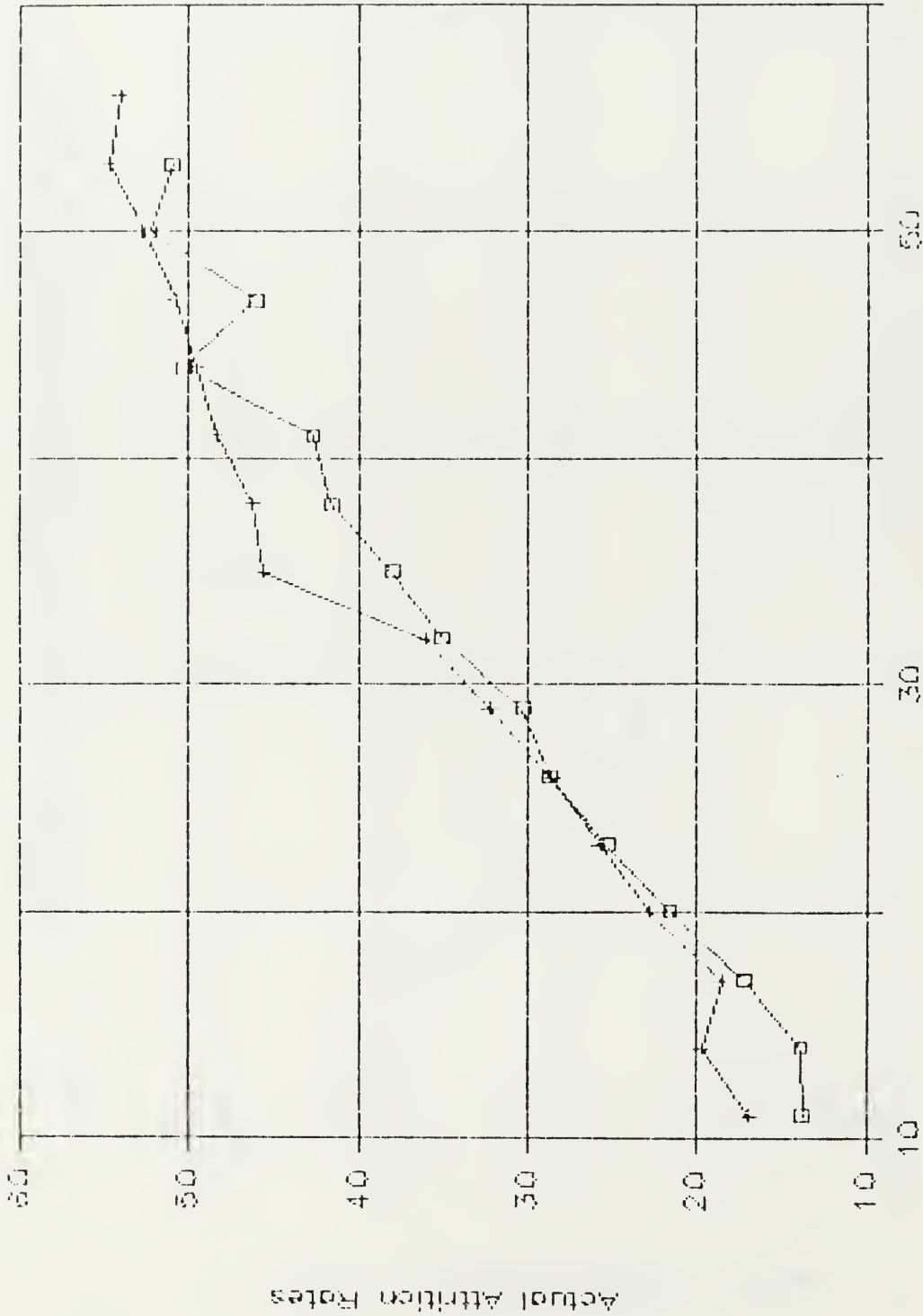


Figure 36. MALE ARMY ENLISTED PERSONNEL: RELATIONSHIP BETWEEN COMPOSITE 3 SCORES AND ACTUAL ATTRITION RATES BY RACE FOR FY 1981 AND 1982 ACCESSIONS

for the overall population. Therefore, Composite 2 appeared to be the least discriminatory screening composite for male enlisted personnel.

One of the female enlistment screens provided only five attrition prediction scores within a limited range. Therefore, although the model's F statistic was .84, the scores did not discriminate well enough and the model was abandoned. The graphical analyses for female accessions, as shown in Figures 37 through 51, are difficult to interpret because many irregularities occurred. These irregularities may have been a result of small cell sizes, the use of ineffective predictors of female attrition, restricted range affecting the degree of variability or a combination of one or more of these predictive limitations. For the estimation sample (FY 1979 and 1980 accessions), Composite 1 afforded the best overall predictions, as shown in Figure 37, but Composite 2 best predicted attrition by AFQT groups. Composites 1 and 3 consistently underpredicted non-black attrition and overpredicted black attrition. Composite 2 accurately predicted black attrition rates and underpredicted non-black attrition. The presence of more black female accessions would result in lower attrition prediction scores for combinations of other variables since the overall black female attrition rate is thirty-five percent.<sup>5</sup> Composite 2 attrition prediction scores account for the difference in black and non-black attrition rates.

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<sup>5</sup>The overall non-black female attrition rate is fifty-one percent.

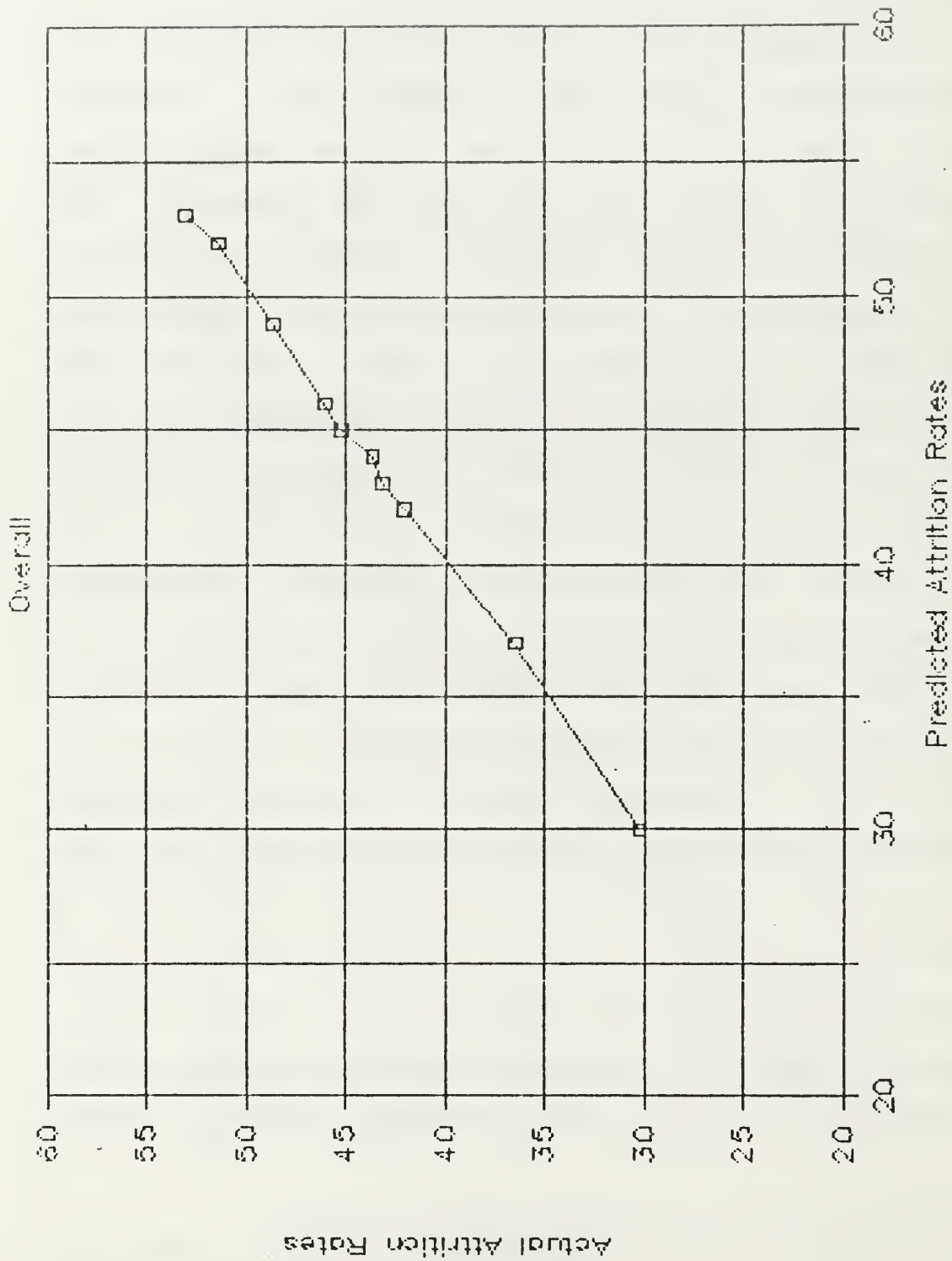


Figure 37. FEMALE ARMY ENLISTED PERSONNEL: RELATIONSHIP BETWEEN COMPOSITE 1 SCORES AND ACTUAL ATTRITION RATES FOR FY 1979 AND 1980 ACCESSIONS



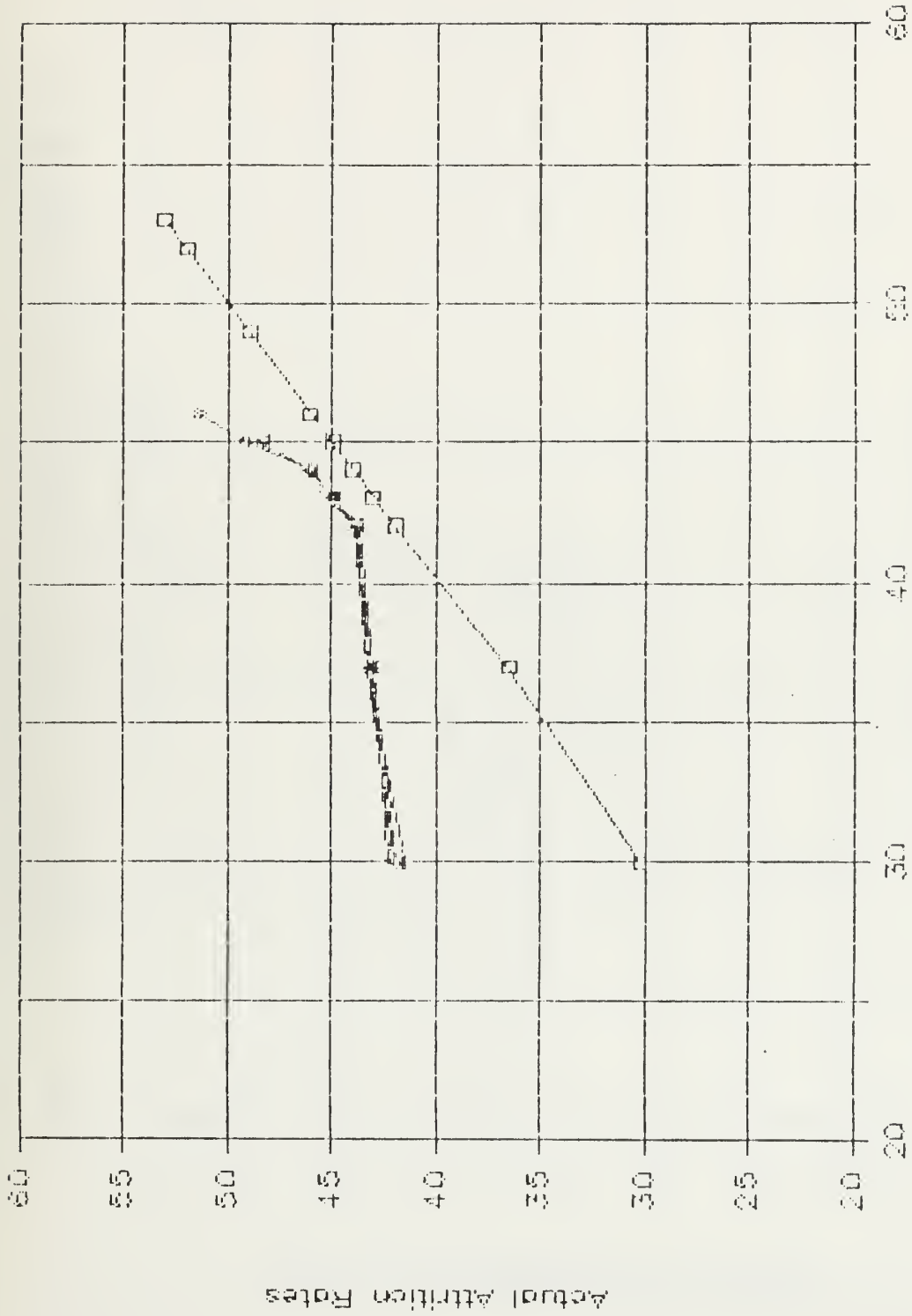


Figure 38. FEMALE ARMY ENLISTED PERSONNEL: RELATIONSHIP BETWEEN COMPOSITE I SCORES AND ACTUAL ATTRITION RATES BY AFQT CATEGORY FOR FY 1979 AND 1980 ACCESSIONS

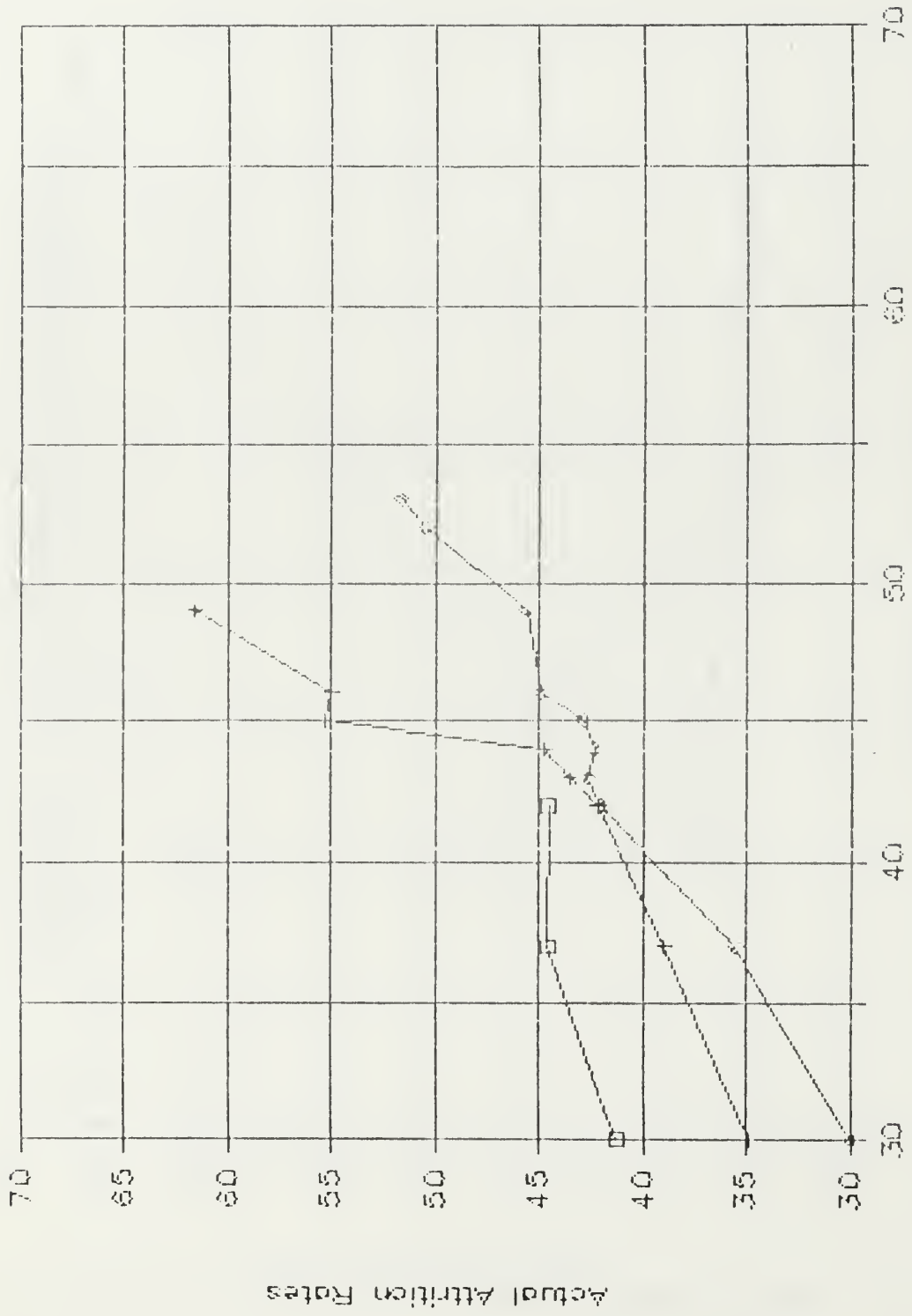


Figure 39. FEMALE ARMY ENLISTED PERSONNEL: RELATIONSHIP BETWEEN COMPOSITE I SCORES AND ACTUAL ATTRITION RATES BY AGE AT SERVICE ENTRY FOR FY 1979 AND 1980 ACCESSIONS

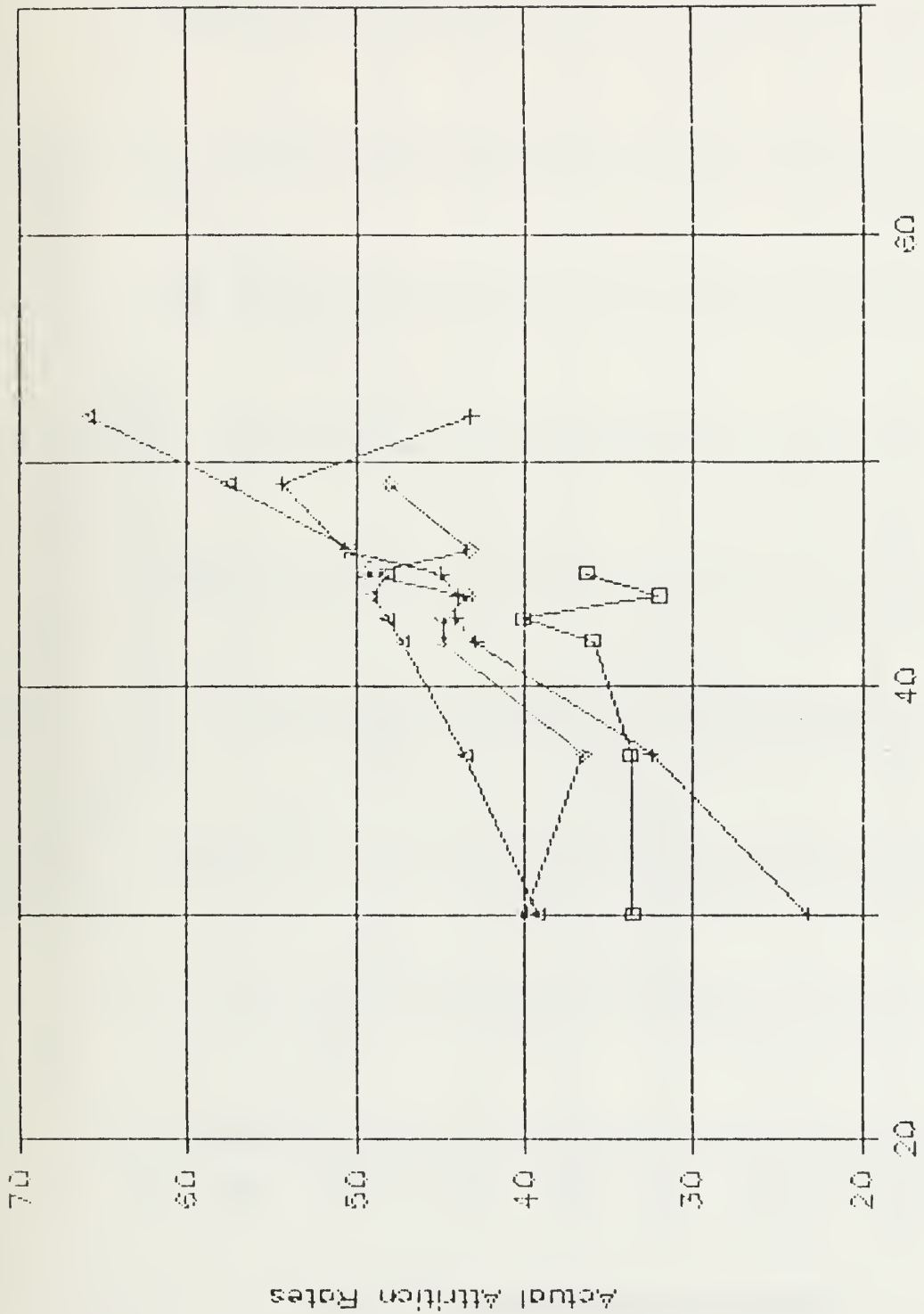


Figure 40. FEMALE ARMY ENLISTED PERSONNEL: RELATIONSHIP BETWEEN COMPOSITE I SCORES AND ACTUAL ATTRITION RATES BY GEOGRAPHIC ATTRITION CODE FOR FY 1979 AND 1980 ACCESSIONS

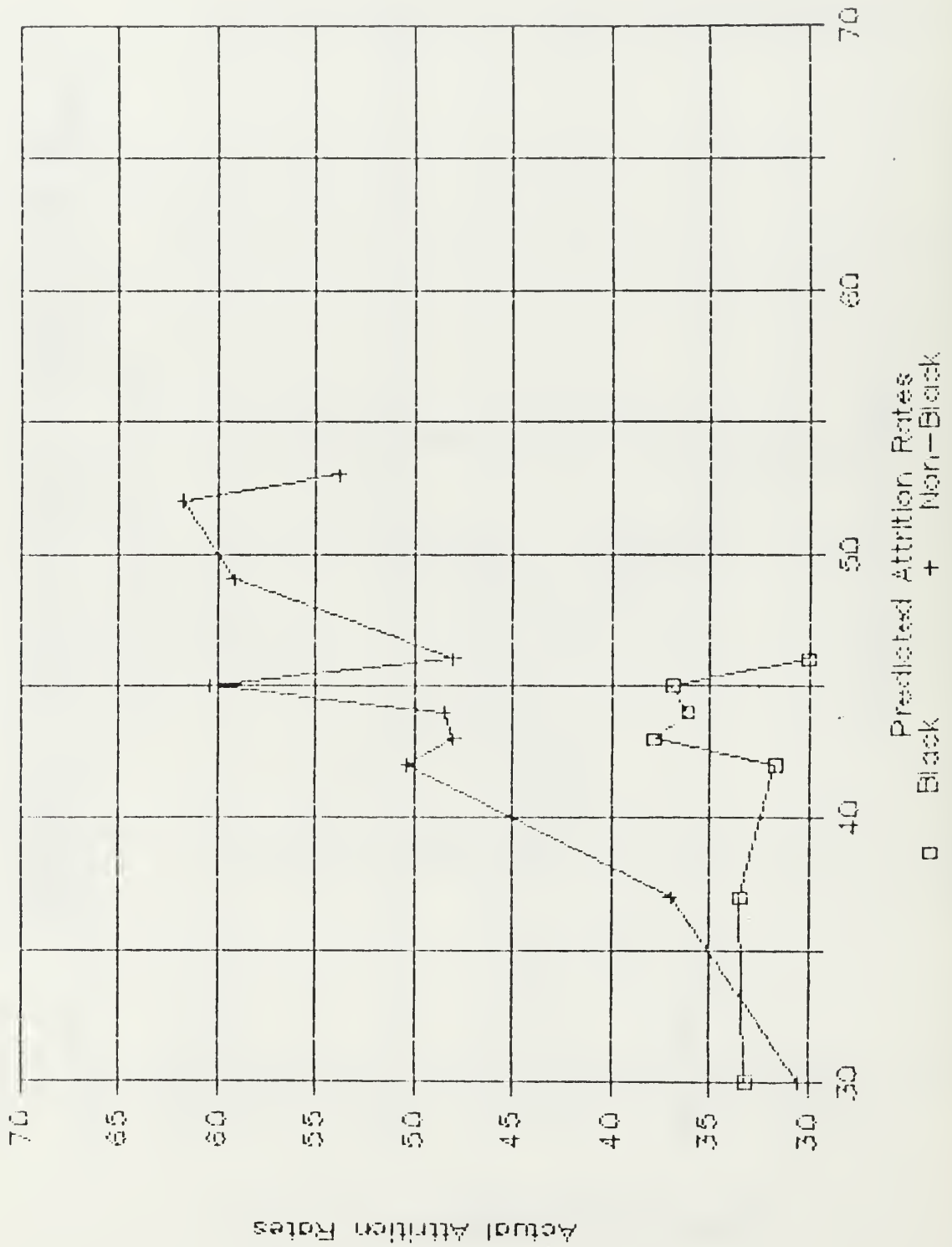


Figure 41. FEMALE ARMY ENLISTED PERSONNEL: RELATIONSHIP BETWEEN COMPOSITE I SCORES AND ACTUAL ATTRITION RATES BY RACE FOR FY 1979 AND 1980 ACCESSIONS

