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A VALIDITY STUDY ON
THE AIR FORCE INSTITUTE OF TECHNOLOGY
STUDENT SELECTION CRITERIA
FOR RESIDENT MASTER'S DEGREE PROGRAMS

THESIS

Daniel R. Sny, Captain, USAF

AFIT/GLM/LSR/91S-59

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DEPARTMENT OF THE AIR FORCE
AIR UNIVERSITY
AIR FORCE INSTITUTE OF TECHNOLOGY

Wright-Patterson Air Force Base, Ohio

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A VALIDITY STUDY ON THE AIR FORCE INSTITUTE OF TECHNOLOGY STUDENT SELECTION CRITERIA FOR RESIDENT MASTER'S DEGREE PROGRAMS

THESIS

Presented to the Faculty of the School of Systems and Logistics

of the Air Force Institute of Technology

Air University

In Partial Fulfillment of the

Requirements for the Degree of

Master of Science in Logistics Management

Daniel R. Sny, B.S.

Captain, USAF

September, 1991

Approved for public release; distribution unlimited

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Daniel R. Sny

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Abstract

The purpose of this thesis was to determine the validity of the selection procedures that AFIT uses for admission to their resident graduate programs by discovering if the variables considered by the AFIT registrar's office can predict success at AFIT.

The study was based on a collection of 4507 academic records of US military officers, foreign military officers, and civilians who attended an AFIT resident graduate program from 1975 to 1987. The academic records provided the predictor variables to include each graduate student's undergraduate GPA, standardized test scores, and demographics.

Through correlation analysis, this study examined the relationships between the criterion, which was graduate GPA, and the predictor variables. The entire sample was analyzed and then divided by academic program to determine predictor suitability across all programs.

The study found that all predictors were significantly correlated with graduate GPA. The study also found that the predictors were not equally weighted across all academic programs. Prediction models were developed using significantly correlated predictor variables for each academic program. Graduate students should be selected within each academic program based on the models developed.

A VALIDITY STUDY ON THE AIR FORCE INSTITUTE OF TECHNOLOGY STUDENT SELECTION CRITERIA FOR RESIDENT MASTER'S DEGREE PROGRAMS

I. Introduction

General Issue

Education is the means by which a profession enhances the capability of its personnel. The level of formal education is specific to the profession and the level of expertise demanded from within the field. In a profession where the level of expertise is vital to the national defense, as in the Profession of Arms, there cannot be enough emphasis placed on the ability of the personnel to demonstrate competence.

Within the Profession of Arms, the individual men and women of the United States Air Force have been leaders in innovative technology and the management of that technology. The exponential pace of technological growth experienced in the world today demands the United States Air Force exploit those advances to deter military aggression and remain a viable tool in support of the United States' national objectives. Realizing this necessity, the United States Air Force recognized the need for continuing professional managerial and technical education. The Air Force Institute of Technology (AFIT) is the product of that recognition. It is here where Department of Defense employees can gain undergraduate and graduate education in management, engineering and other Department of Defense related professional fields.

The mission of AFIT, as stated in its current catalog is, "to support national defense through graduate and professional education and research programs" (Air Force Institute of Technology, 1989, p. 2). One way they obtain this goal is by offering 24 different degrees (Air Force Institute of Technology, 1989, p. 5), in various managerial and technical disciplines, through graduate resident study at the Institute. Because of the unique nature of AFIT, its resident graduate students receive a blending of formal graduate education specialized to the profession each student is being prepared to practice once he reenters the mainstream Department of Defense.

The admissions requirements at AFIT are stringent for the purpose of maximizing the combination of tax dollars to future professional output. Student selection procedures and individual requirements for each program differ slightly. United States Air Force officers, for example, are selected for AFIT programs by the Air Force Military Personnel Center. Their selection is from a pool of individuals, "who are academically eligible," and fulfil, "other criteria such as officership, AFSC (Air Force Specialty Code), eligibility for PCS (Permanent Change of Station), time on station, etc." (Air Force Institute of Technology, 1989, p. 10). Though slightly different selection processes are used for resident graduate students by other services and the Department of Defense for civilian employees, the academic requirements imposed by the Air Force Institute of Technology registrar's office are consistent. They specify the minimum requirements are an undergraduate grade-point-average of 2.5 on a 4.0 scale and either a Graduate Record Examinations verbal and quantitative score totalling at least 1000, or a Graduate Management Admissions score of at least 500 (Van Scotter, 1983). Undergraduate grade-point-average has been used as a criterion for admission to graduate school for many years (Breaugh & Mann, 1981; Omizo & Michael, 1979; Lewis, 1964). It has been logically related to potential graduate success. Research on this issue is divided. Findings on the predictive validity of undergraduate grade-point-average to graduate grade-point-average have reported correlations as high as .69 (Omizo & Michael, 1979). On the other hand, some researchers have concluded that undergraduate grade-point-average shows no significant relationship to graduate grade-point-average (e.g., Lewis, 1964). Undergraduate academic institutions emphasize different areas of study resulting in varied curricula. This lack of standardization effects the predictive validity of undergraduate grade-point-average for graduate grade-point-average since curricula vary across schools. This unquantifiable variation clearly calls for the use of standardized testing to enhance graduate admission criteria. The Graduate Record Examinations and the Graduate Management Admissions Test were developed to address this problem.