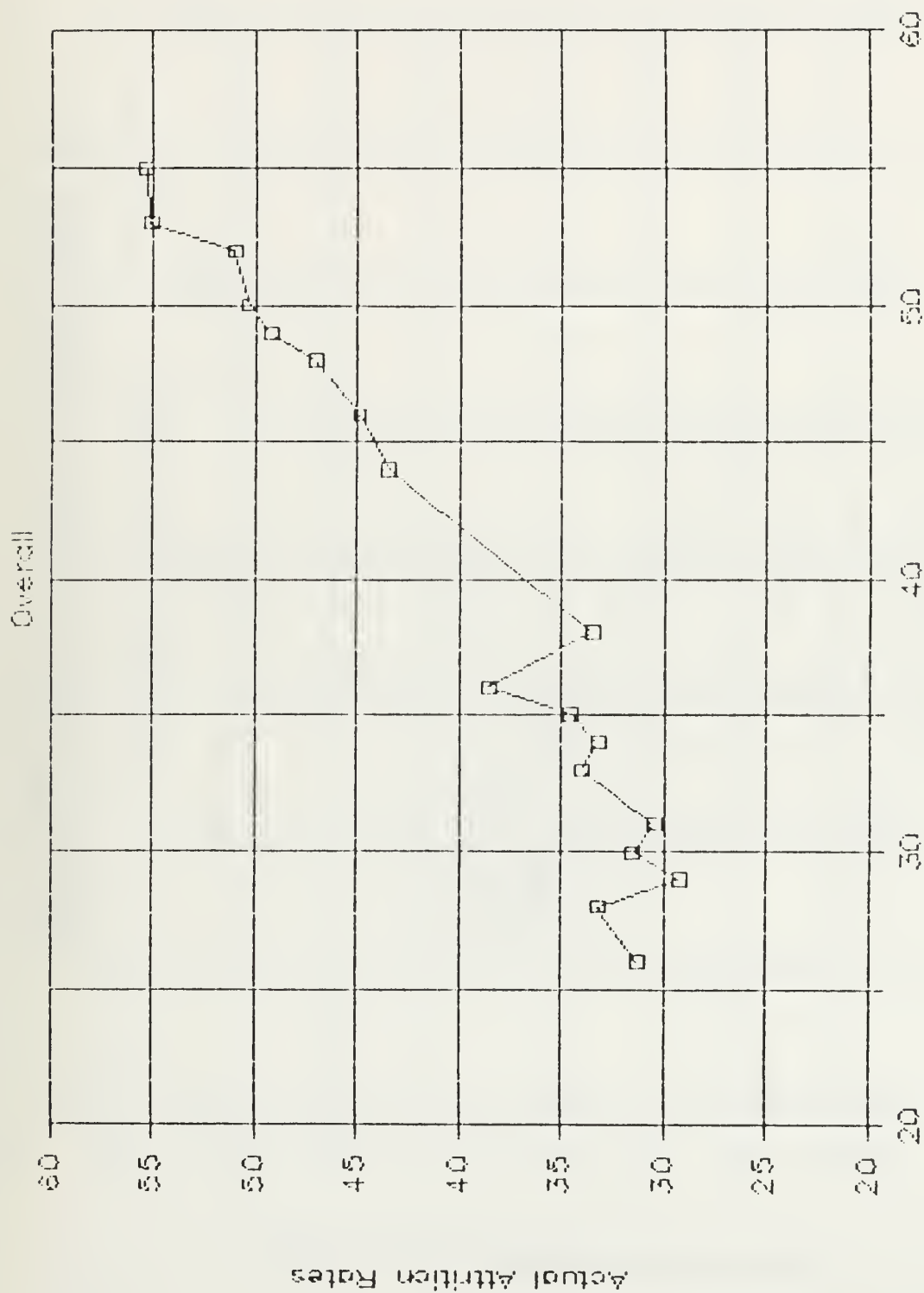


Figure 42. FEMALE ARMY ENLISTED PERSONNEL: RELATIONSHIP BETWEEN COMPOSITE 2 SCORES AND ACTUAL ATTRITION RATES FOR FY 1979 AND 1980 ACCESSIONS

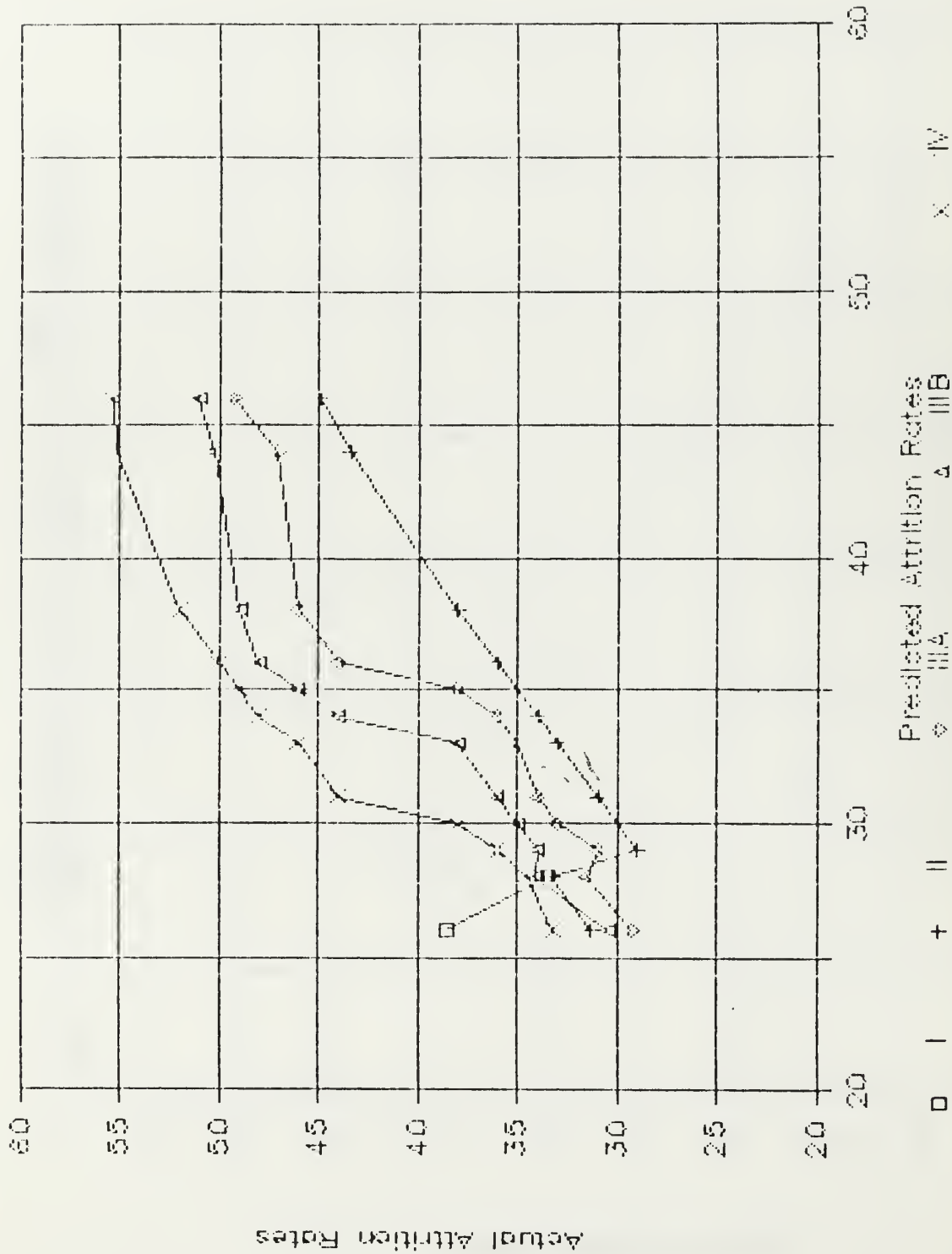


Figure 43. FEMALE ARMY ENLISTED PERSONNEL: RELATIONSHIP BETWEEN COMPOSITE 2 SCORES AND ACTUAL ATTRITION RATES BY AFQT CATEGORY FOR FY 1979 AND 1980 ACCESSIONS

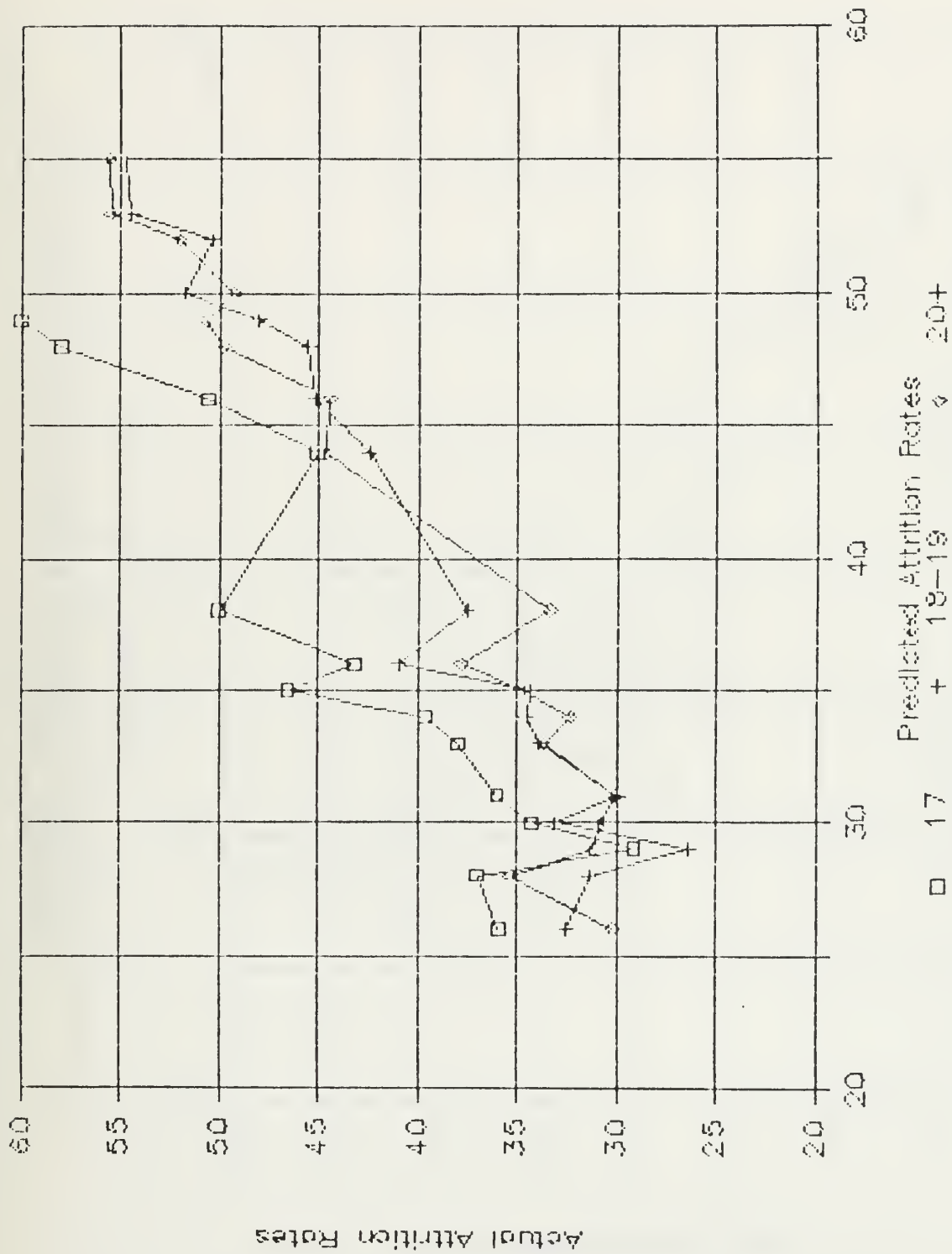


Figure 44. FEMALE ARMY ENLISTED PERSONNEL: RELATIONSHIP BETWEEN COMPOSITE 2 SCORES AND ACTUAL ATTRITION RATES BY AGE AT SERVICE ENTRY FOR FY 1979 AND 1980 ACCESSIONS

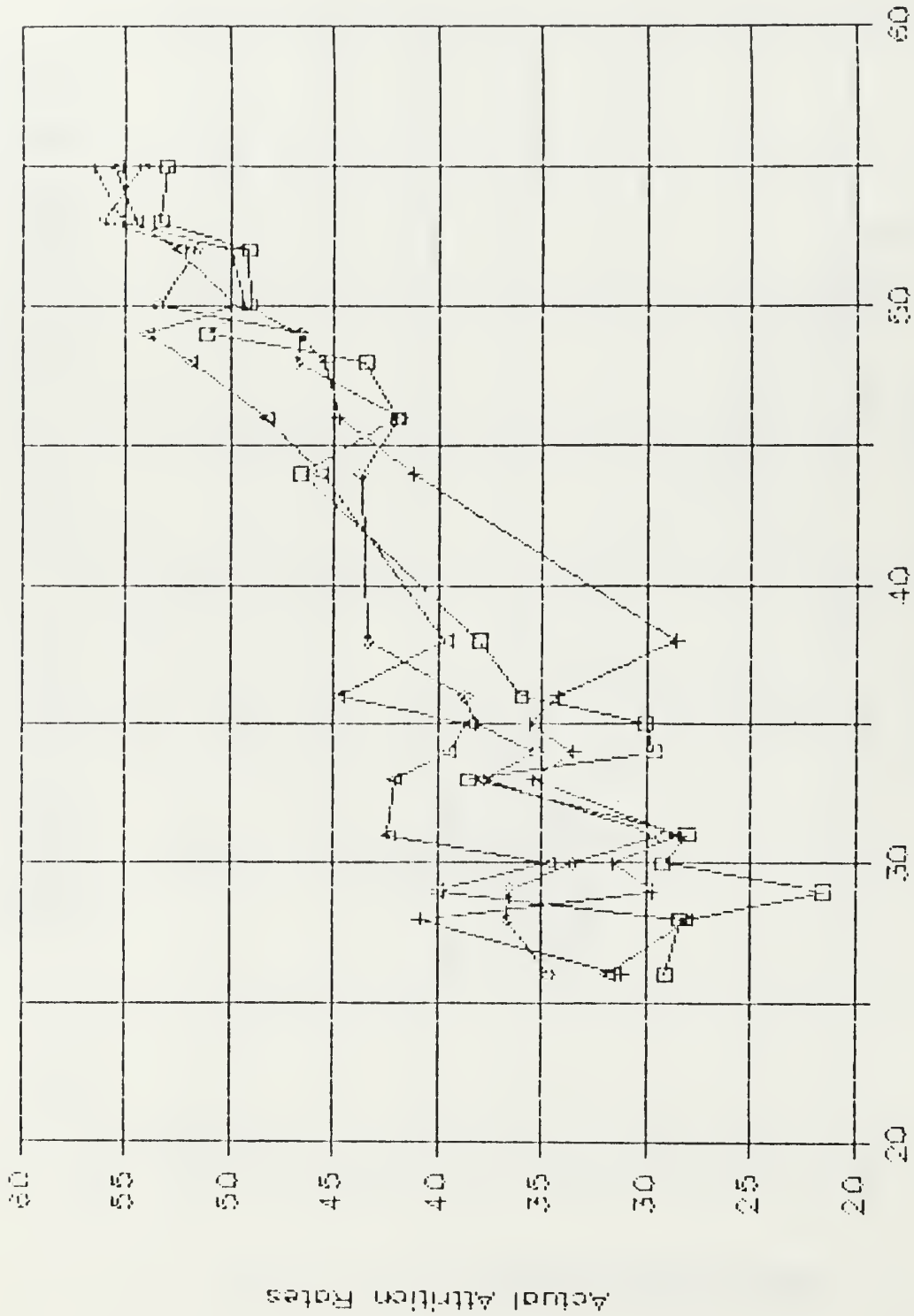


Figure 45. FEMALE ARMY ENLISTED PERSONNEL: RELATIONSHIP BETWEEN COMPOSITE 2 SCORES AND ACTUAL ATTRITION RATES BY GEOGRAPHIC ATTRITION CODE FOR FY 1979 AND 1980 ACCESSIONS



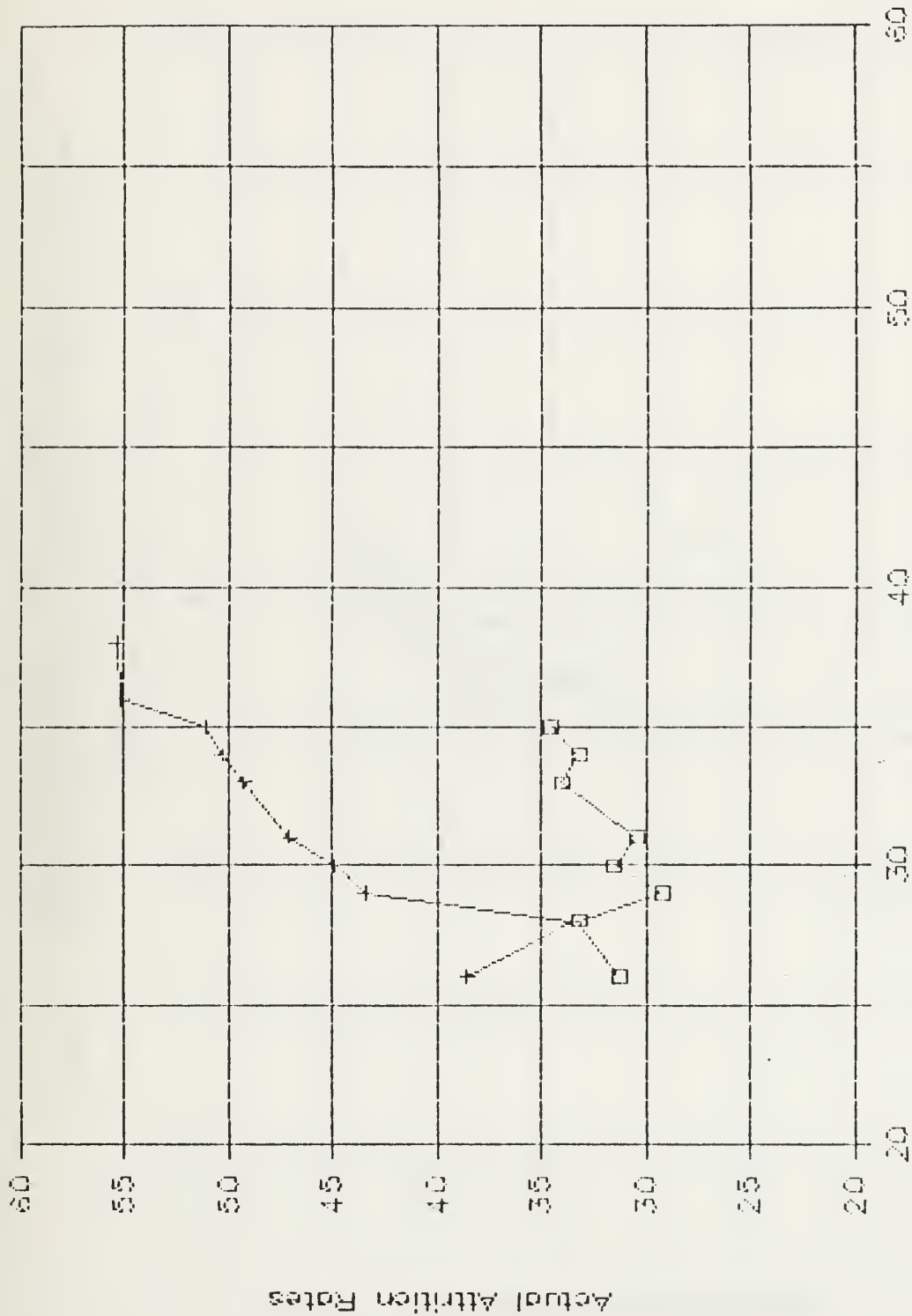


Figure 46. FEMALE ARMY ENLISTED PERSONNEL: RELATIONSHIP BETWEEN COMPOSITE 2 SCORES AND ACTUAL ATTRITION RATES BY RACE FOR FY 1979 AND 1980 ACCESSIONS

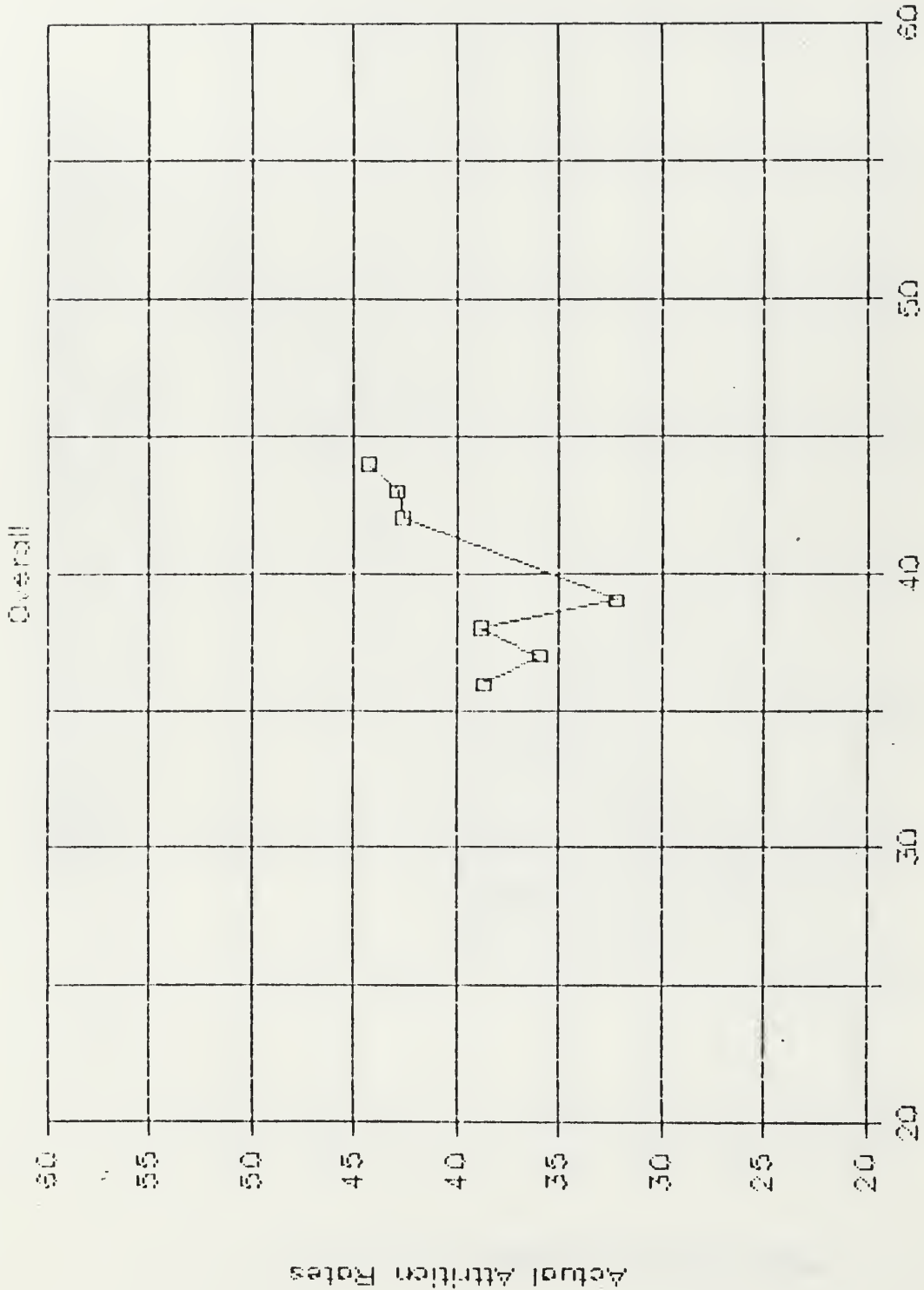


Figure 47. FEMALE ARMY ENLISTED PERSONNEL: RELATIONSHIP BETWEEN COMPOSITE 3 SCORES AND ACTUAL ATTRITION RATES FOR FY 1979 AND 1980 ACCESSIONS

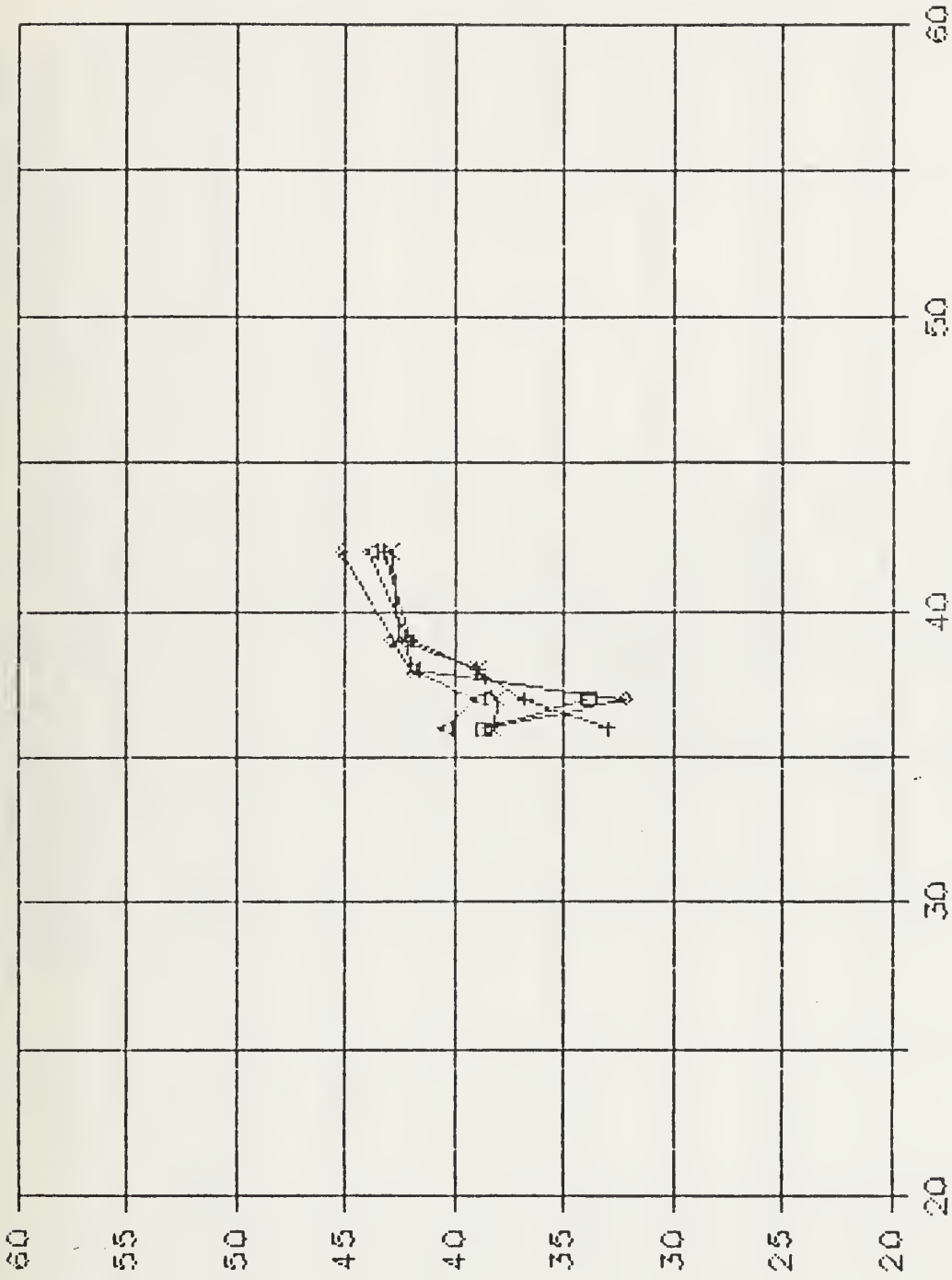


Figure 48. FEMALE ARMY ENLISTED PERSONNEL: RELATIONSHIP BETWEEN PREDICTED ATTRITION RATES AND ACTUAL ATTRITION RATES BY AFQT CATEGORY FOR FY 1979 AND 1980 ACCESSIONS