When the predictive ability of undergraduate grade-point-average to graduate grade-point-average became suspect, several studies investigated the alternative of pairing undergraduate grade-point-average with standardized test scores.

Early work by Jenson (1953) was aimed at increasing the predictive ability of undergraduate grade-point-average to graduate grade-point-average by pairing it with several standardized tests. These included the Miller Analogies Test, the Iowa Mathematical Aptitude Test, and the Cooperative Reading Comprehension Test. Using University of Pittsburgh graduate students from several disciplines, he concluded that undergraduate grade-point-averages paired with standardized test scores significantly improved the prediction of graduate grade-point-averages of his subjects.

Likewise, Sisson and Dizney attempted to increase the predictive power of undergraduate grade-point-average to graduate grade-point-average by pairing it with the Pharmacy College Admission Test for entering pharmacy students. Through the use of stepwise regression techniques with several possible predictors, they concluded that entering grade-point-average and the Pharmacy College Admission Test scores were indeed more accurate predictors of success than entering grade-point-average alone (Sisson & Dizney, 1980).

The Educational Testing Service (ETS) has determined through several years of research on standardized tests that the best predictor for grades in graduate management school are a combination of the Graduate Management Admissions Test and undergraduate grade-point-average (Educational Testing Service, 1982b). Even after these findings, the ETS stresses that it is still important to, "establish the relationship between GMAT scores and performance in your graduate management school. . ." (Educational Testing Service, 1982b, p. 5).

Though many other studies researching this area resulted in similar findings, some interesting side issues were discovered. Travers and Wallace (1950) discovered not only the increased predictive power of adding standardized tests to the equation, but greater predictive gains when portions of the standardized tests were weighted for different areas of study. In other words, they could maximize their prediction accuracy for different academic groups if they weighted portions of the test before they totaled their scores. Research in this area suggests scores on appropriate sub-areas of standardized tests should be given more consideration when attempting prediction of success of graduate students depending on the area of study the prospective student is aimed toward.

Problem Statement

Air Force Institute of Technology master's degree applicants are chosen for resident graduate programs primarily based on Graduate Record Examinations test scores, Graduate Management Admissions Test scores, and undergraduate grade-point-average. The cost of the graduate program per student, makes the AFIT selection criteria of interest to taxpayers, and the services that expect professional returns from the graduates.

The problem is that the combination of principal variables considered for an applicant's admission to a particular AFIT resident program may not be the best predictors of success for that program. Since Graduate Records Examinations/Graduate Management Admissions Tests test scores and undergraduate grade-point-averages are the primary admission criteria for all the resident programs, AFIT's current admission procedures require study to determine the legitimacy of this practice. This research may provide valuable insight to enhance the Air Force Institute of Technology's selection procedures or it may conclude that the current procedure is sound. The main purpose of this research is to determine the criterion-related validity of the Graduate Record Examinations and the Graduate Management Admissions Tests, along with other variables, as predictors of success in the resident master's program at the Air Force Institute of Technology. As done in past research in this area (Van Scotter, 1983), the Air Force Institute of Technology's selection process was reviewed to determine its validity. The result of this research will be prediction models for this process. The model's effectiveness will be compared to past admissions decisions to determine the accuracy of the Air Force

Institute of Technology's admission procedures.

<u>Background</u>

The use of standardized tests, like the Graduate Record Examinations and the Graduate Management Admissions Test, allow graduate admissions committees to discriminate among applicants on a common scale. The criterion-related validity of these tests in predicting educational success has been investigated for decades (e.g., Roscoe & Houston, 1969).