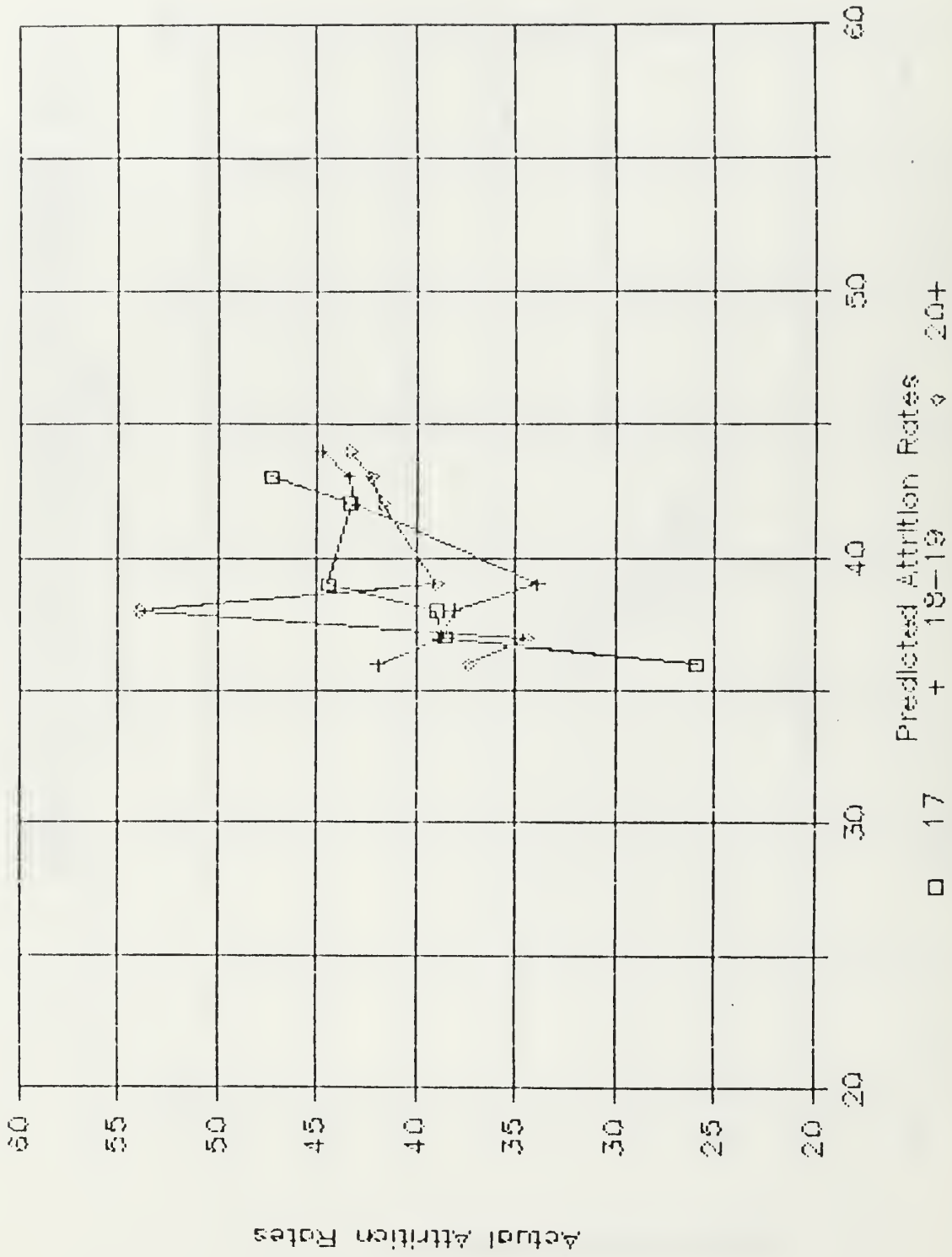


Figure 49. FEMALE ARMY ENLISTED PERSONNEL: RELATIONSHIP BETWEEN COMPOSITE 3 SCORES AND ACTUAL ATTRITION RATES BY AGE AT SERVICE ENTRY FOR FY 1979 AND 1980 ACCESSIONS

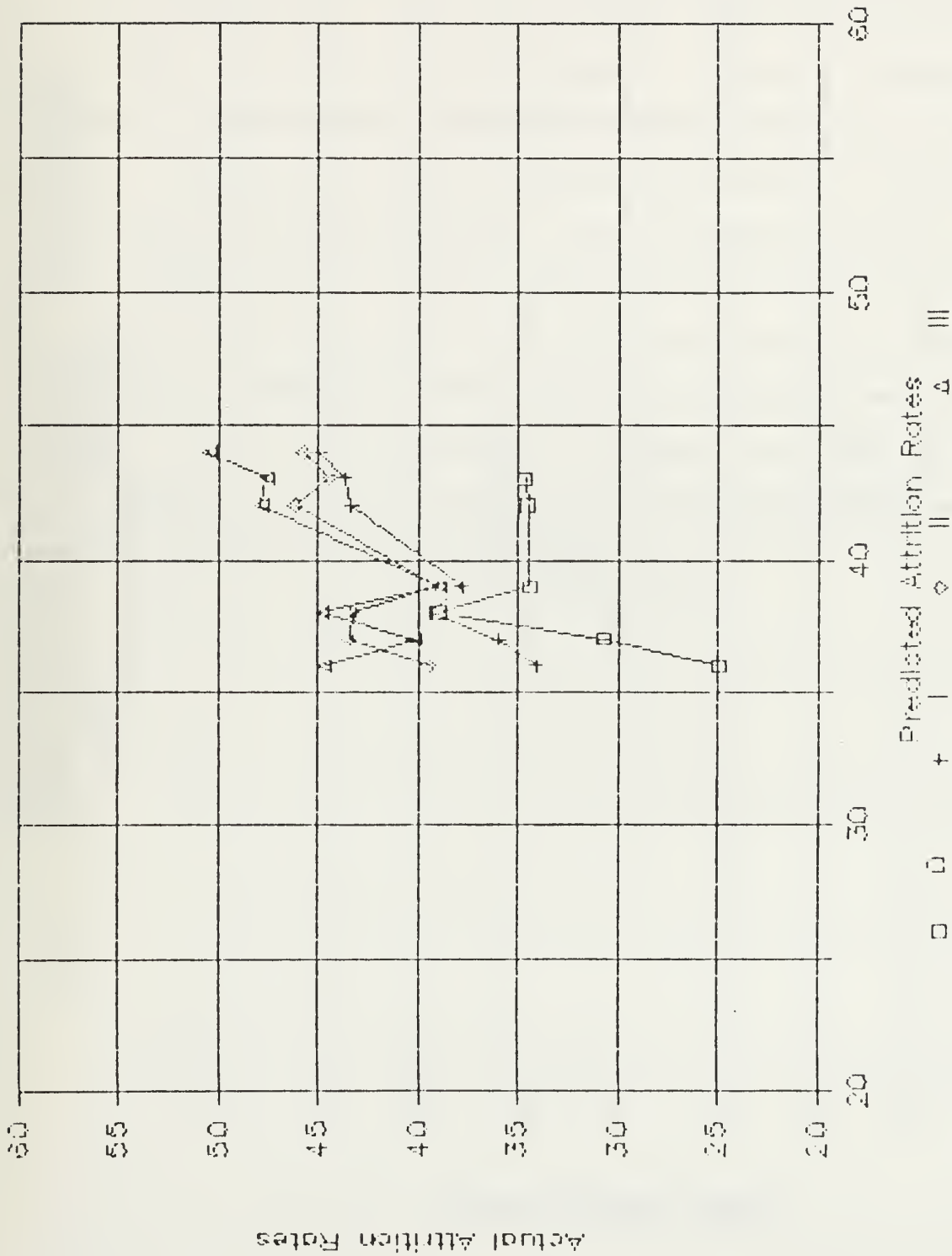


Figure 50. FEMALE ARMY ENLISTED PERSONNEL: RELATIONSHIP BETWEEN COMPOSITE 3 SCORES AND ACTUAL ATTRITION RATES BY GEOGRAPHIC ATTRITION CODE FOR FY 1979 AND 1980 ACCESSIONS

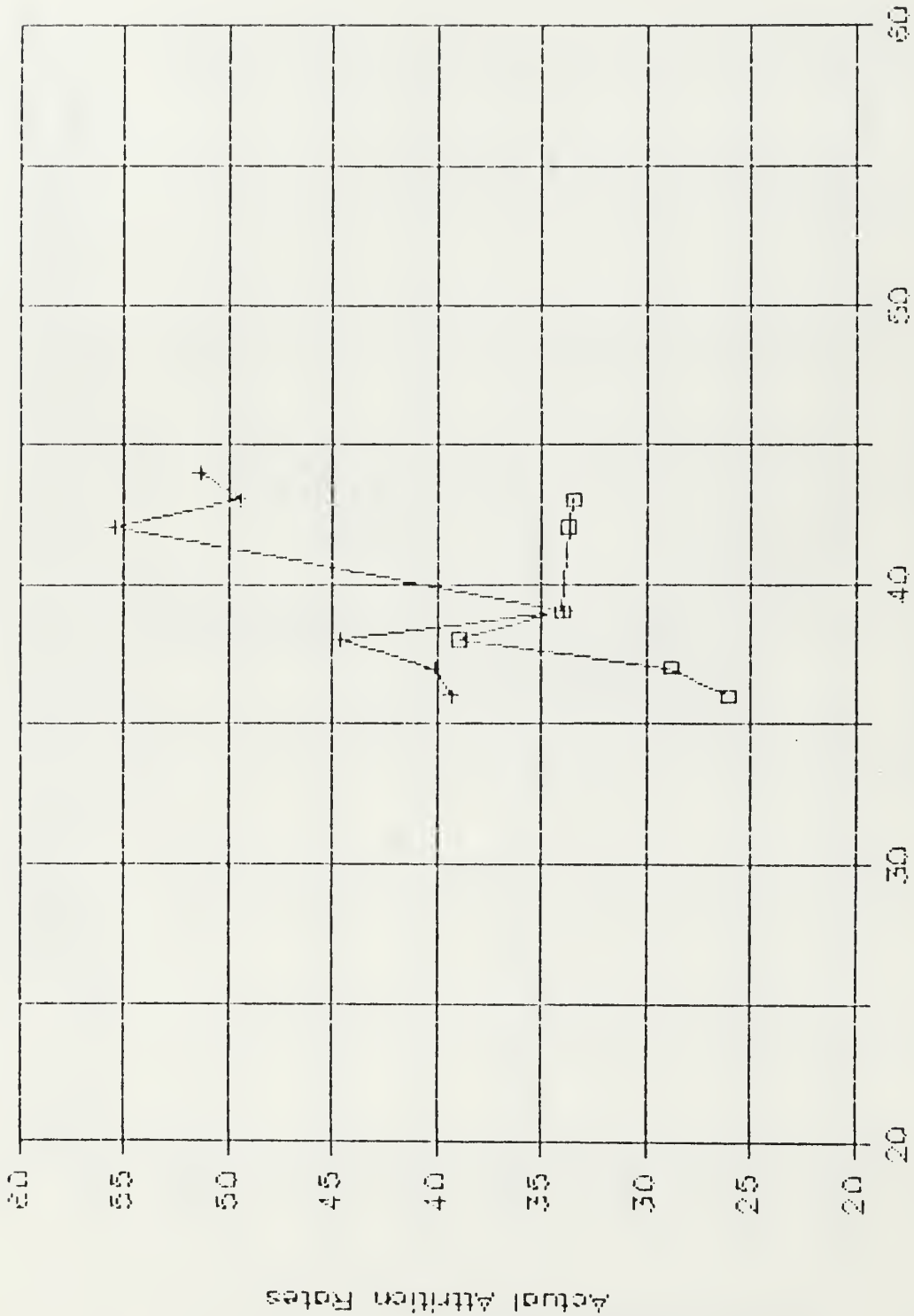


Figure 51. FEMALE ARMY ENLISTED PERSONNEL: RELATIONSHIP BETWEEN COMPOSITE 3 SCORES AND ACTUAL ATTRITION RATES BY RACE FOR FY 1979 AND 1980 ACCESSIONS

However, the effect of race was dampened by its interaction with AFQT category.

The graphical analyses of the cross-validation sample indicated that Composite 2 was most stable overall and performed equally well or better for the subgroups. Figures 52 through 66 illustrate the predictive stability in cross-validation of each composite. Composite 3 (Figures 62 through 66) showed considerable irregularity in cross-validation. This composite proved to be inferior in both estimation and cross-validation sample analyses. One explanation for this may be that only nine attrition prediction scores were generated for this model with a resultant restriction of range. Generally, Composite 2 displayed the best subgroup analysis results as well as providing the widest range of screening scores and predictive stability.

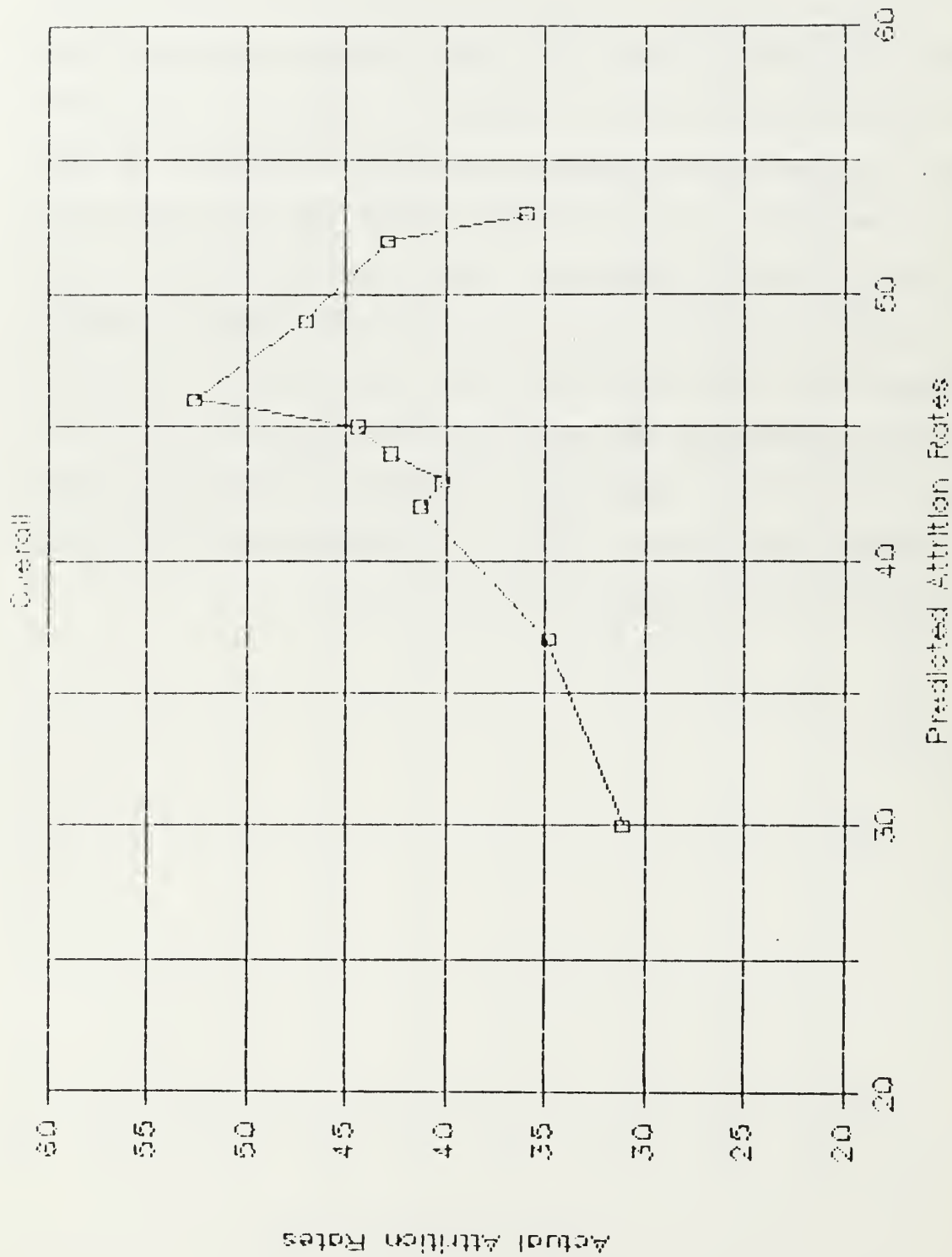


Figure 52. FEMALE ARMY ENLISTED PERSONNEL: RELATIONSHIP BETWEEN COMPOSITE 1 SCORES AND ACTUAL ATTRITION RATES FOR FY 1981 AND 1982 ACCESSIONS



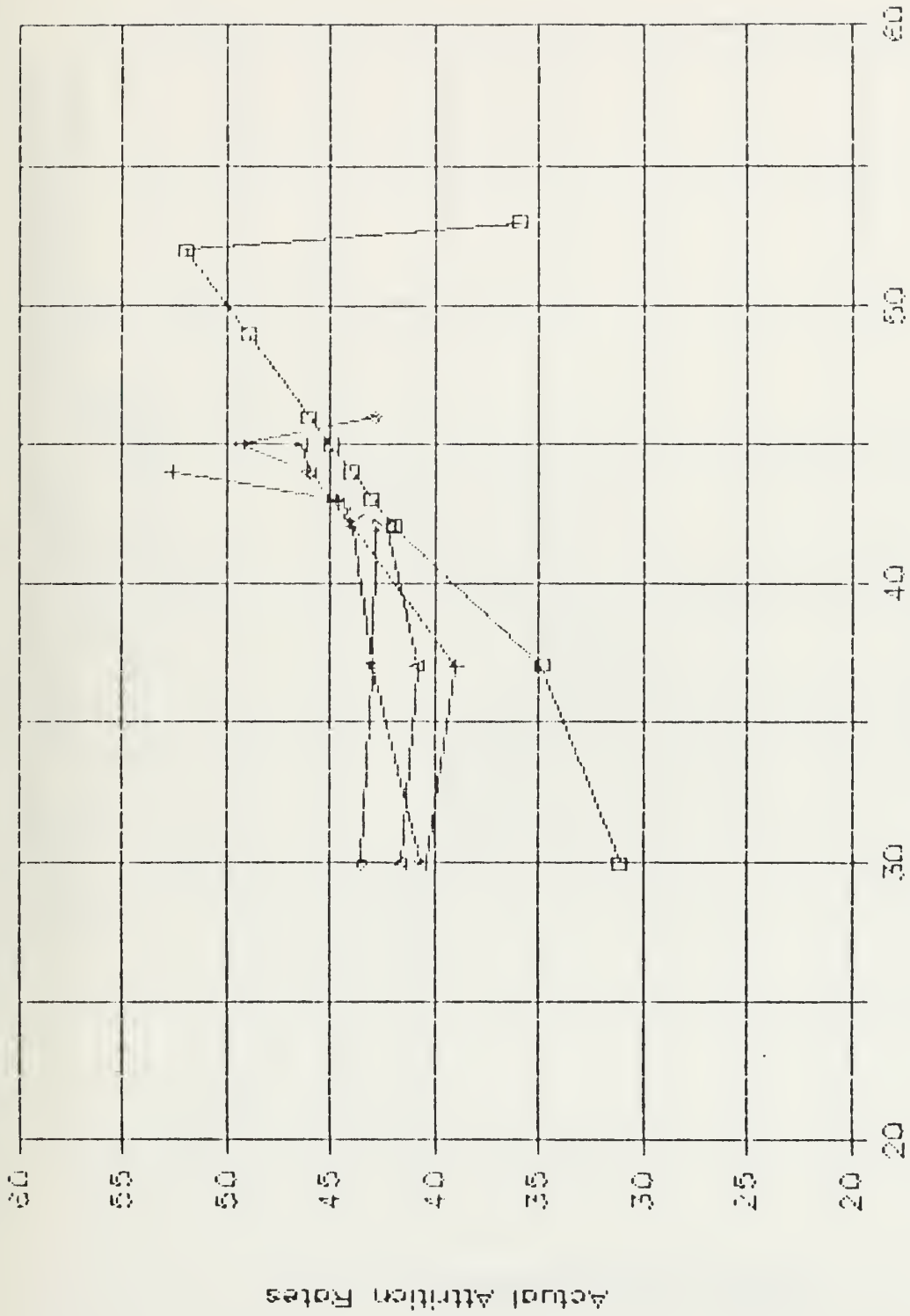


Figure 53. FEMALE ARMY ENLISTED PERSONNEL: RELATIONSHIP BETWEEN COMPOSITE I SCORES AND ACTUAL ATTRITION RATES BY AFOT CATEGORY FOR FY 1981 AND 1982 ACCESSIONS

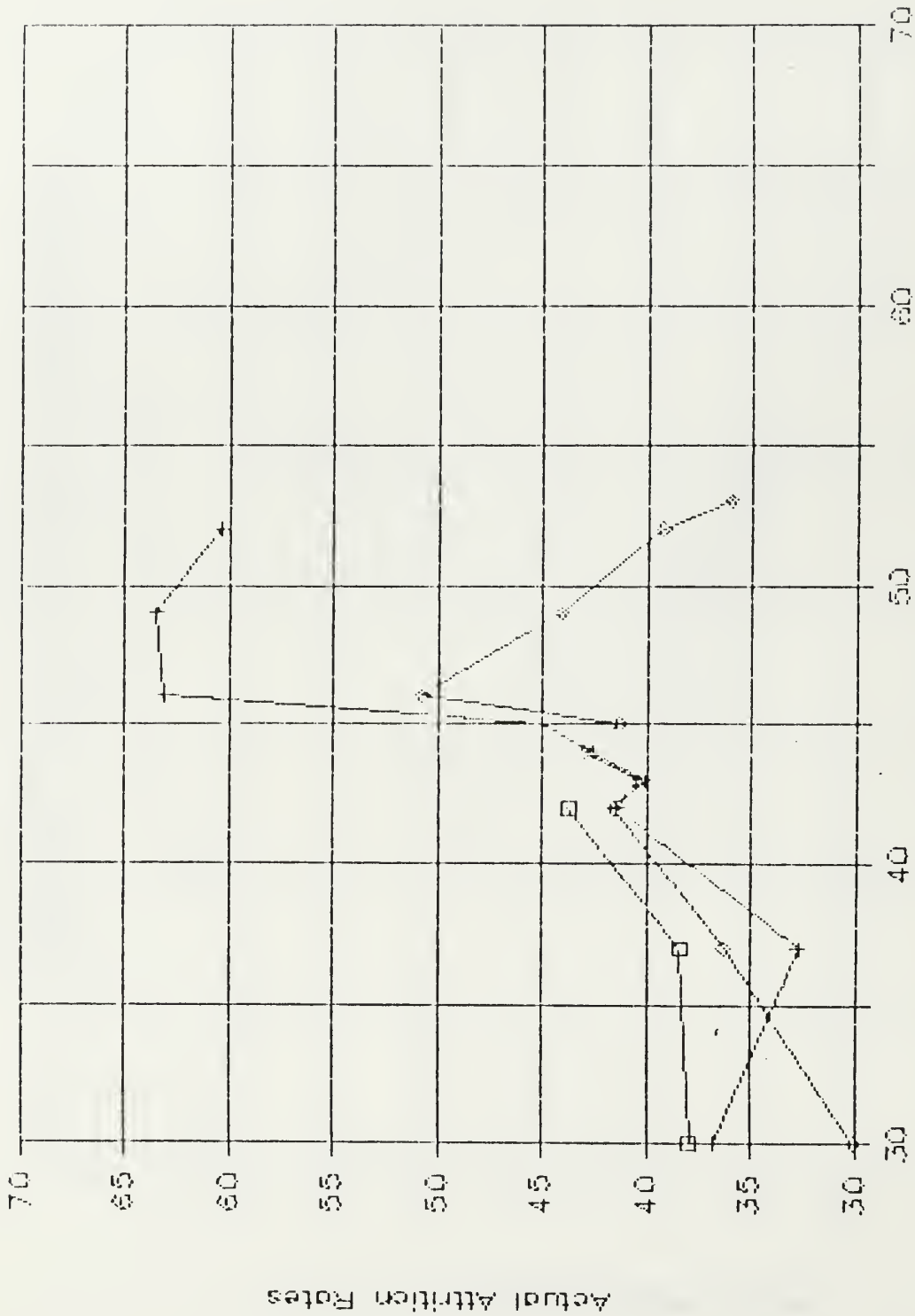


Figure 54. FEMALE ARMY ENLISTED PERSONNEL: RELATIONSHIP BETWEEN COMPOSITE I SCORES AND ACTUAL ATTRITION RATES BY AGE AT SERVICE ENTRY FOR FY 1981 AND 1982 ACCESSIONS

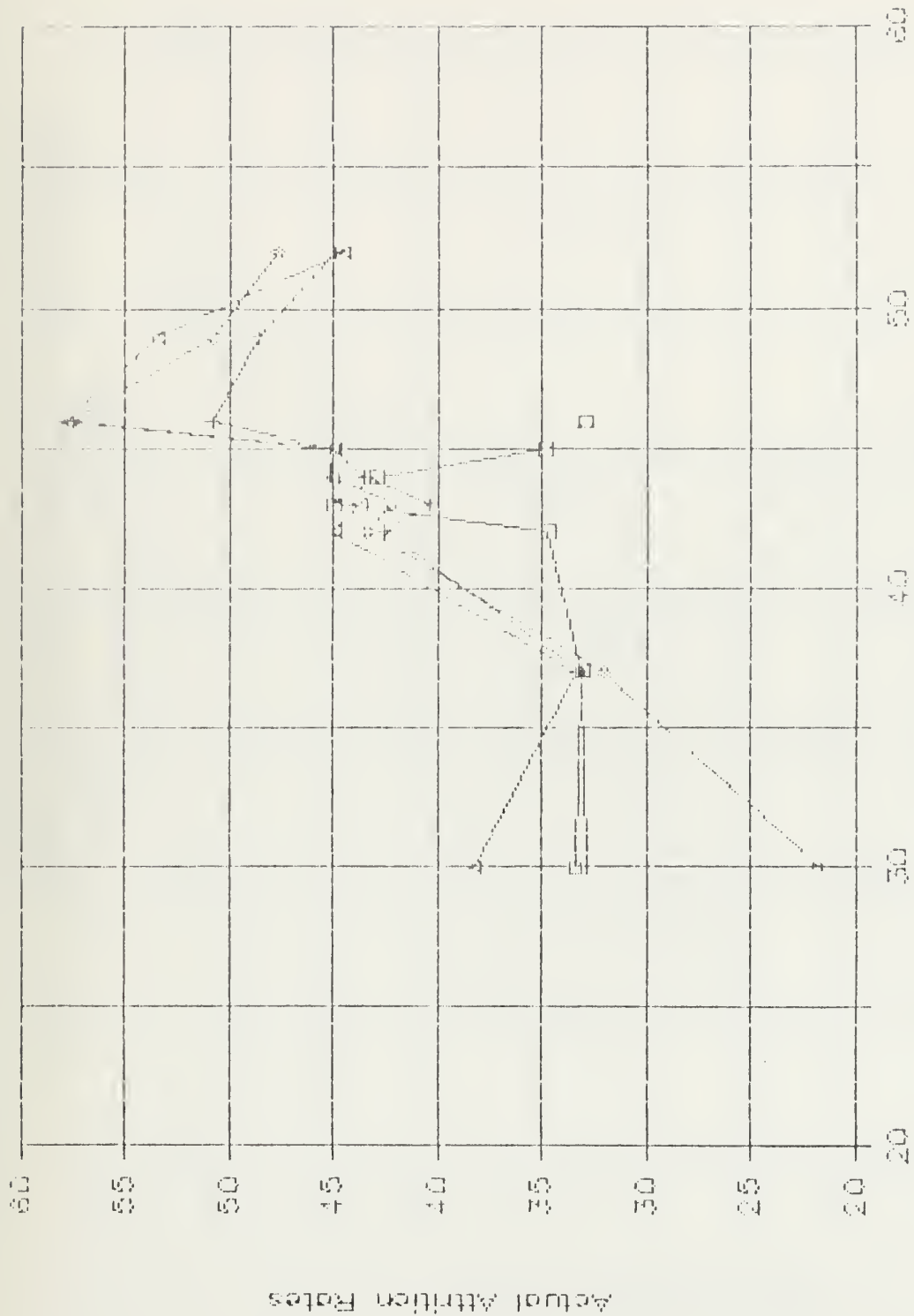


Figure 55. FEMALE ARMY ENLISTED PERSONNEL: RELATIONSHIP BETWEEN COMPOSITE I SCORES AND ACTUAL ATTRITION RATES BY GEOGRAPHIC ATTRITION CODE FOR FY 1981 AND 1982 ACCESSIONS

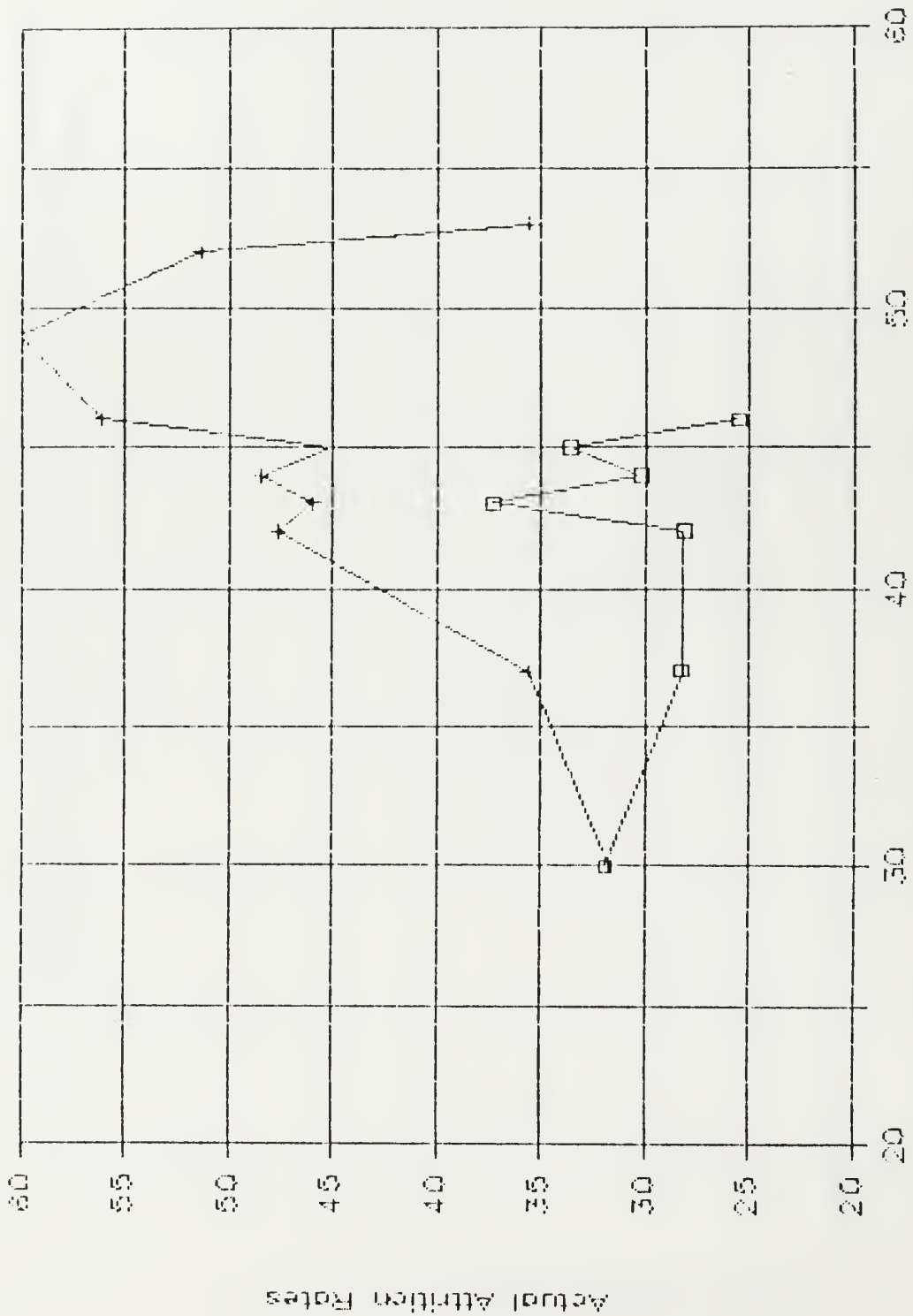


Figure 56. FEMALE ARMY ENLISTED PERSONNEL: RELATIONSHIP BETWEEN COMPOSITE I SCORES AND ACTUAL ATTRITION RATES BY RACE FOR FY 1981 AND 1982 ACCESSIONS

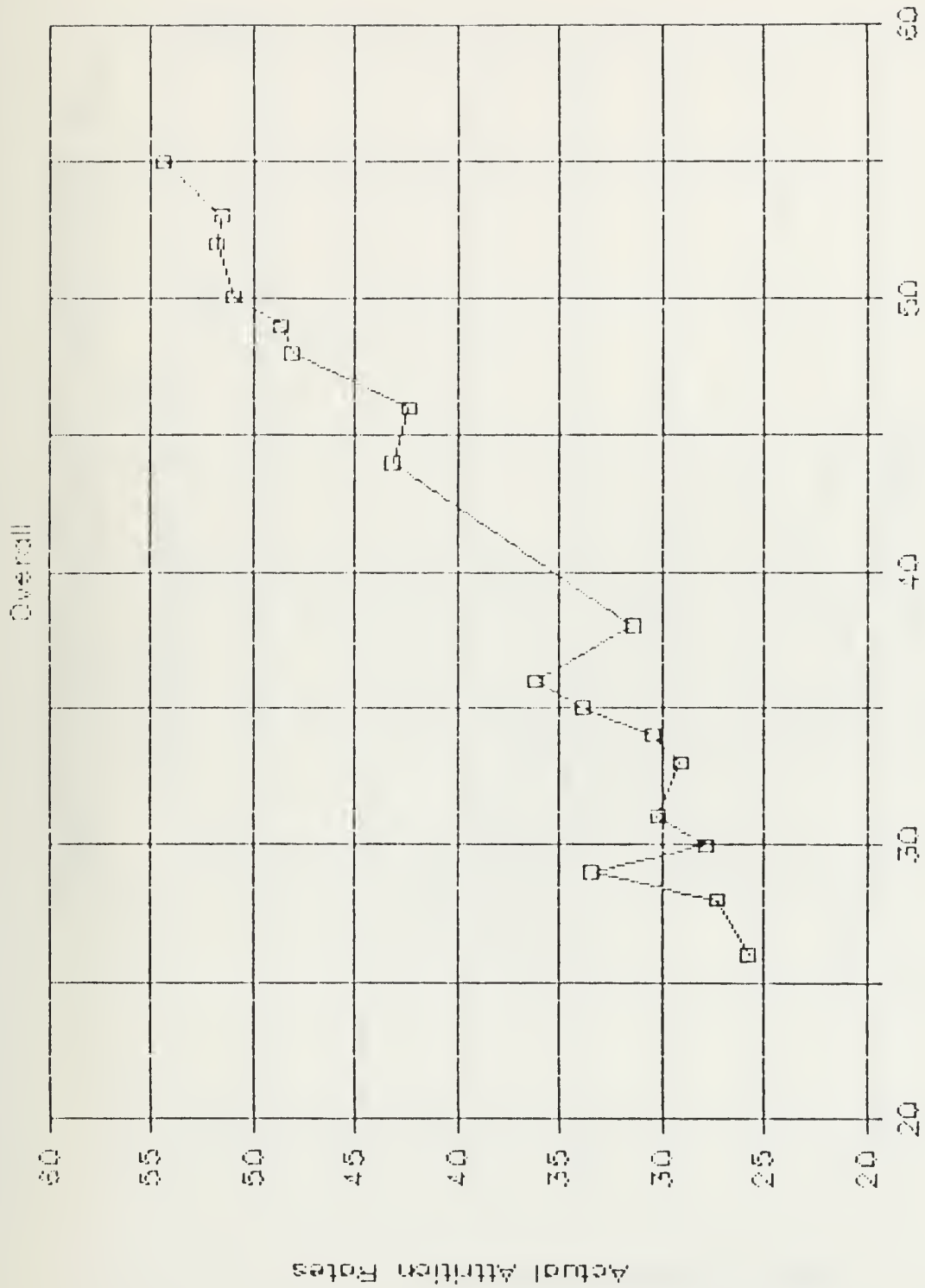


Figure 57. FEMALE ARMY ENLISTED PERSONNEL: RELATIONSHIP BETWEEN COMPOSITE 2 SCORES AND ACTUAL ATTRITION RATES FOR FY 1981 AND 1982 ACCESSIONS

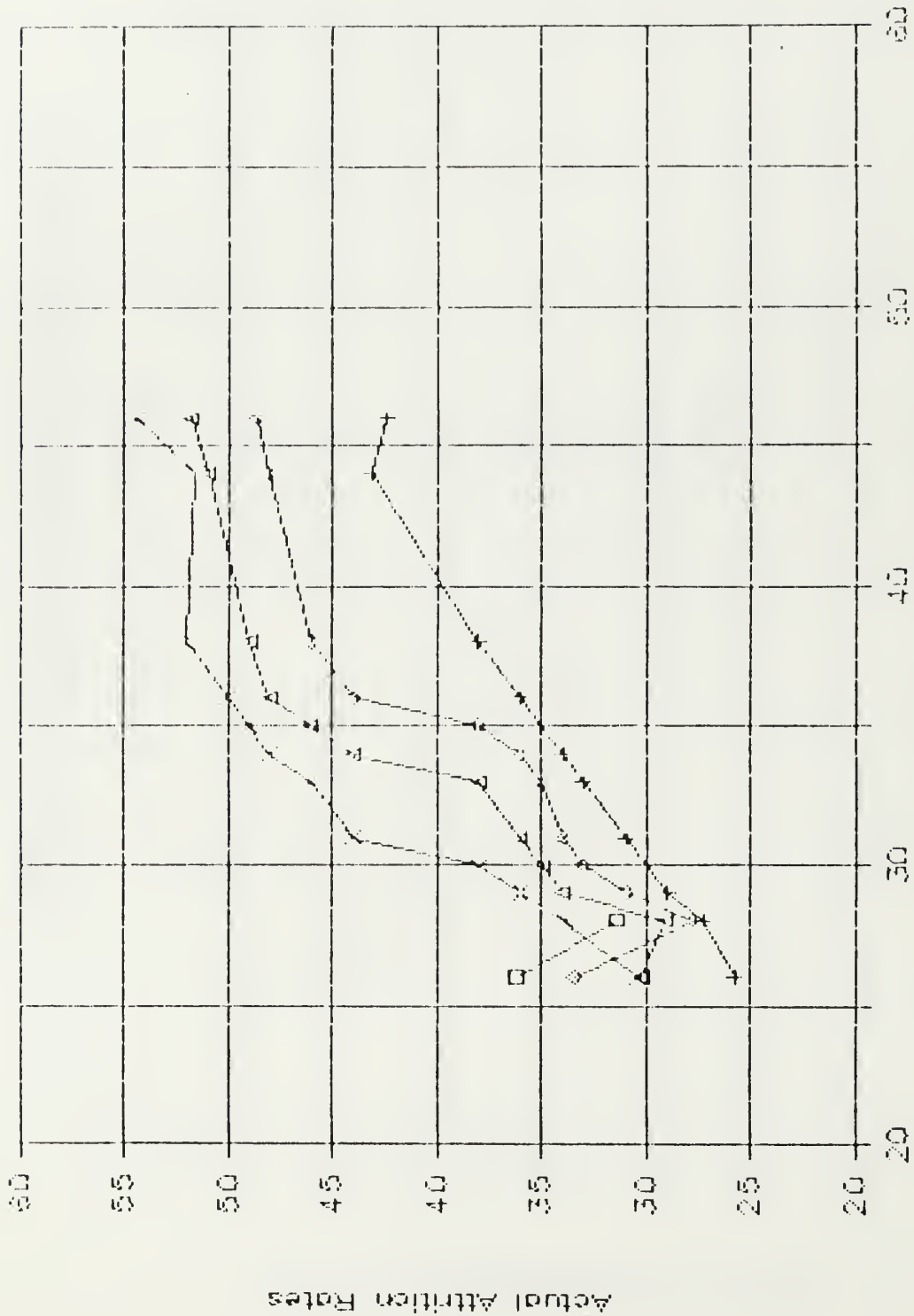


Figure 58. FEMALE ARMY ENLISTED PERSONNEL: RELATIONSHIP BETWEEN COMPOSITE 2 SCORES AND ACTUAL ATTRITION RATES BY AFQT CATEGORY FOR FY 1981 AND 1982 ACCESSIONS

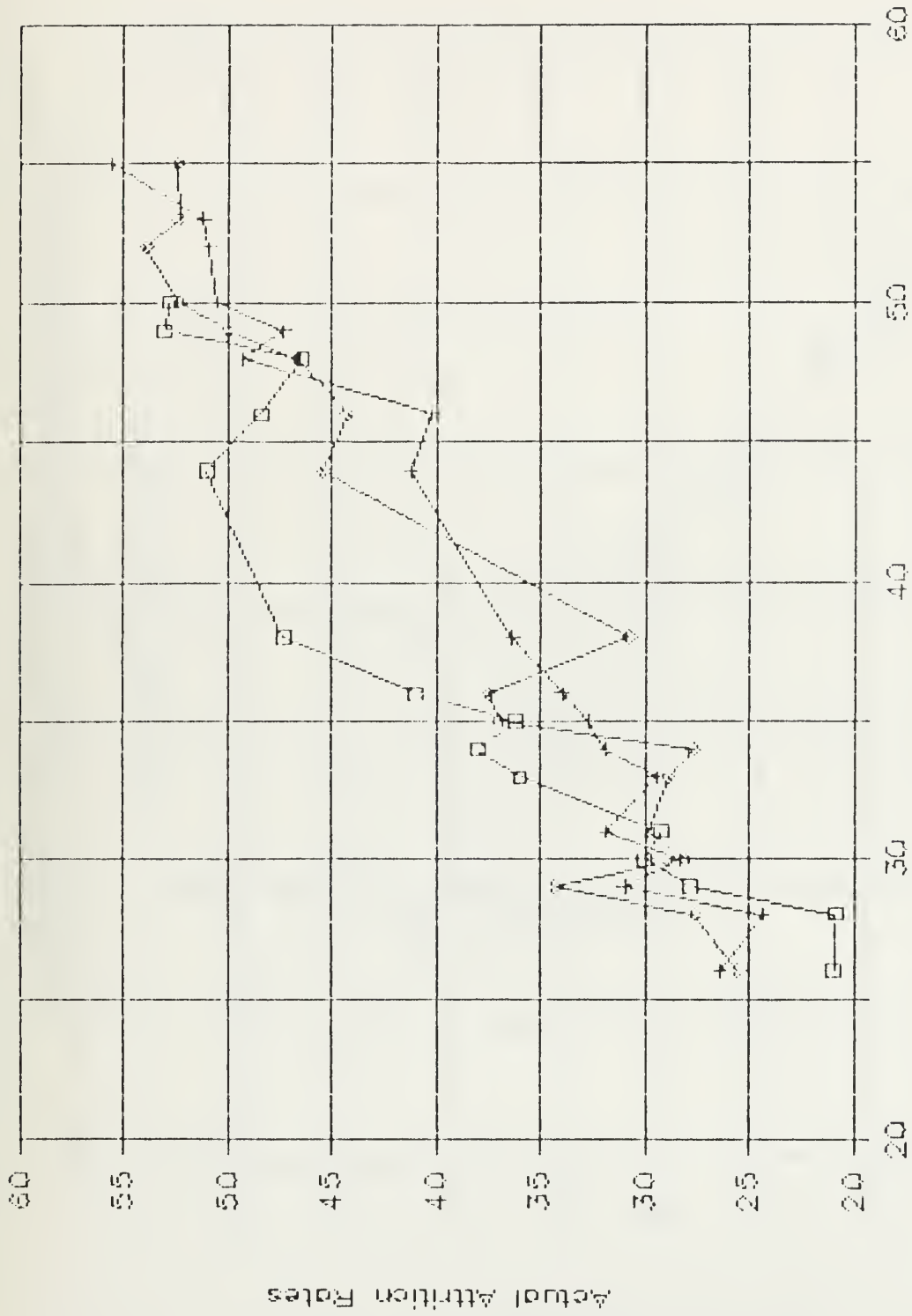


Figure 59. FEMALE ARMY ENLISTED PERSONNEL: RELATIONSHIP BETWEEN COMPOSITE 2 SCORES AND ACTUAL ATTRITION RATES BY AGE AT SERVICE ENTRY FOR FY 1981 AND 1982 ACCESSIONS

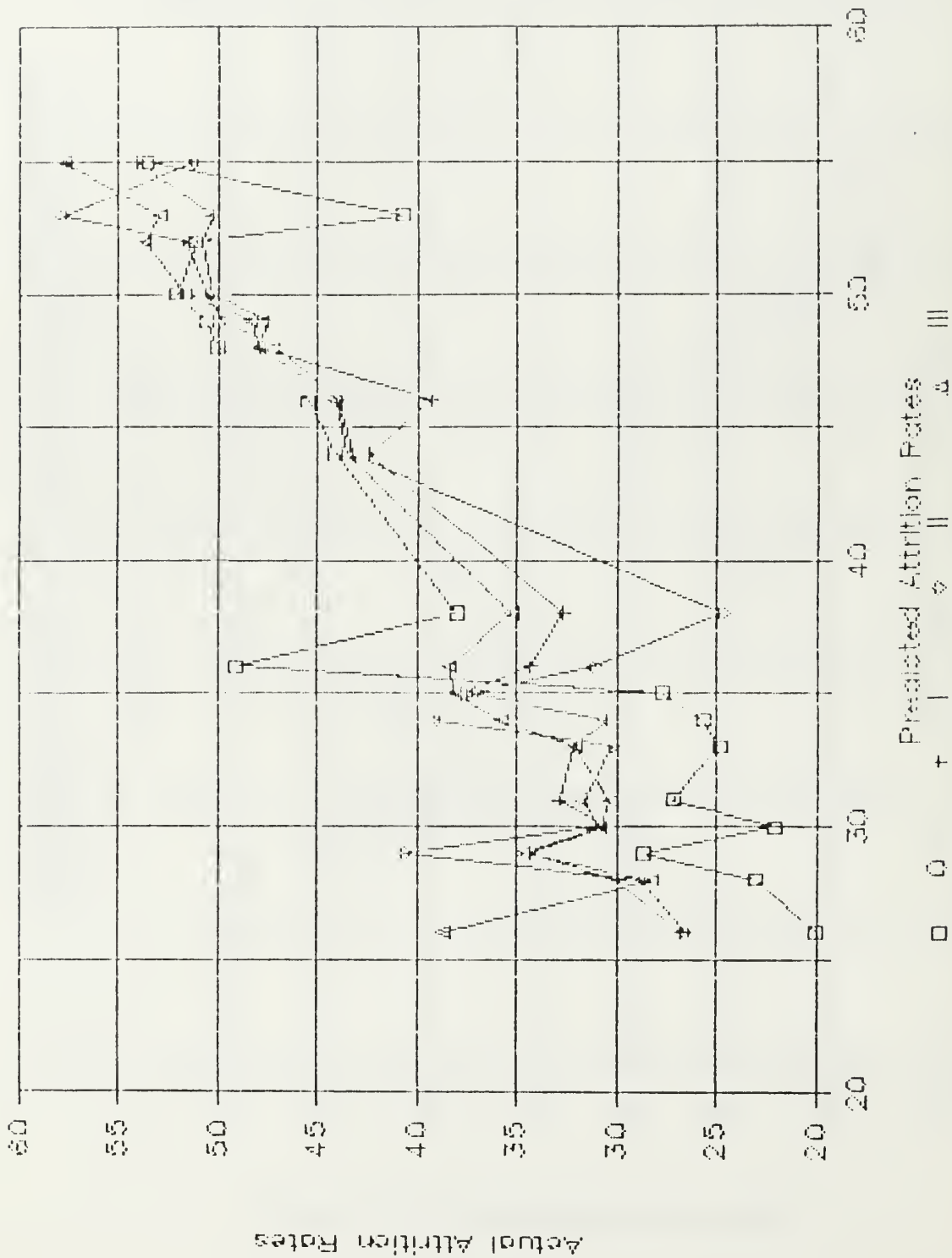


Figure 60. FEMALE ARMY ENLISTED PERSONNEL: RELATIONSHIP BETWEEN COMPOSITE 2 SCORES AND ACTUAL ATTRITION RATES BY GEOGRAPHIC ATTRITION CODE FOR FY 1981 AND 1982 ACCESSIONS



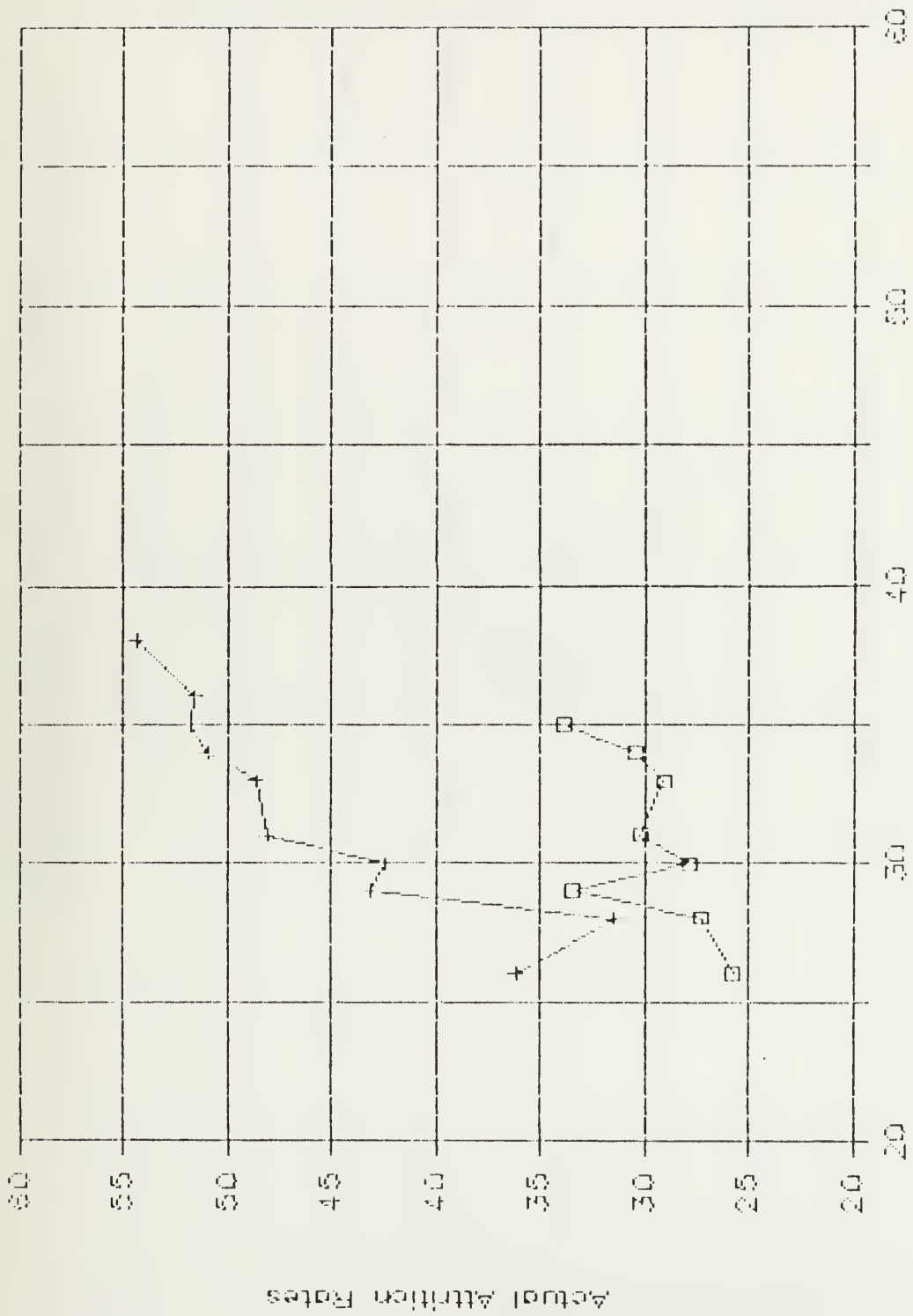


Figure 61. FEMALE ARMY ENLISTED PERSONNEL: RELATIONSHIP BETWEEN COMPOSITE 2 SCORES AND ACTUAL ATTRITION RATES BY RACE FOR FY 1981 AND 1982 ACCESSIONS

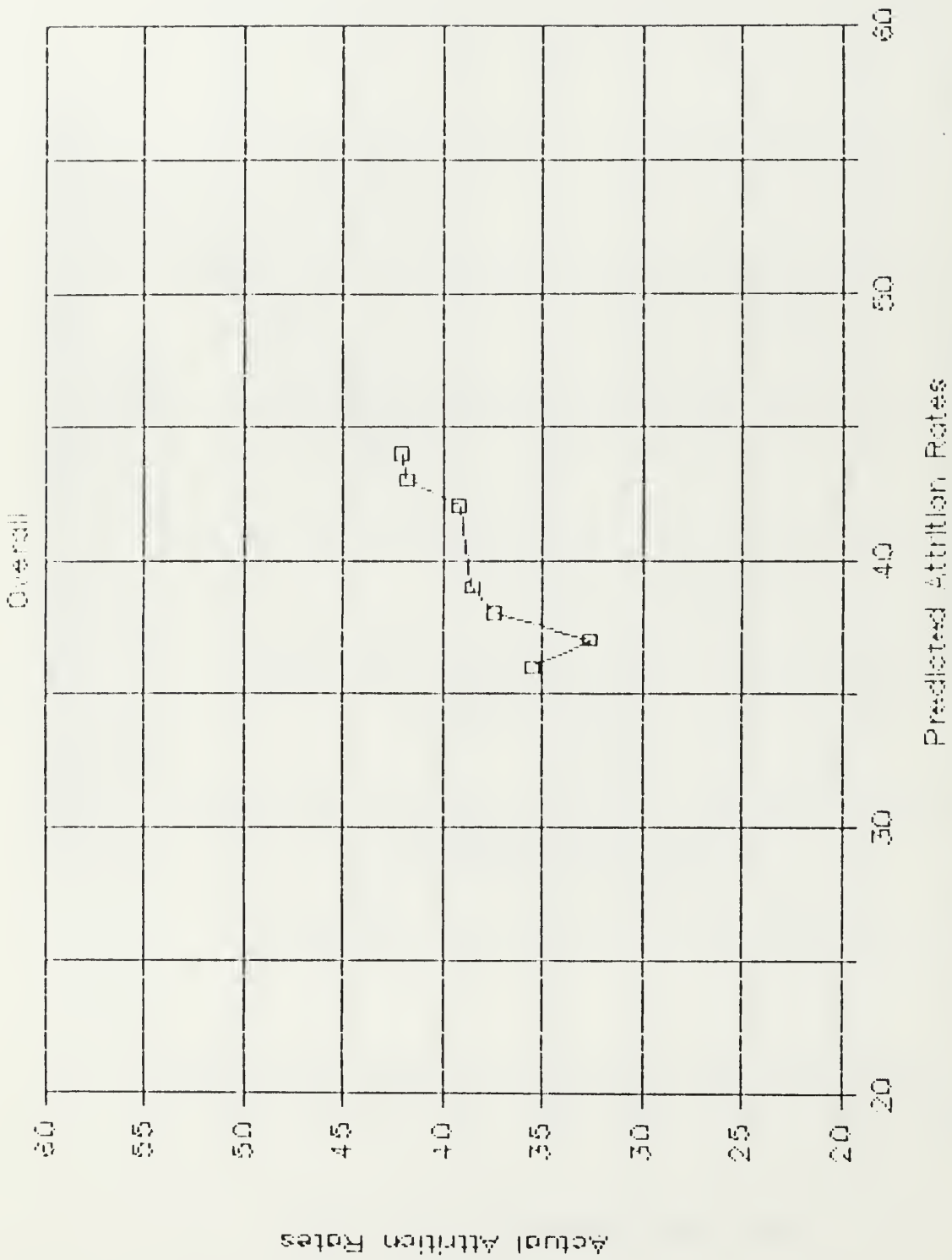


Figure 62. FEMALE ARMY ENLISTED PERSONNEL: RELATIONSHIP BETWEEN COMPOSITE 3 SCORES AND ACTUAL ATTRITION RATES FOR FY 1981 AND 1982 ACCESSIONS

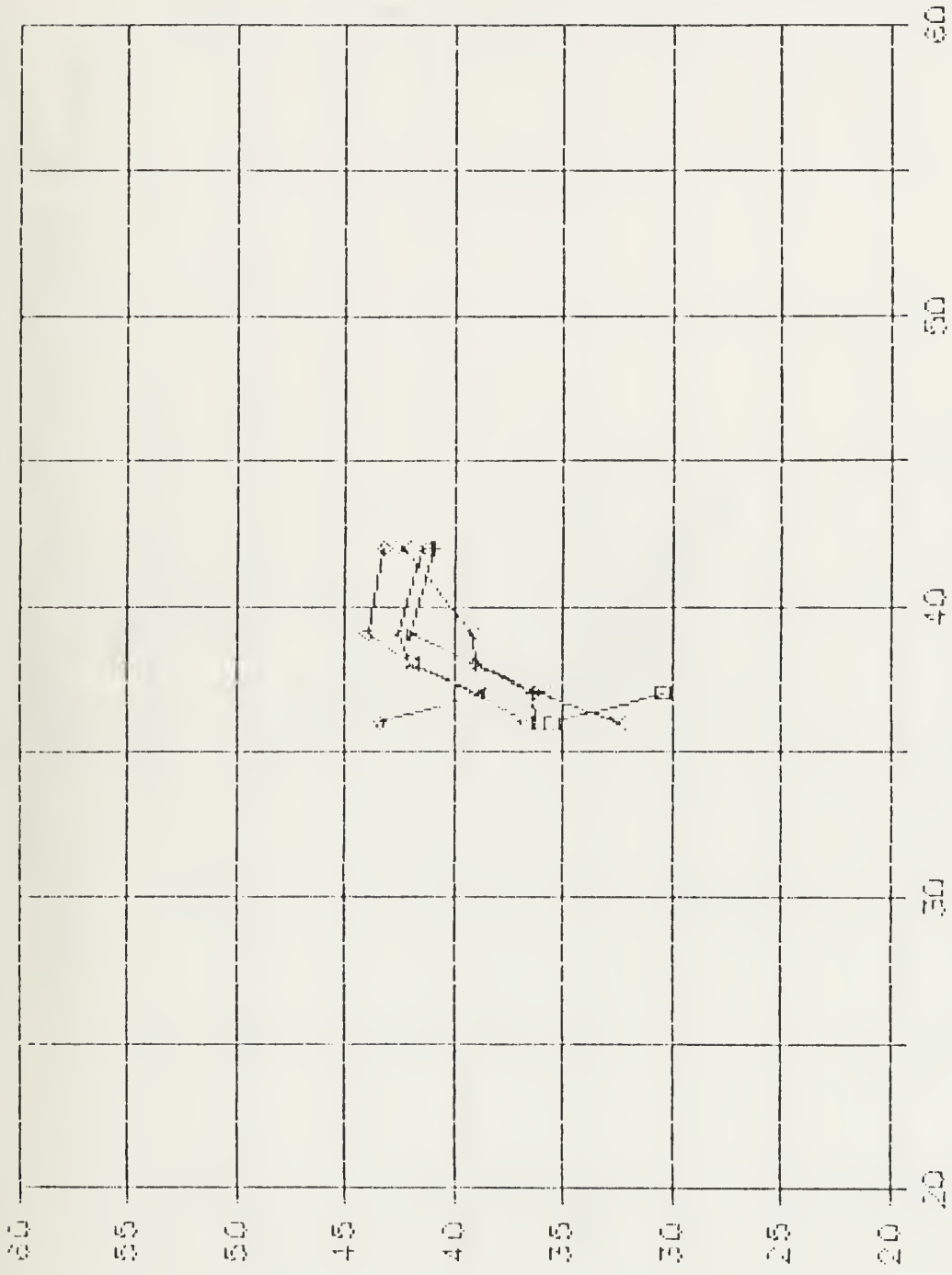


Figure 63. FEMALE ARMY ENLISTED PERSONNEL: RELATIONSHIP BETWEEN COMPOSITE 3 SCORES AND ACTUAL ATTRITION RATES BY AFQT CATEGORY FOR FY 1981 AND 1982 ACCESSIONS

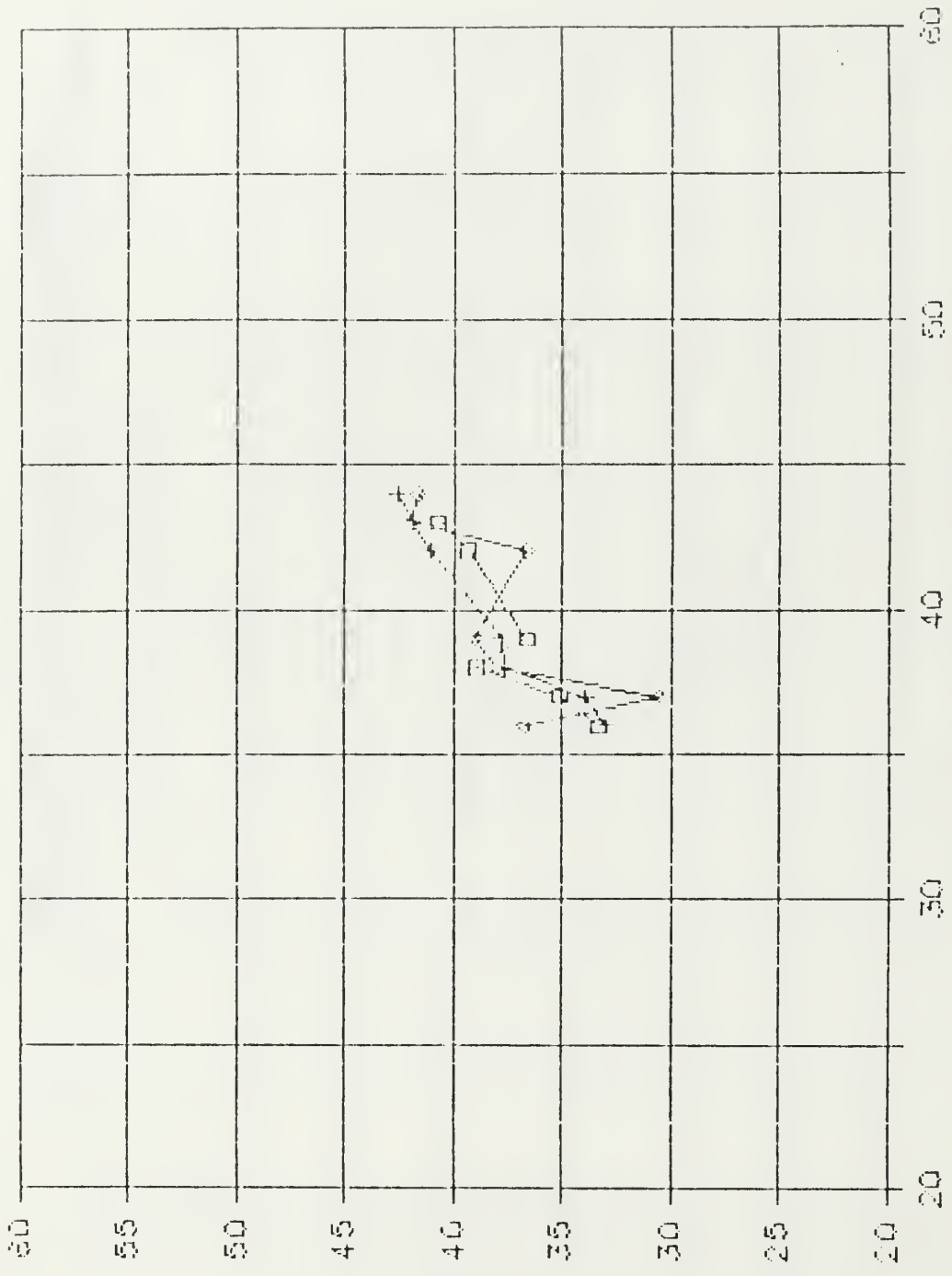


Figure 64. FEMALE ARMY ENLISTED PERSONNEL: RELATIONSHIP BETWEEN COMPOSITE 3 SCORES AND ACTUAL ATTRITION RATES BY AGE AT SERVICE ENTRY FOR FY 1981 AND 1982 ACCESSIONS

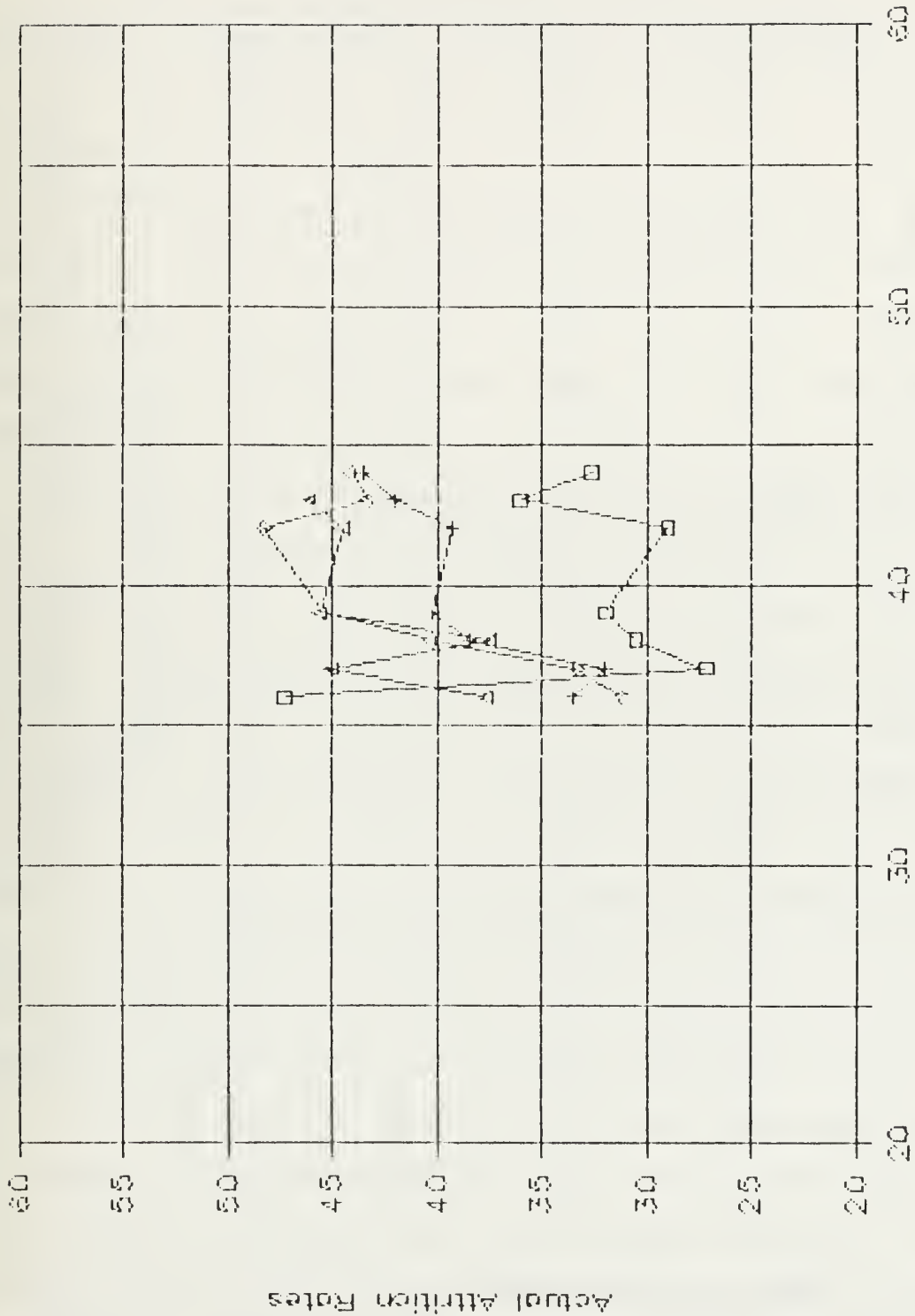


Figure 65. FEMALE ARMY ENLISTED PERSONNEL: RELATIONSHIP BETWEEN COMPOSITE 3 SCORES AND ACTUAL ATTRITION RATES BY GEOGRAPHIC ATTRITION CODE FOR FY 1981 AND 1982 ACCESSIONS

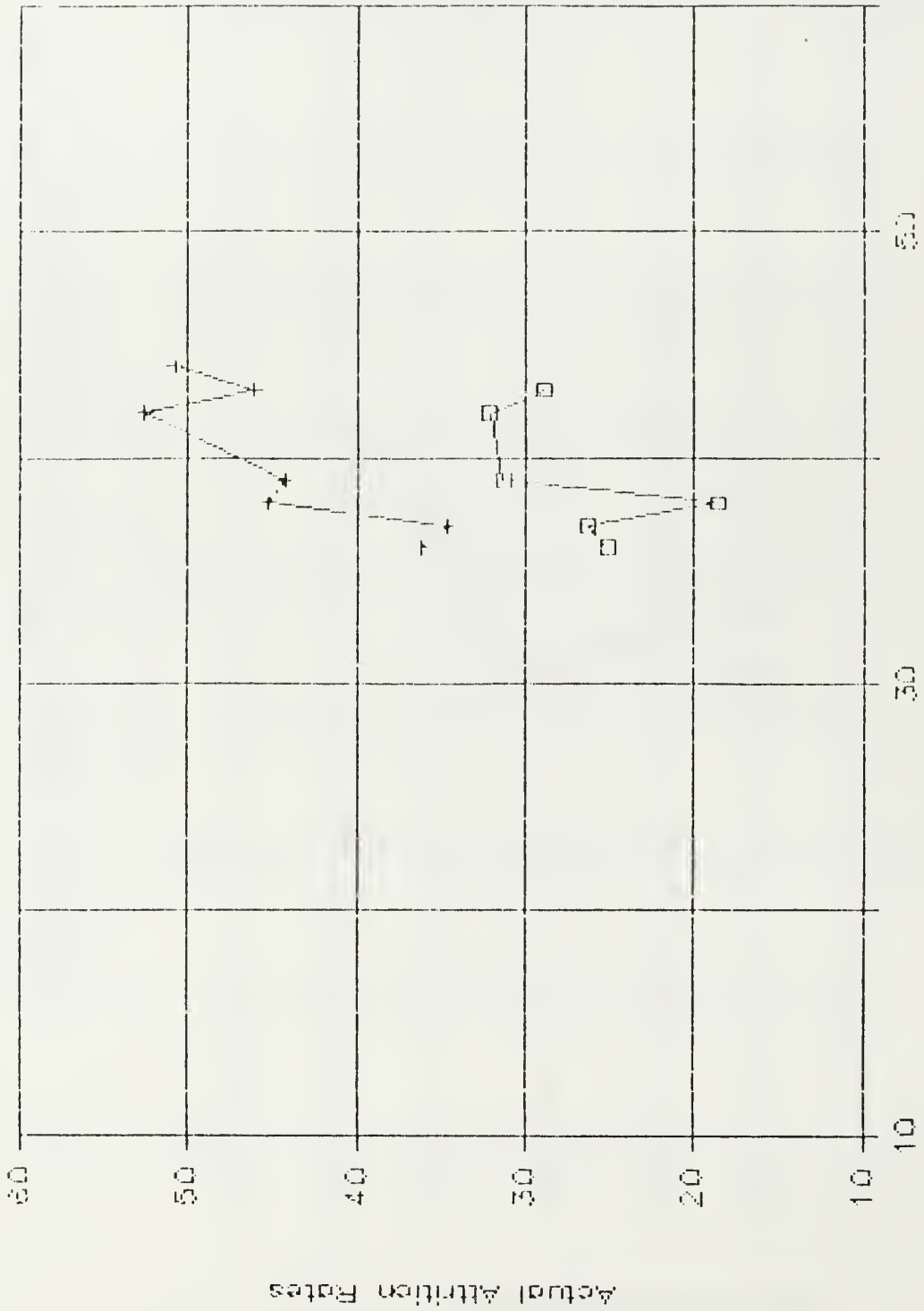


Figure 66. FEMALE ARMY ENLISTED PERSONNEL: RELATIONSHIP BETWEEN COMPOSITE 3 SCORES AND ACTUAL ATTRITION RATES BY RACE FOR FY 1981 AND 1982 ACCESSIONS

## V. CONCLUSIONS AND RECOMMENDATIONS

One objective of this study was to identify important screening variables. Another purpose was to develop and validate composites of these variables for use in preenlistment screening. The first objective was accomplished by cross-tabulating the variables available at the time of enlistment application with three-year attrition. The variables were incorporated into models which were compared on the basis of goodness of fit, validity and cross-validity, predictive accuracy, and impact upon population subgroups.

The principal conclusions from the analyses employed are that the male Composite 2 predicts first-term attrition most accurately, offers reasonable stability in cross-validation and provides a wide range of screening scores. There is no overwhelming support of the male Composite 2 in terms of differences in validities or differences in efficiencies at designated cut-off points. On the other hand, the subgroup analyses lend support to Composite 2 for the males, as do the cumulative frequency distributions of each composite shown in Tables 11, 12 and 13. By using the same cut-off score or a similar scoring interval for each composite, a comparison of the models' efficiencies may be made. As noted in Tables 11 through 13, a cut-off score may be selected to examine the percentage of the total number denied enlistment, those denied enlistment who successfully completed first-term service, and those denied enlistment who were prematurely discharged. Composite 2 would exclude a greater proportion of

TABLE 11  
 CUMULATIVE FREQUENCY DISTRIBUTION OF  
 MALE COMPOSITE 1 SCORES

(Cross-validation Sample)

<u>SCREEN SCORES</u>	<u>COMPLETED THREE YEARS OF SERVICE</u>	<u>ATTRITION DURING FIRST THREE YEARS OF SERVICE</u>	<u>TOTAL POPULATION</u>
61-63	0.00	0.01	0.01
58-60	0.06	0.12	0.08
55-57	0.93	2.48	1.40
52-54	3.60	9.56	5.41
49-51	6.78	17.20	9.94
46-48	9.55	23.85	13.88
43-45	11.55	28.23	16.60
40-42	12.73	30.70	18.17
37-39	13.05	31.25	18.56
34-36	13.33	31.77	18.91
31-33	17.52	36.63	23.31
28-30	28.19	47.71	34.10
25-27	52.86	69.69	57.95
22-24	74.56	85.42	77.84
19-21	94.15	97.01	95.01
16-18	99.87	99.92	99.88
13-15	100.00	100.00	100.00

NOTE: This table should be read in the following manner: A cutting score on Composite 1 of 49 would have denied enlistment to about 10 percent of Army recruits entering service during FY 1981-1982. This action would have reduced the three-year attrition group by about 17 percent and the three-year completion group by about 7 percent.



TABLE 12  
 CUMULATIVE FREQUENCY DISTRIBUTION OF  
 MALE COMPOSITE 2 SCORES

(Cross-validation Sample)

<u>SCREEN SCORES</u>	<u>COMPLETED THREE YEARS OF SERVICE</u>	<u>ATTRITION DURING FIRST THREE YEARS OF SERVICE</u>	<u>TOTAL POPULATION</u>
57-59	0.32	0.81	0.47
54-56	2.30	6.30	3.51
51-53	3.87	10.38	5.84
48-50	7.00	18.11	10.36
45-47	9.67	24.35	14.11
42-44	11.72	28.70	16.86
39-41	12.52	30.32	17.91
36-38	13.21	31.58	18.77
33-35	15.01	33.95	20.74
30-32	21.63	41.64	27.68
27-29	34.54	54.75	40.65
24-26	57.82	74.32	62.82
21-23	81.20	90.13	83.91
18-20	96.27	98.13	96.84
15-17	99.64	99.85	99.71
12-14	100.00	100.00	100.00

NOTE: This table should be read in the following manner: A cutting score on Composite 2 of 49 would have denied enlistment to about 10 percent of Army recruits entering service during FY 1981-1982. This action would have reduced the three-year attrition group by about 18 percent and the three-year completion group by about 7 percent.

TABLE 13  
 CUMULATIVE FREQUENCY DISTRIBUTION OF  
 MALE COMPOSITE 3 SCORES

(Cross-validation Sample)

<u>SCREEN SCORES</u>	<u>COMPLETED THREE YEARS OF SERVICE</u>	<u>ATTRITION DURING FIRST THREE YEARS OF SERVICE</u>	<u>TOTAL POPULATION</u>
58-60	0.02	1.06	0.03
55-57	0.71	1.90	1.07
52-54	3.07	8.41	4.69
49-51	5.72	14.96	8.52
46-48	8.86	22.40	12.96
43-45	11.07	27.22	15.96
40-42	12.63	30.44	18.02
37-39	12.95	31.07	18.43
34-36	13.22	31.59	18.78
31-33	17.95	37.15	23.76
28-30	29.15	48.89	35.12
25-27	51.19	68.43	56.41
22-24	69.84	82.53	73.69
19-21	91.04	95.63	92.44
16-18	96.38	98.31	96.97
13-15	99.53	99.79	99.61
10-12	100.00	100.00	100.00

NOTE: This table should be read in the following manner: A cutting score on Composite 3 of 49 would have denied enlistment to about 9 percent of Army recruits entering service during FY 1981-1982. This action would have reduced the three-year attrition group by about 15 percent and the three-year completion group by about 6 percent.

the attritive group at higher (less restrictive) cut-off scores than would Composites 1 and 3. Consequently, Composite 2 has demonstrated significant strengths.

It is important to note that Composite 2 screen scores specifically employ race as a predictive variable. The inclusion of race as a screening factor may be perceived negatively or as a source of discriminatory action. However, attrition rates for blacks are considerably lower than those of their non-black cohorts. It would, therefore, be more discriminatory to ignore these differences and thereby deny entry to black applicants who may appear to be higher attrition risks on the basis of other screening criteria. This issue must be considered when selecting an operational preenlistment screen, and should be viewed as an aid to nondiscriminatory selection rather than the reverse.

Similarly, the female composite evaluations have indicated that Composite 2 provides the widest and most reliable range of attrition prediction scores. As seen in Table 6, this combination of AFQT category, term of enlistment, and race explains about eighteen percent of the criterion variance compared with only four percent from Composites 1 and 3. The cumulative frequency distributions for the female composites are provided in Tables 14 through 16.

Further, the second composite's stability was maintained in cross-validation, as displayed in Figures 57 through 61. Finally, the upper end of the distribution of screen scores for Composite 2 is more graduated than the distributions for Composites 1 and 3, thereby allowing a number of higher scores to be used as cut-off

TABLE 14  
 CUMULATIVE FREQUENCY DISTRIBUTION OF  
 FEMALE COMPOSITE 1 SCORES

(Cross-validation Sample)

<u>SCREEN SCORES</u>	<u>COMPLETED THREE YEARS OF SERVICE</u>	<u>ATTRITION DURING FIRST THREE YEARS OF SERVICE</u>	<u>TOTAL POPULATION</u>
53	0.27	0.22	0.25
52	1.36	1.38	1.37
49	3.32	3.87	3.55
46	5.14	6.75	5.81
45	5.49	7.15	6.18
44	19.00	21.57	20.06
43	56.98	57.81	57.32
42	97.21	98.02	97.54
37	98.74	99.19	98.92
30	100.00	100.00	100.00

NOTE: This table should be read in the following manner: A cutting score on Composite 1 of 44 would have denied enlistment to about 20 percent of Army recruits entering service during FY 1981-1982. This action would have reduced the three-year attrition group by about 22 percent and the three-year completion group by about 19 percent.

TABLE 15  
 CUMULATIVE FREQUENCY DISTRIBUTION OF  
 FEMALE COMPOSITE 2 SCORES

(Cross-validation Sample)

<u>SCREEN SCORES</u>	<u>COMPLETED THREE YEARS OF SERVICE</u>	<u>ATTRITION DURING FIRST THREE YEARS OF SERVICE</u>	<u>TOTAL POPULATION</u>
55	3.59	6.09	4.62
53	4.87	8.02	6.17
52	15.56	24.37	19.19
50	19.35	29.97	23.73
49	28.48	42.30	34.18
48	32.66	47.82	38.91
46	46.37	62.18	52.89
44	55.93	72.51	62.76
38	57.29	73.40	63.93
36	58.89	74.69	65.40
35	67.34	80.87	72.92
34	70.50	82.84	75.59
33	84.13	90.80	86.88
31	88.46	93.47	90.52
30	93.41	96.19	94.55
29	95.56	97.73	96.45
28	98.20	99.14	98.58
26	99.90	99.98	99.93
21	99.94	99.99	99.96
20	100.00	100.00	100.00

NOTE: This table should be read in the following manner: A cutting score on Composite 2 of 44 would have denied enlistment to about 63 percent of Army recruits entering service during FY 1981-1982. This action would have reduced the three-year attrition group by about 73 percent and the three-year completion group by about 56 percent.

TABLE 16  
 CUMULATIVE FREQUENCY DISTRIBUTION OF  
 FEMALE COMPOSITE 3 SCORES

(Cross-validation Sample)

<u>SCREEN SCORES</u>	<u>COMPLETED THREE YEARS OF SERVICE</u>	<u>ATTRITION DURING FIRST THREE YEARS OF SERVICE</u>	<u>TOTAL POPULATION</u>
44	35.83	37.08	36.35
43	85.14	87.64	86.18
42	88.84	91.03	89.75
39	89.89	91.97	90.75
38	95.42	96.67	95.94
37	98.32	98.67	98.47
36	99.96	99.95	99.96
32	99.98	99.98	99.98
31	100.00	100.00	100.00

NOTE: This table should be read in the following manner: A cutting score on Composite 3 of 44 would have denied enlistment to about 36 percent of Army recruits entering service during FY 1981-1982. This action would have reduced the three-year attrition group by about 37 percent and the three-year completion group by about 36 percent.

points. Also notable is the substantial difference in the percentages of stayers and leavers that would have been eliminated by using cut-off scores of forty-four and above for each of the composites. Composite 2 consistently would have eliminated far more actual leavers than stayers at any cut-off score above thirty-five and particularly with scores above fifty. For this reason the use of Composite 2 may be advantageous.

Although the use of Composite 2 is recommended for operational use (for males and females), Appendix B contains attrition prediction scores for all three composites. In addition, Appendix A contains information on geographic attrition rates which is necessary to make use of the screening tables for males<sup>6</sup>.

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<sup>6</sup>In the screening tables, "Low Attrition Area of Residence" refers to states in the first quintile of the distribution shown in Table A.1. "Below-Average Attrition Area of Residence" refers to states in the second quintile, and so on.

## VI. IMPLICATIONS

Although female Composite 2 adequately provides estimates which may be used for preenlistment screening, the examination of other variables predictive of female first-term attrition would be desirable. It is probable that female enlistees are more influenced by bio-demographic factors which do not play as emphatic a role in male enlistment and attrition decisions. The investigations conducted for this study have indicated that females with one or more dependents and those who have not expressed an interest in military enlistment during high school have higher attritive probabilities than other enlistees. The variables currently available for preenlistment screening do not provide as effectual attrition predictions for females as for males. As such, the predictive validities associated with currently available screening composites must be accepted or more applicant information must be uniformly gathered and analyzed for future operational use.

In addition, attrition may not be the sole criterion of interest for preenlistment screening. Therefore, a secondary screening criterion could estimate an individual's ability to achieve minimally acceptable performance. This scale could be developed on the basis of Skill Qualifications Test (SQT) performance, performance ratings, or attainment of the E-4 paygrade. Once a measure of expected performance was established, it could be used as a final filter in conjunction with the measure of expected attrition. This would effectively exclude those low



aptitude applicants who would probably not perform adequately if enlisted.

On the other hand, some possible benefits of enlisting low aptitude individuals have been noted by Sticht (1985). First, Sticht has shown that low aptitude enlistees have performed nearly as well as average performers over the last twenty years, during Project 100,000 and the ASVAB misnorming. Secondly, intergenerational enlistment has been studied and preliminary findings indicate that children of lower aptitude accessions show an interest in and often enlist in a military service.<sup>7</sup> Furthermore, these individuals often use educational benefits for themselves and their children, which improves the future recruitment pool. Another consideration is the advancement in technology enabling lower aptitude recruits to efficiently operate weaponry or machinery previously requiring more skills. Finally, during mobilization first-term discharges may be called back and require less training due to some learning retention. For these reasons, various aspects of suitability need to be considered in preenlistment screening.

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<sup>7</sup>Ongoing research being conducted by George Thomas at the Naval Postgraduate School.

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A P P E N D I C E S

- A: DEVELOPMENT OF PREDICTOR CATEGORIES FOR GEOGRAPHIC  
ATTRITION CODES AND WAIVER EXPLANATION CODES
- B: PREENLISTMENT SCREENING TABLES
- C: PREENLISTMENT SCREENING COMPOSITE DISTRIBUTIONS
- D: COMPUTER PROGRAMS



APPENDIX A:

DEVELOPMENT OF PREDICTOR CATEGORIES FOR  
GEOGRAPHIC ATTRITION CODES AND  
WAIVER EXPLANATION CODES

TABLE A.1  
ATTRITION RATE DISTRIBUTION BY HOME OF  
RECORD (HOR) FOR FISCAL YEAR 1976 THROUGH 1978  
MALE ARMY ENLISTED ACCESSIONS

<u>STATE</u>	<u>PERCENT ATTRITION</u>	<u>STATE</u>	<u>PERCENT ATTRITION</u>
<u>1st quintile</u>		<u>3rd quintile (continued)</u>	
Hawaii	25.66	Iowa	38.38
South Carolina	28.14	Nebraska	38.43
Georgia	29.23	California	38.57
Florida	29.96	Massachusetts	38.58
Alabama	30.65	Arkansas	38.58
North Dakota	30.83	<u>4th quintile</u>	
Virginia	31.24	Nevada	38.84
South Dakota	31.39	Washington	39.80
Mississippi	31.61	Texas	40.40
North Carolina	31.63	Wyoming	41.12
<u>2nd quintile</u>		Colorado	41.42
New Mexico	32.15	Oregon	41.45
Washington, DC	32.17	Ohio	41.50
New Hampshire	32.22	West Virginia	41.62
Arizona	32.94	Illinois	41.80
Delaware	33.20	Michigan	42.14
Maine	33.31	<u>5th quintile</u>	
Minnesota	34.26	New Jersey	42.30
Maryland	34.61	Tennessee	42.47
Wisconsin	34.83	Kansas	42.59
New York	35.61	Indiana	42.72
<u>3rd quintile</u>		Rhode Island	42.79
Idaho	35.76	Alaska	42.82
Connecticut	36.55	Kentucky	43.21
Louisiana	36.63	Missouri	43.27
Montana	36.80	Oklahoma	43.42
Pennsylvania	38.19	Utah	44.24

TABLE A.2  
 ATTRITION RATE DISTRIBUTION BY HOME OF  
 RECORD (HOR) FOR FISCAL YEAR 1976 THROUGH 1978  
 FEMALE ARMY ENLISTED ACCESSIONS

<u>STATE</u>	<u>PERCENT ATTRITION</u>	<u>STATE</u>	<u>PERCENT ATTRITION</u>
<u>1st quintile</u>		<u>3rd quintile (continued)</u>	
Washington, DC	35.00	Iowa	45.49
Hawaii	35.26	New Jersey	46.15
Alabama	36.07	Tennessee	46.30
North Dakota	37.18	Colorado	46.42
Georgia	37.48	<u>4th quintile</u>	
Mississippi	37.68	Massachusetts	46.92
Virginia	37.69	Wyoming	47.05
North Carolina	38.94	Indiana	47.42
Maryland	38.94	California	47.65
<u>2nd quintile</u>		Michigan	47.82
South Dakota	39.65	Rhode Island	48.37
New York	39.66	Texas	48.55
Nebraska	39.88	Missouri	48.67
New Hampshire	41.48	Kansas	49.22
Pennsylvania	42.27	Nevada	49.67
Louisiana	42.67	<u>5th quintile</u>	
Florida	43.07	West Virginia	49.70
Wisconsin	43.40	Delaware	49.71
Minnesota	43.75	Arkansas	49.78
<u>3rd quintile</u>		Kentucky	49.86
New Mexico	44.00	Idaho	50.00
Connecticut	44.01	Washington	50.04
Illinois	44.15	Oregon	50.64
Arizona	44.25	Oklahoma	51.38
Maine	44.98	Utah	52.96
Ohio	45.18	Alaska	55.81



TABLE A.3  
 ATTRITION RATES BY WAIVER REASON AND  
 APPROVAL AUTHORITY FOR FISCAL YEAR 1976 THROUGH 1981  
 MALE ARMY ACCESSIONS

<u>Reason for Waiver*</u>	<u>Approval Authority*</u>	<u>Total N</u>	<u>Percent Attrition</u>
No waiver	Not applicable	715792	35.90
Minor Traffic Offenses	Cdr, DRC	1697	38.95
Less Than 3 Minor Nontraffic Offenses	Cdr, DRC	3467	42.28
3 or More Minor Nontraffic Offenses	Cdr, DRC	1881	43.43
Misdemeanor	Cdr, RRC	46085	42.20
Felony (Adult)	CG, MILPERCEN	479	28.39
Felony (Juvenile)	CG, MILPERCEN	1006	35.49
Preservice Drug Abuse	CG, USAREC	669	45.74
Preservice Alcohol Abuse	CG, USAREC	2371	40.15

\*Sources: AR 601-210 and AR 601-56

Note: FY1979 and 1980 accession data show that persons waived for felony offenses, preservice alcohol and drug abuse and minor traffic offenses have similar three-year attrition rates to those without waivers and have therefore been assigned to one waiver category. Less than three minor non-traffic offenses and misdemeanors comprise the second waiver category. Waiver category 3 includes three or more minor non-traffic offenses.



APPENDIX B:

PRE-ENLISTMENT SCREENING TABLES

TABLE B.1  
COMPOSITE 1 FIRST-TERM ATTRITION PREDICTION SCORES FOR  
MALE PRE-ENLISTMENT SCREENING

Male High School Graduates

	Low Attrition Area of Residence					Below-Average Attrition Area of Residence					Average Attrition Area of Residence																																																																																																																																																																																																								
	AFQT Category					AFQT Category					AFQT Category																																																																																																																																																																																																								
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<sup>a</sup>Waiver categories are explained in Table A.3.

<sup>b</sup>There were no FY 1979 and 1980 accessions in this cell.

TABLE B.1 (CONTINUED)  
 COMPOSITE I FIRST-TERM ATTRITION PREDICTION SCORES FOR  
 MALE PRE-ENLISTMENT SCREENING

Male Non-High School Graduates

	Low Attrition Area of Residence					Below-Average Attrition Area of Residence					Average Attrition Area of Residence																																				
	AFQT Category IV IIIB IIIA II I					AFQT Category IV IIIB IIIA II I					AFQT Category IV IIIB IIIA II I																																				
<u>Age 17</u>																																															
Waiver Category <sup>a</sup>																																															
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2	46	45	43	39	35	49	48	46	42	37	53	52	50	46	42																																
3	53	51	50 <sup>b</sup>	46	41 <sup>b</sup>	56	54	53	49	45 <sup>b</sup>	60	59	57	53	48 <sup>b</sup>																																
<u>Ages 18 +19</u>																																															
Waiver Category																																															
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3	48	47	46 <sup>b</sup>	43 <sup>b</sup>	38 <sup>b</sup>	51	50	48	44	39	55	54	52	48	43 <sup>b</sup>																																
<u>Ages 20 +</u>																																															
Waiver Category																																															
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2	46	45	43	39	35	49	48	46	42	38	54	52	51	47	42																																
3	53	52	50	46	41 <sup>b</sup>	56	55	53 <sup>b</sup>	49	44 <sup>b</sup>	60	59	57	53	48 <sup>b</sup>																																
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<u>Age 17</u>																																															
Waiver Category																																															
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2	54	53	51	47	42						56	55	53	49	44																																
3	61	59	58	54	49 <sup>b</sup>						63	61	60	56 <sup>b</sup>	52 <sup>b</sup>																																
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3	56	55	53	49	44 <sup>b</sup>						58	57	55	51	48																																
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2	54	53	51	47	42						56	55	53	49	44																																
3	61	60	58	54	49						63	61	60	56	51																																

<sup>a</sup>Waiver categories are explained in Table A.3.

<sup>b</sup>There were no FY 1979 and 1980 accessions in this cell.

TABLE B.2  
COMPOSITE 2 FIRST-TERM ATTRITION PREDICTION SCORES FOR  
MALE PRE-ENLISTMENT SCREENING

Male High School Graduates

	Low Attrition Area of Residence					Below-Average Attrition Area of Residence					Average Attrition Area of Residence				
	AFQT Category IV III B IIIA II I					AFQT Category IV III B IIIA II I					AFQT Category IV III B IIIA II I				
<u>Blacks</u>															
Age 17	22	21	19	17	14	24	22	20	18	15	27	25	23	20	17 <sup>a</sup>
Ages 18 & 19	19	18	17	14	12	20	19	17	15	12	23	22	20	17	14
Ages 20 +	23	21	20	17	14	24	22	21	18	15	27	26	24	21	17
<u>Non-Blacks</u>															
Age 17	27	25	23	20	17	28	26	24	21	18	31	30	28	24	20
Ages 18 & 19	23	21	20	17	14	24	23	21	18	15	27	26	24	21	18
Ages 20 +	27	25	24	20	17	28	27	25	22	18	32	30	28	25	21
	Above-Average Attrition Area of Residence					High Attrition Area of Residence									
	AFQT Category IV III B IIIA II I					AFQT Category IV III B IIIA II I									
<u>Blacks</u>															
Age 17						27	26	24	21	18 <sup>a</sup>	29	27	25	22	19 <sup>a</sup>
Ages 18 & 19						24	22	21	18	15	25	24	22	19	16
Ages 20 +						28	26	24	21	18	30	28	26	23	19
<u>Non-blacks</u>															
Age 17						32	30	28	25	21	34	32	30	26	22
Ages 18 & 19						28	26	24	21	18	30	28	26	23	19
Ages 20 +						33	31	29	25	21	34	32	30	27	23

<sup>a</sup>There were no FY 1979 and 1980 accessions in this cell.

TABLE B.2 (CONTINUED)  
 COMPOSITE 2 FIRST-TERM ATTRITION PREDICTION SCORES FOR  
 MALE PRE-ENLISTMENT SCREENING

Male Non-High School Graduates

	Low Attrition Area of Residence					Below-Average Attrition Area of Residence					Average Attrition Area of Residence				
	AFQT Category IV IIIB IIIA II I					AFQT Category IV IIIB IIIA II I					AFQT Category IV IIIB IIIA II I				
<u>Blacks</u>															
Age 17	44	42	40	36	31 <sup>a</sup>	46	44	41	37	32	50	48	46	41	36 <sup>a</sup>
Ages 18 & 19	40	37	35	31	26 <sup>a</sup>	41	39	37	33	27 <sup>a</sup>	45	43	41	37	31 <sup>a</sup>
Ages 20 +	45	43	40	36	31 <sup>a</sup>	47	44	42	38	33	51	49	46	42	37
<u>Non-Blacks</u>															
Age 17	50	48	45	41	36	52	49	47	43	37	56	54	51	47	42
Ages 18 & 19	45	43	41	36	31	47	45	42	38	33	51	49	47	42	37
Ages 20 +	50	48	46	41	36	52	50	48	43	38	56	54	52	47	42
	Above-Average Attrition Area of Residence					High Attrition Area of Residence									
	AFQT Category IV IIIB IIIA II I					AFQT Category IV IIIB IIIA II I									
<u>Blacks</u>															
Age 17	51 49 46 42 37					53 51 48 44 39									
Ages 18 & 19	46 44 42 37 32					48 46 44 39 34									
Ages 20 +	52 49 47 42 37					54 51 49 44 39									
<u>Non-blacks</u>															
Age 17	57 54 52 47 42					59 56 54 50 44									
Ages 18 & 19	52 49 47 43 38					54 52 49 45 40									
Ages 20 +	57 55 53 48 43					59 57 55 50 45									

<sup>a</sup>There were no FY 1979 and 1980 accessions in this cell.

TABLE B.3  
COMPOSITE 3 FIRST-TERM ATTRITION PREDICTION SCORES FOR  
MALE PRE-ENLISTMENT SCREENING

Male High School Graduates

	Low Attrition Area of Residence					Below-Average Attrition Area of Residence					Average Attrition Area of Residence				
	AFQT Category					AFQT Category					AFQT Category				
	IV	IIIB	IIIA	II	I	IV	IIIB	IIIA	II	I	IV	IIIB	IIIA	II	I
<hr/>															
High School															
<u>ASVAB Testing</u>															
Age 17	18	18	17	15	12	20	19	18	16	13	23	22	21	19	16
Ages 18 & 19	16	15	14	12	10	17	16	15	13	11	20	19	18	16	13
Ages 20 +	18	17	16	14	11 <sup>a</sup>	20	19	18	15	12 <sup>a</sup>	23	22	20	18	15
Other Operational															
<u>ASVAB Testing</u>															
Age 17	25	24	23	20	17	27	26	25	22	19	31	30	28	25	22
Ages 18 & 19	21	20	19	17	14	23	22	21	19	16	27	26	24	21	18
Ages 20 +	24	23	22	19	17	26	25	24	21	18	30	29	28	24	21
<hr/>															
	Above-Average Attrition Area of Residence					High Attrition Area of Residence									
	AFQT Category					AFQT Category									
	IV	IIIB	IIIA	II	I	IV	IIIB	IIIA	II	I					
<hr/>															
High School															
<u>ASVAB Testing</u>															
Age 17	24	23	21	19	16	25	24	23	20	17					
Ages 18 & 19	20	19	18	16	13	21	21	19	17	14					
Ages 20 +	23	22	21	18	15	24	23	22	20	17 <sup>a</sup>					
Other Operational															
<u>ASVAB Testing</u>															
Age 17	31	30	29	26	22	33	32	31	27	23					
Ages 18 & 19	27	26	25	22	19	29	28	26	23	20					
Ages 20 +	31	29	28	25	21	32	31	30	26	23					

<sup>a</sup>There were no FY 1979 and 1980 accessions in this cell.





TABLE B.4  
 COMPOSITE 1 FIRST-TERM ATTRITION  
 PREDICTION SCORES FOR FEMALE PRE-ENLISTMENT SCREENING

Female High School Graduates

2 or 3 Year Terms  
of Enlistment

<u>AFOT Category</u>	<u>No Dependents</u>	<u>1 or more Dependents</u>
IV	42	45
IIIB	43	48
IIIA	44	52
II	43	46
I	30	53

4 or More Year Terms  
of Enlistment

<u>AFOT Category</u>	<u>No Dependents</u>	<u>1 or more Dependents</u>
IV	42	42
IIIB	42	44
IIIA	42	49
II	42	46
I	37	53

TABLE B.5  
 COMPOSITE 2 FIRST-TERM ATTRITION  
 PREDICTION SCORES FOR FEMALE PRE-ENLISTMENT SCREENING

Female High School Graduates

2 or 3 Year Terms  
of Enlistment

<u>AFOT Category</u>	<u>Blacks</u>	<u>Non-Blacks</u>
IV	35	55
IIIB	33	52
IIIA	30	49
II	28	46
I	21	38

4 or More Year Terms  
of Enlistment

<u>AFOT Category</u>	<u>Blacks</u>	<u>Non-Blacks</u>
IV	34	53
IIIB	31	50
IIIA	29	48
II	26	44
I	20	36

TABLE B.6  
 COMPOSITE 3 FIRST-TERM ATTRITION  
 PREDICTION SCORES FOR FEMALE PRE-ENLISTMENT SCREENING

Female High School Graduates

2 or 3 Year Terms  
of Enlistment

<u>AFOT Category</u>	<u>High School ASVAB Testing</u>	<u>Other Operational ASVAB Testing</u>
IV	38	43
IIIB	38	44
IIIA	39	44
II	38	43
I	32	37

4 or More Year Terms  
of Enlistment

<u>AFOT Category</u>	<u>High School ASVAB Testing</u>	<u>Other Operational ASVAB Testing</u>
IV	37	42
IIIB	38	43
IIIA	38	43
II	37	43
I	31	36



APPENDIX C:

PRE-ENLISTMENT SCREENING COMPOSITE DISTRIBUTIONS

TABLE C.1  
 FIRST-TERM ATTRITION RATES FOR  
 MALE ARMY ENLISTED PERSONNEL BY COMPOSITE 1 SCORES  
 (FY 1979 and 1980 Accession Cohorts)

Composite 1 Attrition Prediction Scores	Number Completing 3 Years of Service	Attrition During First 3 Years of Service	Total	Percent Attrition
13-15	240	55	295	18.64
16-18	5690	1157	6847	16.90
19-21	24740	5754	30494	18.87
22-24	25264	7195	32459	22.17
25-27	25335	9258	34593	26.76
28-30	10942	4945	15887	31.13
31-33	3802	1889	5691	33.19
34-36	457	354	811	43.65
37-39	1211	814	2025	40.20
40-42	4950	3790	8740	43.36
43-45	6898	5629	12527	44.93
46-48	11707	10231	21938	46.64
49-51	16916	16701	33617	49.68
52-54	8291	9290	17581	52.84
55-57	6511	7657	14168	54.04
58-60	566	665	1231	54.02
61-63	14	27	41	65.85
Total	153534	85411	153534	
Overall Attrition Rate				35.75

TABLE C.2  
 FIRST-TERM ATTRITION RATES FOR  
 MALE ARMY ENLISTED PERSONNEL BY COMPOSITE 2 SCORES  
 (FY 1979 and 1980 Accession Cohorts)

Composite 2 Attrition Prediction Scores	Number Completing 3 Years of Service	Attrition During First 3 Years of Service	Total	Percent Attrition
12-14	336	79	415	19.04
15-17	2886	611	3497	17.47
18-20	19149	4192	23341	17.96
21-23	25881	6869	32750	20.97
24-26	23173	7678	30851	24.89
27-29	15371	6439	21810	29.52
30-32	7252	3271	10523	31.08
33-35	2302	1293	3595	35.97
36-38	1810	1176	2986	39.38
39-41	4284	3029	7313	41.42
42-44	5725	4483	10208	43.92
45-47	12633	10871	23504	46.25
48-50	9627	9508	19135	46.69
51-53	11381	12114	23495	51.56
54-56	7667	8904	16571	53.73
57-59	4057	4894	8951	54.68
Total	153534	85411	238945	
Overall Attrition Rate				35.75

TABLE C.3  
 FIRST-TERM ATTRITION RATES FOR  
 MALE ARMY ENLISTED PERSONNEL BY COMPOSITE 3 SCORES  
 (FY 1979 and 1980 Accession Cohorts)

Composite 3 Attrition Prediction Scores	Number Completing 3 Years of Service	Attrition During First 3 Years of Service	Total	Percent Attrition
10-12	355	51	406	12.56
13-15	4536	790	5326	14.83
16-18	5673	1158	6831	16.95
19-21	24362	5920	30282	19.55
22-24	20707	6184	26891	23.00
25-27	23174	8167	31341	26.06
28-30	11217	5027	16244	30.95
31-33	6372	3144	9516	33.04
34-36	572	446	1018	43.81
37-39	915	552	1467	37.63
40-42	3751	2883	6634	43.46
43-45	10604	8721	19325	45.13
46-48	9568	8338	17906	46.57
49-51	15744	15661	31405	49.87
52-54	8563	9455	18018	52.48
55-57	6633	7770	14403	53.95
58-60	788	1144	1932	59.21
Total	153534	85411	238945	
Overall Attrition Rate				35.75

TABLE C.4  
 FIRST-TERM ATTRITION RATES FOR  
 MALE ARMY ENLISTED PERSONNEL BY COMPOSITE 1 SCORES  
 (FY 1981 and 1982 Accession Cohorts)

Composite 1 Attrition Prediction Scores	Number Completing 3 Years of Service	Attrition During First 3 Years of Service	Total	Percent Attrition
13-15	182	46	228	20.18
16-18	7861	1736	9597	18.09
19-21	26912	6905	33817	20.42
22-24	29811	9370	39181	23.91
25-27	33892	13094	46986	27.87
28-30	14648	6601	21249	31.06
31-33	5776	2897	8673	33.40
34-36	385	311	696	44.68
37-39	442	327	769	42.52
40-42	1616	1471	3087	47.65
43-45	2749	2606	5355	48.66
46-48	3810	3958	7768	50.95
49-51	4374	4548	8922	50.98
52-54	3675	4215	7890	53.42
55-57	1197	1403	2600	53.96
58-60	81	64	145	44.14
61-63	3	7	10	70.00
Total	137414	59559	196973	
Overall Attrition Rate				30.24



TABLE C.5  
 FIRST-TERM ATTRITION RATES FOR  
 MALE ARMY ENLISTED PERSONNEL BY COMPOSITE 2 SCORES

(FY 1981 and 1982 Accession Cohorts)

Composite 2 Attrition Prediction Scores	Number Completing 3 Years of Service	Attrition During First 3 Years of Service	Total	Percent Attrition
12-14	488	87	575	15.13
15-17	4632	1023	5655	18.09
18-20	20711	4763	25474	18.70
21-23	32116	9420	41536	22.68
24-26	31996	11664	43660	26.72
27-29	17747	7810	25557	30.56
30-32	9091	4578	13669	33.49
33-35	2478	1412	3890	36.30
36-38	946	750	1696	44.22
39-41	1104	963	2067	46.59
42-44	2821	2592	5413	47.88
45-47	3671	3717	7388	50.31
48-50	4297	4601	8898	51.71
51-53	2151	2432	4583	53.07
54-56	2722	3267	5989	54.55
57-59	443	480	923	52.00
Total	137414	59559	196973	
Overall Attrition Rate				30.24

TABLE C.6  
 FIRST-TERM ATTRITION RATES FOR  
 MALE ARMY ENLISTED PERSONNEL BY COMPOSITE 3 SCORES  
 (FY 1981 and 1982 Accession Cohorts)

Composite 3 Attrition Prediction Scores	Number Completing 3 Years of Service	Attrition During First 3 Years of Service	Total	Percent Attrition
10-12	644	127	771	16.47
13-15	4326	879	5205	16.89
16-18	7332	1597	8929	17.89
19-21	29137	7802	36939	21.12
22-24	25630	8400	34030	24.68
25-27	30282	11638	41920	27.76
28-30	15391	6991	22382	31.23
31-33	6506	3309	9815	33.71
34-36	377	310	687	45.12
37-39	437	377	814	46.31
40-42	2138	1918	4056	47.29
43-45	3035	2868	5903	48.59
46-48	4309	4432	8741	50.70
49-51	3638	3899	7537	51.73
52-54	3249	3879	7128	54.42
55-57	953	1096	2049	53.49
58-60	30	37	67	55.22
Total	137414	59559	196973	
Overall Attrition Rate				30.24

TABLE C.7  
 FIRST-TERM ATTRITION RATES FOR  
 FEMALE ARMY ENLISTED PERSONNEL BY COMPOSITE 1 SCORES  
 (FY 1979 and 1980 Accession Cohorts)

Composite 1 Attrition Prediction Scores	Number Completing 3 Years of Service	Attrition During First 3 Years of Service	Total	Percent Attrition
30	143	62	205	30.24
37	226	130	356	36.52
42	12916	9383	22299	42.08
43	4388	3340	7728	43.22
44	1676	1299	2975	43.66
45	279	231	510	45.29
46	277	237	514	46.11
49	291	276	567	48.68
52	120	127	247	51.42
53	31	35	66	53.03
Total	20347	15120	35467	
Overall Attrition Rate				42.63

TABLE C.8  
 FIRST-TERM ATTRITION RATES FOR  
 FEMALE ARMY ENLISTED PERSONNEL BY COMPOSITE 2 SCORES  
 (FY 1979 and 1980 Accession Cohorts)

Composite 2 Attrition Prediction Scores	Number Completing 3 Years of Service	Attrition During First 3 Years of Service	Total	Percent Attrition
20	9	2	11	18.18
21	6	2	8	25.00
26	268	122	390	31.28
28	235	117	352	33.24
29	433	179	612	29.25
30	574	264	838	31.50
31	979	429	1408	30.47
33	1608	829	2437	34.02
34	1675	833	2508	33.21
35	4170	2198	6368	34.52
36	234	147	381	38.58
38	151	76	227	33.48
44	1585	1217	2802	43.43
46	1331	1084	2415	44.89
48	945	839	1784	47.03
49	1103	1069	2172	49.22
50	995	1006	2001	50.27
52	1536	1601	3137	51.04
53	769	945	1714	55.13
55	1741	2161	3902	55.38
Total	20347	15120	35467	
Overall Attrition Rate				42.63

TABLE C.9  
 FIRST-TERM ATTRITION RATES FOR  
 FEMALE ARMY ENLISTED PERSONNEL BY COMPOSITE 3 SCORES

(FY 1979 and 1980 Accession Cohorts)

Composite 3 Attrition Prediction Scores	Number Completing 3 Years of Service	Attrition During First 3 Years of Service	Total	Percent Attrition
31	12	3	15	20.00
32	11	3	14	21.43
36	231	146	377	38.73
37	599	336	935	35.94
38	1224	778	2002	38.86
39	137	65	202	32.18
42	2145	1593	3738	42.62
43	11542	8656	20198	42.86
44	4446	3540	7986	44.33
Total	20347	15120	35467	
Overall Attrition Rate				42.63

TABLE C.10  
 FIRST-TERM ATTRITION RATES FOR  
 FEMALE ARMY ENLISTED PERSONNEL BY COMPOSITE 1 SCORES  
 (FY 1981 and 1982 Accession Cohorts)

Composite 1 Attrition Prediction Scores	Number Completing 3 Years of Service	Attrition During First 3 Years of Service	Total	Percent Attrition
30	233	105	338	31.07
37	282	151	433	34.87
42	7412	5202	12614	41.24
43	6999	4687	11686	40.11
44	2489	1865	4354	42.83
45	65	52	117	44.44
46	336	373	709	52.61
49	362	322	684	47.08
52	200	150	350	42.86
53	50	28	78	35.90
Total	18428	12935	31363	
Overall Attrition Rate				41.24

TABLE C.11  
 FIRST-TERM ATTRITION RATES FOR  
 FEMALE ARMY ENLISTED PERSONNEL BY COMPOSITE 2 SCORES  
 (FY 1981 and 1982 Accession Cohorts)

Composite 2 Attrition Prediction Scores	Number Completing 3 Years of Service	Attrition During First 3 Years of Service	Total	Percent Attrition
20	11	1	12	8.33
21	8	1	9	11.11
26	314	109	423	25.77
28	486	182	668	27.25
29	396	199	595	33.45
30	913	352	1265	27.83
31	798	345	1143	30.18
33	2511	1029	3540	29.07
34	583	255	838	30.43
35	1558	800	2358	33.93
36	295	167	462	36.15
38	251	115	366	31.42
44	1761	1336	3097	43.14
46	2525	1857	4372	42.38
48	771	714	1485	48.08
49	1685	1595	3278	48.66
50	698	725	1423	50.95
52	1970	2115	4085	51.77
53	235	250	485	51.55
55	661	788	1449	54.38
Total	18428	12935	31363	
Overall Attrition Rate				41.24

TABLE C.12  
 FIRST-TERM ATTRITION RATES FOR  
 FEMALE ARMY ENLISTED PERSONNEL BY COMPOSITE 3 SCORES  
 (FY 1981 and 1982 Accession Cohorts)

Composite 3 Attrition Prediction Scores	Number Completing 3 Years of Service	Attrition During First 3 Years of Service	Total	Percent Attrition
31	4	2	6	33.33
32	3	4	7	57.14
36	302	166	468	35.47
37	535	259	794	32.64
38	1019	608	1627	37.37
39	193	121	314	38.54
42	681	439	1120	39.20
43	9088	6540	15628	41.85
44	6603	4796	11399	42.07
Total	18428	12935	31363	
Overall Attrition Rate				41.24



APPENDIX D:  
COMPUTER PROGRAMS

/\* THIS PROGRAM WAS USED TO PRODUCE TABLE 1. \*/

```
DATA T82;  
INPUT  
01 PF3 $1.  
02 PF4 $1.  
03 PF2 $1.  
05 SEX PIB1.;  
07 TOE PIB1.;  
  
PROC FREQ;  
TABLES SEX*TOE*PF3;  
TABLES SEX*TOE*PF4;  
TABLES SEX*TOE*PF2;  
  
//
```

/\* THIS PROGRAM PROVIDES CROSS-TABULATION TABLES USED IN CONSIDERING EACH VARIABLE'S IMPACT ON FIRST-TERM ATTRITION AS INDICATED IN TABLES 2 AND 3. \*/

DATA ARMY;

INPUT

```

01 PF3 1.
017 SEX PIB1.
05 DEP PIB1.
05 TESTF PIB1.
013 AFQTG 1.
014 RET 1.
015 MS 1.
016 DEPEND 1.
011 EDL 1.
09 AGE  PIB1.
013 PGL PIB1.
016 WAIVER2 1.;

```

PROC FORMAT;

```

VALUE AFQTG 0=' GP 4'
              1=' GP 3B'
              2=' GP 3A'
              3=' GP 2'
              4=' GP 1';
VALUE ED 0=' LT 11Y'
          1=' GED'
          2=' 11-12 YR'
          3=' HSG'
          4=' HSG+';
VALUE AGE 0-17=' 17 YR'
           18=' 18 YR'
           19=' 19 YR'
           20=' 20 YR'
           OTHER=' 21+ YR';
VALUE RACE 0=' BLACK'
           1,2=' NONBLK';
VALUE MSX 1=' SINGLE'
          2=' MARRIED';
VALUE DEPX 0=' '
           1-2=' 1-2'
           3-4=' 3-4'
           5-6=' 5-6'
           OTHER=' 7+';
VALUE TESTX 35=' ASVAB 5'
            OTHER=' REST';

```

DATA MALE; SET ARMY;

IF SEX=1;

PROC FREQ;

```

TABLES DEP*AGE*PF3;
FORMAT DEP DEPX AGE AGE.;
TITLE MALE ;

```

PROC FREQ;

```

TABLES DEP*EDL*PF3;
FORMAT DEP DEPX EDL ED.;
TITLE MALE ;

```

PROC FREQ;

```

TABLES MS*PF3;
FORMAT MS MSX.;
TITLE MALE - MARITAL STATUS;

```

PROC FREQ;

```

TABLES DEPEND*PF3;
TITLE MALE - DEPENDENTS;

```

PROC FREQ;

```

TABLES PGL*DEPEND*PF3;
TITLE MALE - PAYGRADE AT LOSS BY DEPENDENTS;

```

PROC FREQ;

```

TABLES TESTF*PF3;
FORMAT TESTF TESTX.;
TITLE MALE - TEST FORM;

```

PROC DELETE DATA = MALE;

```

DATA FEMALE; SET ARMY;
IF SEX=2;
  PROC FREQ;
  TABLES DEP*AGEE*PF3;
  FORMAT DEP DEPX. AGEE AGE.;
  TITLE FEMALE ;
  PROC FREQ;
  TABLES DEP*EDL*PF3;
  FORMAT DEP DEPX. EDL ED.;
  TITLE FEMALE ;
  PROC FREQ;
  TABLES MS*PF3;
  FORMAT MS MSX.;
  TITLE FEMALE - MARITAL STATUS;
  PROC FREQ;
  TABLES DEPEND*PF3;
  TITLE FEMALE - DEPENDENTS;
  PROC FREQ;
  TABLES PGL*DEPEND*PF3;
  TITLE FEMALE - PAYGRADE AT LOSS BY DEPENDENTS;
  PROC FREQ;
  TABLES TESTF*PF3;
  FORMAT TESTF TESTX.;
  TITLE FEMALE - TEST FORM;
  PROC FREQ;
  TABLES RET*AGEE*EDL*AFQTG*PF3;
  FORMAT RET RACE. AGEE AGE. EDL ED. AFQTG AFQTGP.;
  PROC DELETE DATA = FEMALE;
//

```

/\*  
WAIVER LEVEL AND WAIVER EXPLANATION CODES WERE COMPARED AND  
EVALUATED FOR USE AS A COMPOSITE VARIABLE. \*/

```
DATA WKSAS;  
INPUT  
31 PF3 1.  
36 WRLVL 1.  
37 WREXP 1.  
35 SEX PIB1.;  
IF SEX>0;  
IF WRLVL>3 THEN WRLVL=0;  
PROC FREQ;  
TABLES SEX*WRLVL*PF3;  
PROC FREQ;  
TABLES SEX*WREXP*PF3;  
//
```

```

/*
THIS PROGRAM COMPUTES THE COEFFICIENTS FOR THE LOGISTIC REGRESSION
MODELS. IT ALSO PROVIDES ESTIMATES OF THE PROBABILITY OF ATTRITION
WHICH MAY BE USED TO BUILD A SCREEN TABLE. THE ADDCELL=.5 OPTION
PRECLUDES ERROR FORM EMPTY CELLS
*/

```

```

DATA ARCAT;
INPUT
@6 PF3 1.
@7 DEP PIB1.
@8 TESTF PIB1.
@9 AGEЕ PIB1.
@10 SEX PIB1.
@11 EDL 1.
@12 AFQTS 1.
@13 RET 1.
@14 MS 1.
@15 DEPENDS 1.
@16 TJE PIB1.
@17 WVRVL1 1.
@18 WVRVL2 1.
@19 GEОG PIB1.;
@20 FY PIB1.;
IF SEX=1;

IF RET =0 THEN RACE=0;
IF RET>=1 THEN RACE=1;

IF EDL<=2 THEN EDL=2;
IF EDL>=3 THEN EDL=3;

IF AGEЕ<=17 THEN AGE=17;
IF AGEЕ =18 THEN AGE=19;
IF AGEЕ =19 THEN AGE=19;
IF AGEЕ>=20 THEN AGE=20;

IF DEP = 0 THEN MIDEP=0;
IF DEP = 1 THEN MIDEP=1;
IF DEP = 2 THEN MIDEP=1;
IF DEP = 3 THEN MIDEP=3;
IF DEP = 4 THEN MIDEP=3;
IF DEP = 5 THEN MIDEP=5;
IF DEP = 6 THEN MIDEP=5;
IF DEP>= 7 THEN MIDEP=7;

IF DEPENDS = 0 THEN DEPOTS=0;
IF DEPENDS>=1 THEN DEPOTS=1;

IF TOE<= 2 THEN TOE=2;
IF TOE>= 3 THEN TOE=3;

IF TESTF<=34 THEN TEST=0;
IF TESTF =35 THEN TEST=5;
IF TESTF>=36 THEN TEST=0;

IF FY=79 & WVRVL2=9 THEN WVR=2;
IF FY=80 & WVRVL2=9 THEN WVR=1;
IF WVRVL2<=1 THEN WVR=1;
IF WVRVL2>=5 & WVRVL<=8 THEN WVR=1;
IF WVRVL2=4 THEN WVR=2;
IF WVRVL2=2 THEN WVR=2;
IF WVRVL2=3 THEN WVR=3;

PROC FUNCAT DATA = ARCAT;
MODEL PF = TEST EDL AGE AFQTS GEОG /
ONEWAY NOGLS ML PROB PREDICT CURPB ADDCELL=.5;
TITLE AFQT AGE EDL GEОG TEST PREDICTIONS;

PROC FUNCAT DATA = ARCAT;
MODEL PF = RACE EDL AGE WVR AFQTS GEОG /
ONEWAY NOGLS ML PROB PREDICT ML ADDCELL=.5;
TITLE RACE AGE EDL GEОG WVR PREDICTIONS;
//

```

/\* THIS PROGRAM EXTRACTS AND RECODES ARMY NON-PRIOR SERVICE PERSONNEL \*/

```

// EXEC EXRECODE
DCL N='HOR' P=10 L=1 T=2; /* HOME OF RECORD OR STATE CODE */
DCL N='AGEE' P=16 L=1 T=2; /* AGE AT ENTRY */
DCL N='HYEC' P=18 L=1 T=2; /* HIGHEST YEAR OF EDUCATION */
DCL N='SEX' P=19 L=1 T=2;
DCL N='RACE' P=20 L=1 T=2;
DCL N='AFQTGP' P=20 L=1 T=2;
DCL N='MS' P=25 L=1 T=2; /* AFQT GROUP CODING */
DCL N='SVC' P=39 L=1 T=2; /* MARITAL STATUS & NUMBER OF DEPENDENTS */
DCL N='WVRLVL' P=56 L=1 T=2; /* SERVICE CODE (1=ARMY) */
DCL N='DOEY' P=58 L=1 T=2; /* PRIOR SERVICE CODE */
DCL N='DOEM' P=59 L=1 T=2; /* WAIVER APPROVAL LEVEL & EXPLANATION */
DCL N='ITOE' P=61 L=1 T=2; /* DATE OF ENTRY YEAR */
DCL N='TISL' P=150 L=2 T=3; /* DATE OF ENTRY MONTH */
DCL N='PGL' P=157 L=1 T=2; /* TERM OF ENLISTMENT */
DCL N='SPDC' P=161 L=1 T=6; /* TOTAL ACTIVE MILITARY SERVICE AT SEPARATION */
DCL N='SPDB' P=161 L=1 T=2; /* PAY GRADE AT SEPARATION */
DCL N='REL' P=176 L=1 T=2; /* SEPARATION PROGRAM DESIGNATOR */
DCL N='ISCL' P=164 L=1 T=2; /* SEPARATION PROGRAM DESIGNATOR */
DCL N='DEP' P=188 L=1 T=2; /* RE-ENLISTMENT CODE */
DCL N='FILEDATE' P=116 L=2 T=3; /* INTER-SERVICE SEPARATION CODE */
DCL N='TAFMSM' P=86 L=2 T=3; /* MONTHS IN DELAYED ENTRY PROGRAM */
DCL N='TESTF' P=24 L=1 T=2; /* FILE DATE */
DCL N='TST' P=0 L=1 T=2; /* TOTAL MILITARY SERVICE AT TIME OF FILE */
DCL N='WVR' P=0 L=1 T=2; /* TEST FORM */
DCL N='DEPDT' P=0 L=1 T=2; /* RECORDED TEST FORM */
/* RECORDED WAIVER CODE */
/* RECORDED NUMBER OF DEPENDENTS */
PARM LRECL1=135, LRECL2=15;
IF SVC = 1 THEN GOTO PEADA; /* SELECTS ARMY */
IF PS = 1 THEN GOTO PEADA; /* SELECTS NON-PRIOR SERVICE */
IF HOR LIST(07,03,07,14,43,52) | HOR>56 /* SELECTS ONLY THOSE */
THEN GOTO PEADA; /* INDIVIDUALS FROM THE 50 STATES */
IF FILEDATE=0000 THEN GOTO PEADA;
IF AFQTGP = 0 THEN GOTO PEADA;
DOEY*100 + DOEM TO DOE(0,4,4);

IF TAFMSL>35 | (ISCL>0 & ISCL<10) | TAFMSM>23 & ISCL=3 |
ISCL LIST(40,41,42) | (ISCL=0 & REL>0) THEN '1' TO R(01,1,6,PF3);
ELSE '0' TO PF3;
/* CREATES A VARIABLE FOR 3 YEAR PASS/FAIL CODE. */
IF TAFMSL>35 | (ISCL>0 & ISCL<10) |
(ISCL=1 & (SPDB=0 | SPDC='0') & TAFMSM>23) |
ISCL LIST(40,41,42) | (ISCL=0 & REL>0) THEN '1' TO R(02,1,6,PF3A);
ELSE '0' TO PF3A;
/* CREATES A MODIFIED CRITERION FOR FY81 & FY82 ACCESSIONS WHO CAN NOT
HAVE COMPLETED 35 OR MORE MONTHS OF ACTIVE DUTY SERVICE (TAFMSL). */
IF TAFMSL>23 | (ISCL>0 & ISCL<10) |
ISCL LIST(40,41,42) | (ISCL=0 & REL>0) THEN '1' TO R(03,1,6,PF2);
ELSE '0' TO PF2;
/* CREATES A VARIABLE FOR 2 YEAR PASS/FAIL CODE. */
AFQT TO R(04,1,2);
DEP TO R(05,1,2);
IF TESTF=35 THEN 5 TO TST;
ELSE 0 TO TST;
IF MS=10 | MS=20 THEN 0 TO DEPDT;
ELSE 1 TO DEPDT;
IF ITOE <= 3 THEN 3 TO R(06,1,2,TOE);
ELSE 4 TO TOE;
AGEE TO R(07,1,2);
SEX TO R(08,1,2);
IF HYEC < 5 THEN 0 TO R(09,1,2,EDL);
ELSE IF HYEC = 5 THEN 1 TO EDL;
ELSE IF HYEC = 13 THEN 2 TO EDL;
ELSE IF HYEC = 6 THEN 3 TO EDL;
ELSE 4 TO EDL;
IF AFQTGP = 5 THEN 1 TO R(10,1,2,AFQTG);
ELSE IF AFQTGP = 6 THEN 2 TO AFQTG;
ELSE IF AFQTGP = 7 THEN 3 TO AFQTG;
ELSE IF AFQTGP = 8 THEN 4 TO AFQTG;
ELSE 0 TO AFQTG;
IF RACT = 2 THEN 0 TO R(11,1,2,RET);
ELSE 1 TO RET;

```

```

IF S S S X 1 40R = 15 THEN 0 TO (1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40);
IF S S S X = 1 40R = 45 THEN 0 TO GEO;
IF S S S X = 1 40R = 13 THEN 0 TO GEO;
IF S S S X = 1 40R = 12 THEN 0 TO GEO;
IF S S S X = 1 40R = 01 THEN 0 TO GEO;
IF S S S X = 1 40R = 38 THEN 0 TO GEO;
IF S S S X = 1 40R = 51 THEN 0 TO GEO;
IF S S S X = 1 40R = 46 THEN 0 TO GEO;
IF S S S X = 1 40R = 28 THEN 0 TO GEO;
IF S S S X = 1 40R = 37 THEN 0 TO GEO;
IF S S S X = 1 40R = 35 THEN 1 TO GEO;
IF S S S X = 1 40R = 11 THEN 1 TO GEO;
IF S S S X = 1 40R = 33 THEN 1 TO GEO;
IF S S S X = 1 40R = 34 THEN 1 TO GEO;
IF S S S X = 1 40R = 13 THEN 1 TO GEO;
IF S S S X = 1 40R = 23 THEN 1 TO GEO;
IF S S S X = 1 40R = 27 THEN 1 TO GEO;
IF S S S X = 1 40R = 24 THEN 1 TO GEO;
IF S S S X = 1 40R = 55 THEN 1 TO GEO;
IF S S S X = 1 40R = 36 THEN 1 TO GEO;
IF S S S X = 1 40R = 16 THEN 2 TO GEO;
IF S S S X = 1 40R = 09 THEN 2 TO GEO;
IF S S S X = 1 40R = 22 THEN 2 TO GEO;
IF S S S X = 1 40R = 50 THEN 2 TO GEO;
IF S S S X = 1 40R = 42 THEN 2 TO GEO;
IF S S S X = 1 40R = 19 THEN 2 TO GEO;
IF S S S X = 1 40R = 31 THEN 2 TO GEO;
IF S S S X = 1 40R = 06 THEN 2 TO GEO;
IF S S S X = 1 40R = 25 THEN 2 TO GEO;
IF S S S X = 1 40R = 05 THEN 2 TO GEO;
IF S S S X = 1 40R = 32 THEN 3 TO GEO;
IF S S S X = 1 40R = 53 THEN 3 TO GEO;
IF S S S X = 1 40R = 48 THEN 3 TO GEO;
IF S S S X = 1 40R = 56 THEN 3 TO GEO;
IF S S S X = 1 40R = 08 THEN 3 TO GEO;
IF S S S X = 1 40R = 41 THEN 3 TO GEO;
IF S S S X = 1 40R = 39 THEN 3 TO GEO;
IF S S S X = 1 40R = 54 THEN 3 TO GEO;
IF S S S X = 1 40R = 17 THEN 3 TO GEO;
IF S S S X = 1 40R = 26 THEN 3 TO GEO;
IF S S S X = 1 40R = 34 THEN 4 TO GEO;
IF S S S X = 1 40R = 47 THEN 4 TO GEO;
IF S S S X = 1 40R = 20 THEN 4 TO GEO;
IF S S S X = 1 40R = 18 THEN 4 TO GEO;
IF S S S X = 1 40R = 44 THEN 4 TO GEO;
IF S S S X = 1 40R = 02 THEN 4 TO GEO;
IF S S S X = 1 40R = 21 THEN 4 TO GEO;
IF S S S X = 1 40R = 29 THEN 4 TO GEO;
IF S S S X = 1 40R = 40 THEN 4 TO GEO;
IF S S S X = 1 40R = 43 THEN 4 TO GEO;
IF S S S X = 2 40R = 24 THEN 0 TO GEO;
IF S S S X = 2 40R = 37 THEN 3 TO GEO;
IF S S S X = 2 40R = 51 THEN 5 TO GEO;
IF S S S X = 2 40R = 24 THEN 0 TO GEO;
IF S S S X = 2 40R = 13 THEN 0 TO GEO;
IF S S S X = 2 40R = 38 THEN 3 TO GEO;
IF S S S X = 2 40R = 01 THEN 7 TO GEO;
IF S S S X = 2 40R = 15 THEN 0 TO GEO;
IF S S S X = 2 40R = 11 THEN 0 TO GEO;
IF S S S X = 2 40R = 27 THEN 1 TO GEO;
IF S S S X = 2 40R = 55 THEN 1 TO GEO;
IF S S S X = 2 40R = 12 THEN 1 TO GEO;
IF S S S X = 2 40R = 22 THEN 1 TO GEO;
IF S S S X = 2 40R = 42 THEN 1 TO GEO;
IF S S S X = 2 40R = 33 THEN 1 TO GEO;
IF S S S X = 2 40R = 31 THEN 1 TO GEO;
IF S S S X = 2 40R = 36 THEN 1 TO GEO;
IF S S S X = 2 40R = 46 THEN 1 TO GEO;
IF S S S X = 2 40R = 08 THEN 2 TO GEO;
IF S S S X = 2 40R = 47 THEN 2 TO GEO;
IF S S S X = 2 40R = 19 THEN 2 TO GEO;
IF S S S X = 2 40R = 33 THEN 2 TO GEO;
IF S S S X = 2 40R = 23 THEN 2 TO GEO;
IF S S S X = 2 40R = 04 THEN 2 TO GEO;
IF S S S X = 2 40R = 17 THEN 2 TO GEO;
IF S S S X = 2 40R = 09 THEN 2 TO GEO;
IF S S S X = 2 40R = 35 THEN 2 TO GEO;

```

```

IF SEX=2 & HOR=32 THEN 3 TO GEO;
IF SEX=2 & HOR=20 THEN 3 TO GEO;
IF SEX=2 & HOR=22 THEN 3 TO GEO;
IF SEX=2 & HOR=24 THEN 3 TO GEO;
IF SEX=2 & HOR=26 THEN 3 TO GEO;
IF SEX=2 & HOR=06 THEN 3 TO GEO;
IF SEX=2 & HOR=18 THEN 3 TO GEO;
IF SEX=2 & HOR=56 THEN 1 TO GEO;
IF SEX=2 & HOR=225 THEN 1 TO GEO;
IF SEX=2 & HOR=29 THEN 1 TO GEO;
IF SEX=2 & HOR=40 THEN 1 TO GEO;
IF SEX=2 & HOR=41 THEN 1 TO GEO;
IF SEX=2 & HOR=53 THEN 1 TO GEO;
IF SEX=2 & HOR=16 THEN 1 TO GEO;
IF SEX=2 & HOR=21 THEN 1 TO GEO;
IF SEX=2 & HOR=55 THEN 1 TO GEO;
IF SEX=2 & HOR=54 THEN 1 TO GEO;
IF 4VRLVL LIST(9,19,29,35,49,59,69,75,89,99) THEN DO;
IF DOE<7910 THEN 2 TO WVR;
IF DOE>799 THEN 1 TO WVR;
END;
IF 4VRLVL LIST(8,18,28,38,48,58,68,78,88,98) THEN 1 TO WVR;
IF 4VRLVL LIST(7,17,27,37,47,57,67,77,87,97) THEN 1 TO WVR;
IF 4VRLVL LIST(6,16,26,36,46,56,66,76,86,96) THEN 1 TO WVR;
IF 4VRLVL LIST(5,15,25,35,45,55,65,75,85,95) THEN 1 TO WVR;
IF 4VRLVL LIST(4,14,24,34,44,54,64,74,84,94) THEN 2 TO WVR;
IF 4VRLVL LIST(3,13,23,33,43,53,63,73,83,93) THEN 3 TO WVR;
IF 4VRLVL LIST(2,12,22,32,42,52,62,72,82,92) THEN 2 TO WVR;
IF 4VRLVL LIST(1,11,21,31,41,51,61,71,81,91) THEN 1 TO WVR;
IF 4VRLVL LIST(0,10,20,30,40,50,60,70,80,90) THEN 1 TO WVR;
IF SEX=1 THEN DO;
IF EDK<=2 THEN DO;
IF AGE<=17 THEN DO;
IF AFQTG=0 & GEO=0 & WVR=1 THEN 47 TO R(13,1,2,CT1);
IF AFQTG=0 & GEO=0 & WVR=2 THEN 46 TO CT1;
IF AFQTG=0 & GEO=0 & WVR=3 THEN 53 TO CT1;
IF AFQTG=0 & GEO=1 & WVR=1 THEN 50 TO CT1;
IF AFQTG=0 & GEO=1 & WVR=2 THEN 49 TO CT1;
IF AFQTG=0 & GEO=1 & WVR=3 THEN 56 TO CT1;
IF AFQTG=0 & GEO=2 & WVR=1 THEN 55 TO CT1;
IF AFQTG=0 & GEO=2 & WVR=2 THEN 53 TO CT1;
IF AFQTG=0 & GEO=2 & WVR=3 THEN 60 TO CT1;
IF AFQTG=0 & GEO=3 & WVR=1 THEN 56 TO CT1;
IF AFQTG=0 & GEO=3 & WVR=2 THEN 54 TO CT1;
IF AFQTG=0 & GEO=3 & WVR=3 THEN 61 TO CT1;
IF AFQTG=0 & GEO=4 & WVR=1 THEN 57 TO CT1;
IF AFQTG=0 & GEO=4 & WVR=2 THEN 56 TO CT1;
IF AFQTG=0 & GEO=4 & WVR=3 THEN 63 TO CT1;
IF AFQTG=1 & GEO=0 & WVR=1 THEN 46 TO CT1;
IF AFQTG=1 & GEO=0 & WVR=2 THEN 45 TO CT1;
IF AFQTG=1 & GEO=0 & WVR=3 THEN 51 TO CT1;
IF AFQTG=1 & GEO=1 & WVR=1 THEN 49 TO CT1;
IF AFQTG=1 & GEO=1 & WVR=2 THEN 48 TO CT1;
IF AFQTG=1 & GEO=1 & WVR=3 THEN 54 TO CT1;
IF AFQTG=1 & GEO=2 & WVR=1 THEN 54 TO CT1;
IF AFQTG=1 & GEO=2 & WVR=2 THEN 52 TO CT1;
IF AFQTG=1 & GEO=2 & WVR=3 THEN 59 TO CT1;
IF AFQTG=1 & GEO=3 & WVR=1 THEN 54 TO CT1;
IF AFQTG=1 & GEO=3 & WVR=2 THEN 53 TO CT1;
IF AFQTG=1 & GEO=3 & WVR=3 THEN 59 TO CT1;
IF AFQTG=1 & GEO=4 & WVR=1 THEN 56 TO CT1;
IF AFQTG=1 & GEO=4 & WVR=2 THEN 55 TO CT1;
IF AFQTG=1 & GEO=4 & WVR=3 THEN 61 TO CT1;
IF AFQTG=2 & GEO=0 & WVR=1 THEN 44 TO CT1;
IF AFQTG=2 & GEO=0 & WVR=2 THEN 43 TO CT1;
IF AFQTG=2 & GEO=0 & WVR=3 THEN 43 TO CT1;
IF AFQTG=2 & GEO=1 & WVR=1 THEN 47 TO CT1;
IF AFQTG=2 & GEO=1 & WVR=2 THEN 46 TO CT1;
IF AFQTG=2 & GEO=1 & WVR=3 THEN 53 TO CT1;
IF AFQTG=2 & GEO=2 & WVR=1 THEN 52 TO CT1;
IF AFQTG=2 & GEO=2 & WVR=2 THEN 50 TO CT1;
IF AFQTG=2 & GEO=2 & WVR=3 THEN 57 TO CT1;
IF AFQTG=2 & GEO=3 & WVR=1 THEN 53 TO CT1;
IF AFQTG=2 & GEO=3 & WVR=2 THEN 51 TO CT1;
IF AFQTG=2 & GEO=3 & WVR=3 THEN 58 TO CT1;

```

































```

IF EDL>=3 & AFQTG =1 & TOE =3 & TST=0 THEN 44 TO CT3;
IF EDL>=3 & AFQTG =1 & TOE =3 & TST=5 THEN 38 TO CT3;
IF EDL>=3 & AFQTG =1 & TOE =4 & TST=J THEN 43 TO CT3;
IF EDL>=3 & AFQTG =1 & TOE =4 & TST=5 THEN 38 TO CT3;
IF EDL>=3 & AFQTG =2 & TOE =3 & TST=0 THEN 44 TO CT3;
IF EDL>=3 & AFQTG =2 & TOE =3 & TST=5 THEN 39 TO CT3;
IF EDL>=3 & AFQTG =2 & TOE =4 & TST=J THEN 43 TO CT3;
IF EDL>=3 & AFQTG =2 & TOE =4 & TST=5 THEN 38 TO CT3;
IF EDL>=3 & AFQTG =3 & TOE =3 & TST=0 THEN 43 TO CT3;
IF EDL>=3 & AFQTG =3 & TOE =3 & TST=5 THEN 38 TO CT3;
IF EDL>=3 & AFQTG =3 & TOE =4 & TST=0 THEN 43 TO CT3;
IF EDL>=3 & AFQTG =3 & TOE =4 & TST=5 THEN 37 TO CT3;
IF EDL>=3 & AFQTG =4 & TOE =3 & TST=J THEN 37 TO CT3;
IF EDL>=3 & AFQTG =4 & TOE =3 & TST=5 THEN 32 TO CT3;
IF EDL>=3 & AFQTG =4 & TOE =4 & TST=0 THEN 36 TO CT3;
IF EDL>=3 & AFQTG =4 & TOE =4 & TST=5 THEN 31 TO CT3;
END;
//

```

```

/*
THIS PROGRAM PROVIDES TABLES SHOWING SAMPLE DISTRIBUTIONS OF ACTUAL
FIRST-TERM ATTRITION/NON ATTRITION STATJS BY THE DISTRIBUTION OF
COMPOSITE SCORES. FISCAL YEAR 1981 AND 1982 ACCESSIONS ARE NOT
REQUIRED TO HAVE COMPLETED 35 OR MORE MONTHS OF ACTIVE DUTY SERVICE
BY FY 1984. THUS, A MODIFIED CRITERION, PF3A, WAS CREATED FOR THIS
SAMPLE.
*/

```

```

DATA COMP;
INPUT
01 PF3 $1.
02 PF3A $1.
03 SEX PIB1.
04 EDL PIB1.
05 CT1 PIB1.
06 CT2 PIB1.
07 CT3 PIB1.;
IF SEX=2 & EDL>=3;
PROC FREQ;
TABLES SEX*CT1*PF3A;
TABLES SEX*CT2*PF3A;
TABLES SEX*CT3*PF3A;
PROC FREQ;
TABLES SEX*CT1*PF3;
TABLES SEX*CT2*PF3;
TABLES SEX*CT3*PF3;
//

```



/\*  
 CUMULATIVE FREQUENCY DISTRIBUTIONS WERE PRODUCED WITH THE  
 CUMCOL OPTION. \*/

```

DATA ARMY;
INPUT
02 PF3      1.
08 SEX      PIB1.
13 CT1      PIB1.
14 CT2      PIB1.
15 CT3      PIB1.;
IF SEX=1;

PROC FORMAT;
VALUE CT1M 13-15='13-15'
           16-18='16-18'
           19-21='19-21'
           22-24='22-24'
           25-27='25-27'
           28-30='28-30'
           31-33='31-33'
           34-36='34-36'
           37-39='37-39'
           40-42='40-42'
           43-45='43-45'
           46-48='46-48'
           49-51='49-51'
           52-54='52-54'
           55-57='55-57'
           58-60='58-60';
VALUE CT2M 12-14='12-14'
           15-17='15-17'
           18-20='18-20'
           21-23='21-23'
           24-26='24-26'
           27-29='27-29'
           30-32='30-32'
           33-35='33-35'
           36-38='36-38'
           39-41='39-41'
           42-44='42-44'
           45-47='45-47'
           48-50='48-50'
           51-53='51-53'
           54-56='54-56'
           57-59='57-59';
VALUE CT3M 10-12='10-12'
           13-15='13-15'
           16-18='16-18'
           19-21='19-21'
           22-24='22-24'
           25-27='25-27'
           28-30='28-30'
           31-33='31-33'
           34-36='34-36'
           37-39='37-39'
           40-42='40-42'
           43-45='43-45'
           46-48='46-48'
           49-51='49-51'
           52-54='52-54'
           55-57='55-57'
           58-60='58-60';

PROC FREQ;
TABLES CT1*PF3/CUMCOL;
FORMAT CT1 CT1M.;
PROC FREQ;
TABLES CT2*PF3/CUMCOL;
FORMAT CT2 CT2M.;
PROC FREQ;
TABLES CT3*PF3/CUMCOL;
FORMAT CT3 CT3M.;

```

//

/\*  
THE N'S, MEANS AND STANDARD DEVIATIONS PRODUCED BY THIS PROGRAM  
WERE USED TO COMPUTE THE MODEL VALIDITIES WITH A BASIC LANGUAGE  
PROGRAM FOR AN IBM PERSONAL COMPUTER. \*/

```
DATA BISER;  
INPUT  
#1 PF3 1.  
#2 PF3A 1.  
#9 EDL PIB1.  
#9 SEX PIB1.  
#13 CT1 PIB1.  
#14 CT2 PIB1.  
#15 CT3 PIB1.;  
IF SEX=1;  
*IF SEX=2 & EDL>='3';  
PROC SORT DATA=BISER;  
BY PF3A;  
PROC MEANS DATA=BISER;  
VAR CT1 CT2 CT3;  
PRJC MEANS DATA=BISER;  
VAR CT1 CT2 CT3;  
BY PF3A;  
PROC SORT DATA=BISER;  
BY PF3;  
PROC MEANS DATA=BISER;  
VAR CT1 CT2 CT3;  
BY PF3;  
//
```

```

/*
CUT-OFF SCORES OF 40, 45, AND 50 WERE EVALUATED FOR EACH COMPOSITE
ON THE BASIS OF MINIMIZING PREDICTIONS OF STAYERS WHO WERE, IN
FACT, LEAVERS.
*/

```

```

DATA CUT8182;
INPUT
  02 PF3A 1.
  09 EDL P181.
  08 SEX P181.
  013 CT1 P181.
  014 CT2 P181.
  015 CT3 P181.;
IF CT1 > 40 THEN PREDAT11 = 0; ELSE PREDAT11 = 1;
IF CT1 > 45 THEN PREDAT12 = 0; ELSE PREDAT12 = 1;
IF CT1 > 50 THEN PREDAT13 = 0; ELSE PREDAT13 = 1;
*;
IF CT2 > 40 THEN PREDAT21 = 0; ELSE PREDAT21 = 1;
IF CT2 > 45 THEN PREDAT22 = 0; ELSE PREDAT22 = 1;
IF CT2 > 50 THEN PREDAT23 = 0; ELSE PREDAT23 = 1;
*;
IF CT3 > 40 THEN PREDAT31 = 0; ELSE PREDAT31 = 1;
IF CT3 > 45 THEN PREDAT32 = 0; ELSE PREDAT32 = 1;
IF CT3 > 50 THEN PREDAT33 = 0; ELSE PREDAT33 = 1;
*;
PROC FREQ;
TABLE PREDAT11*PF3A;
TABLE PREDAT12*PF3A;
TABLE PREDAT13*PF3A;
TABLE PREDAT21*PF3A;
TABLE PREDAT22*PF3A;
TABLE PREDAT23*PF3A;
TABLE PREDAT31*PF3A;
TABLE PREDAT32*PF3A;
TABLE PREDAT33*PF3A;
//

```

/\* THIS PROGRAM PROVIDES THE X,Y COORDINATES FOR THE GRAPHICAL ANALYSES OF POPULATION SUBGROUPS. \*/

```
DATA ARMY;
INPUT
01 PF3 1.
02 PF3A 1.
09 SEX PIB1.
10 AFQT; PIB1.
11 RET PIB1.
12 GEO PIB1.
09 EJI PIB1.
07 AGEE PIB1.
13 CT1 PIB1.
14 CT2 PIB1.
15 CT3 PIB1.;
```

```
PROC FORMAT;
VALUE AFQTGP 0=' GP 4'
1=' GP 3'
2=' GP 3A'
3=' GP 2'
4='GP 1';
VALUE ED 0-2='NHS'
3,4='HSG';
VALUE AGE 0-17='17 YR'
18-19='18-19 YR'
OTHER='20+ YR';
VALUE RACE 1='BLACK';
VALUE CT1M 1,2='NONBLK';
13-15='13-15'
16-19='16-18'
19-21='19-21'
22-24='22-24'
25-27='25-27'
28-30='28-30'
31-33='31-33'
34-36='34-36'
37-39='37-39'
40-42='40-42'
43-45='43-45'
46-48='46-48'
49-51='49-51'
52-54='52-54'
55-57='55-57'
58-60='58-60';
VALUE CT2M 12-14='12-14';
15-17='15-17'
19-20='19-20'
21-23='21-23'
24-26='24-26'
27-29='27-29'
30-32='30-32'
33-35='33-35'
36-38='36-38'
39-41='39-41'
42-44='42-44'
45-47='45-47'
48-50='48-50'
51-53='51-53'
54-56='54-56';
VALUE CT3M 57-59='57-59';
10-12='10-12'
13-15='13-15'
16-18='16-18'
19-21='19-21'
22-24='22-24'
25-27='25-27'
28-30='28-30'
31-33='31-33'
34-36='34-36'
37-39='37-39';
```

```

40-42='41-42'
43-45='43-45'
46-48='46-48'
49-51='49-51'
52-54='52-54'
55-57='55-57'
58-60='58-60';

```

```

DATA MALE; SET ARMY;
IF SEX=1;

```

```

PROC FREQ;
TABLES RET*CT1*PF3;
FORMAT RET RACE. CT1 CT1M.;
TITLE MALE BY RACE / CT1;
PROC FREQ;
TABLES AGEE*CT1*PF3;
FORMAT AGEE AGE. CT1 CT1M.;
TITLE MALE BY AGE AT ENTRY / CT1;
PROC FREQ;
TABLES AFQTG*CT1*PF3;
FORMAT AFQTG AFQTGP. CT1 CT1M.;
TITLE MALE BY AFQT GROUPS / CT1;
PROC FREQ;
TABLES EDL*CT1*PF3;
FORMAT EDL ED. CT1 CT1M.;
TITLE MALE BY EDUCATION LEVELS / CT1;
PROC FREQ;
TABLES RET*CT2*PF3;
FORMAT RET RACE. CT2 CT2M.;
TITLE MALE BY RACE / CT2;
PROC FREQ;
TABLES AGEE*CT2*PF3;
FORMAT AGEE AGE. CT2 CT2M.;
TITLE MALE BY AGE AT ENTRY / CT2;
PROC FREQ;
TABLES AFQTG*CT2*PF3;
FORMAT AFQTG AFQTGP. CT2 CT2M.;
TITLE MALE BY AFQT GROUPS / CT2;
PROC FREQ;
TABLES EDL*CT2*PF3;
FORMAT EDL ED. CT2 CT2M.;
TITLE MALE BY EDUCATION LEVELS / CT2;
PROC FREQ;
TABLES RET*CT3*PF3;
FORMAT RET RACE. CT3 CT3M.;
TITLE MALE BY RACE / CT3;
PROC FREQ;
TABLES AGEE*CT3*PF3;
FORMAT AGEE AGE. CT3 CT3M.;
TITLE MALE BY AGE AT ENTRY / CT3;
PROC FREQ;
TABLES AFQTG*CT3*PF3;
FORMAT AFQTG AFQTGP. CT3 CT3M.;
TITLE MALE BY AFQT GROUPS / CT3;
PROC FREQ;
TABLES EDL*CT3*PF3;
FORMAT EDL ED. CT3 CT3M.;
TITLE MALE BY EDUCATION LEVELS / CT3;
PROC FREQ;
TABLES GEO*CT1*PF3;
FORMAT CT1 CT1M.;
TITLE MALE BY GEO / CT1;
PROC FREQ;
TABLES GEO*CT2*PF3;
FORMAT CT2 CT2M.;
TITLE MALE BY GEO / CT2;
PROC FREQ;
TABLES GEO*CT3*PF3;
FORMAT CT3 CT3M.;
TITLE MALE BY GEO / CT3;
PROC DELETE DATA = MALE;

```

```

DATA FEMALE; SET ARMY;
IF SEX=2 & EDL>=3;
  PROC FREQ;
    TABLES RET*CT1*PF3;
    FORMAT RET RACE.;
    TITLE FEMALE BY RACE / CT1;
  PROC FREQ;
    TABLES AGEE*CT1*PF3;
    FORMAT AGEE AGE.;
    TITLE FEMALE BY AGE AT ENTRY / CT1;
  PROC FREQ;
    TABLES AFQTG*CT1*PF3;
    FORMAT AFQTG AFQTGP.;
    TITLE FEMALE BY AFQT GROUPS / CT1;
  PROC FREQ;
    TABLES RET*CT2*PF3;
    FORMAT RET RACE.;
    TITLE FEMALE BY RACE / CT2;
  PROC FREQ;
    TABLES AGEE*CT2*PF3;
    FORMAT AGEE AGE.;
    TITLE FEMALE BY AGE AT ENTRY / CT2;
  PROC FREQ;
    TABLES AFQTG*CT2*PF3;
    FORMAT AFQTG AFQTGP.;
    TITLE FEMALE BY AFQT GROUPS / CT2;
  PROC FREQ;
    TABLES RET*CT3*PF3;
    FORMAT RET RACE.;
    TITLE FEMALE BY RACE / CT3;
  PROC FREQ;
    TABLES AGEE*CT3*PF3;
    FORMAT AGEE AGE.;
    TITLE FEMALE BY AGE AT ENTRY / CT3;
  PROC FREQ;
    TABLES AFQTG*CT3*PF3;
    FORMAT AFQTG AFQTGP.;
    TITLE FEMALE BY AFQT GROUPS / CT3;
  PROC FREQ;
    TABLES GEO*CT1*PF3;
    TITLE FEMALE BY GEO / CT1;
  PROC FREQ;
    TABLES GEO*CT2*PF3;
    TITLE FEMALE BY GEO / CT2;
  PROC FREQ;
    TABLES GEO*CT3*PF3;
    TITLE FEMALE BY GEO / CT3;
PROC DELETE DATA = FEMALE;
//

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REPORT DOCUMENTATION PAGE

1. REPORT NUMBER Unclassified		2. SECURITY CLASSIFICATION OF ABSTRACT	
3. DATE OF REPORT (Month/Year)		4. CONTRACTING ORGANIZATION REPORT NUMBER	
5. AUTHOR (Last Name, First Name, Middle Initial)		6. AUTHORING ORGANIZATION REPORT NUMBER	
7. TITLE (Main Title, Subtitle)		8. PERFORMING ORGANIZATION REPORT NUMBER	
9. AUTHORING ORGANIZATION NAME(S) AND ADDRESS(ES)		10. AVAILABILITY STATEMENT	
11. AUTHOR(S)		12. DISTRIBUTION STATEMENT (If applicable)	
13. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)		14. DISTRIBUTION STATEMENT (If applicable)	
15. SUBJECT TERMS (Primary, Secondary, and tertiary)		16. DISTRIBUTION STATEMENT (If applicable)	

Unlimited

84-9

Development and Validation of Preenlistment Screening Composites for Army Enlisted Personnel

Dona Zimmerman, Ray Zimmerman, William King

Technical

FROM 7/84 TO 7/85

July 1985

Preenlistment Screening; Attrition; Enlistment Suitability

This report describes the results of analyses employed to develop and compare male and female preenlistment suitability screens. The population studied consisted of nearly 300,000 males and 51,000 female Army non-prior-service recruits who enlisted during Fiscal Years 1979 through 1982. Predictor variables considered in the development of the screening composites included educational level, AFQT category, age at entry, race, term of enlistment, and other entry factors known to be related to attrition.

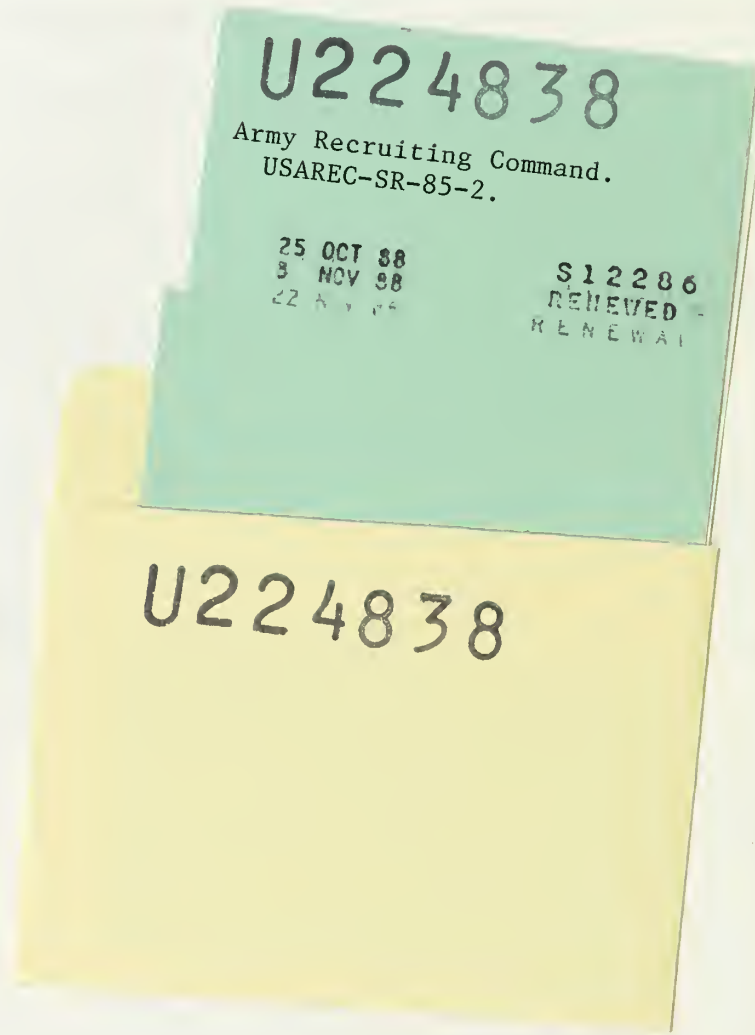
Composite scores predictive of first-term attrition were developed, validated and compared on the basis of stability in cross-validation, ability to minimize error in predicting stayers who actually did not complete the first term of service, and on the cumulative frequency distributions of composite scores. The male and female composites which included race as a predictor provided the most accurate

(cont.)

23. DISTRIBUTION STATEMENT (If applicable)	24. ABSTRACT SECURITY CLASSIFICATION
<input checked="" type="checkbox"/> UNCLASSIFIED <input type="checkbox"/> CONFIDENTIAL <input type="checkbox"/> SECRET	25. ABSTRACT SECURITY CLASSIFICATION

predictions of three-year attrition. Also, the use of these composites in preenlistment screening would result in less adverse impact for population subgroups than would occur through the use of other composites.

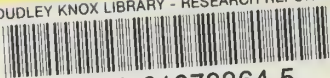
The possible use of a performance screening criterion to estimate an individual's ability to achieve minimally acceptable performance is also discussed.







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