The Graduate Record Examinations and the Graduate Management Admissions Test are used to judge the potential of prospective graduate students in graduate schools throughout the world. Institutions make the decision to administer one if not both of the tests. The student applies directly to the Educational Testing Service to take the test at the institution of his choice and requests that a copy of the particular test be sent to the test site. The institution requests information from the Educational Testing Service concerning the reliability and validity of the tests.

These two tests utilize scaled scores. The purpose of using scaled scores is to gain the ability to compare scores from different versions of the test as they evolve over time (Schrader, 1979). The Graduate Management Admissions Test, for example, is scaled against the group it was originally administered to in 1955. Their scores were adjusted or "scaled" so that a score of 30 on either the quantitative or verbal or a total score of 500 was the average for the group. Also the scales were set so that 67% of the group scored between 22 and 38 on the verbal and quantitative portions and between 400 and 600 in total. Over time, individuals taking the test also have their scores scaled to these original levels. The Educational Testing Service confirms that scores earned on different versions of the test taken at different times are comparable when measurement error is considered (Educational Testing Service, 1982a).

The Graduate Record Examinations and the Graduate Management Admissions Test were both designed for specific purposes. The Graduate Record Examination was designed to measure an individual's ability to learn. It is an aptitude test. The Graduate Management Admissions Test, in contrast, was designed to measure the amount of information an individual possesses in more specific areas than the Graduate Record Examination. It is more of an achievement test. The two tests are very similar even though they have underlying differences. This similarity allows graduate schools to choose either or accept both as an admission requirement.

The Graduate Record Examination is divided into verbal, quantitative, and analytical sections. The verbal and quantitative sections are designed to measure an individual's aptitude in these areas. The analytical section measures the ability to logically reason by asking the individual to analyze situations and reach logical conclusions. The Graduate Management Admissions Test includes verbal and quantitative sections, but no analytical portion. As mentioned earlier, the Educational Testing Service advises graduate institutions to research and understand the relationship between the test scores and performance in their particular institution. They also stress that no one single test accounts for enough variance in its criterion, so several sources should be evaluated while screening graduate school applicants (Educational Testing Service, 1982a).

Other sources, besides undergraduate grade-point-average, may be qualitative and highly subjective in nature making them difficult to compare across a large group with diverse backgrounds. This accounts for the attractiveness of using standardized test scores. Any graduate institution can use the Graduate Record Examination or the Graduate Management Admissions Test scores to rank their applicants although admission decisions are not usually made solely from this information. Evaluation of written recommendations, past personal achievement, or other motivational factors may prove difficult. Some research on the use of quantitative and qualitative predictors of success in graduate programs has concluded there is a relationship between qualitative predictors and specific success criteria, but not to a statistically significant level (e.g., Lewis, 1964). This suggests qualitative measures do deserve consideration, but to what extent may not be clear. Shooster (1974) applied general system theory principles to the problems of test measurement and speculated that individuals cannot be evaluated only by quantitative testing measures since the individual is part of a system composed of inseparable quantitative and qualitative variables.

Studies on enhancing prediction of success in graduate school, through combinations of quantitative and qualitative predictors, are numerous. Quantitative predictors, such as Graduate Record Examination and Graduate Management Admissions Test scores, have been evaluated and refined to ensure their usefulness as predictors in this equation. The usefulness of a quantitative measure can be evaluated through its reliability and validity.

Reliability

The reliability of a measurement tool is its ability to consistently measure something over time. The reliability coefficient, as described by Dick and Hagerty is, "a statistic which is of importance to the test user, a statistic which will be important in the consideration of the usefulness of the test" (1971, p. 63). High reliability provides the users of the test with confidence that it will in fact consistently measure over time. By definition then, it actually reflects to what extent the test instrument is susceptible to random error. Minimizing the influence that random error has on the test instrument is the goal of instrument design. Dick and Hagerty (1971) refer to reliability as, "trustworthiness." They say it should answer the question: "Is the score which I have just obtained for student x the same score I would obtain if I tested him tomorrow and the next day and the next day?"

The reliability of a test instrument can be determined by correlating students' test scores with their scores on an identical test or a very similar test. That correlation coefficient can then be used to estimate the degree to which a group of test takers will obtain the same test scores when similar tests are taken. For example, if a group of test takers obtained exactly the same scores on the two similar tests, the reliability coefficient would be 1.00 because the second set of test scores were identical to the first. The Educational Testing Service is the organization that develops the Graduate Record Examination and the Graduate Management Admissions Test. They also do the reliability testing and have reported reliability higher than .90 for several years on both the Graduate Record Examination and the Graduate Management Admissions Test (Van Scotter, 1983; Buckley, 1989). These reliability figures reflect the reliability coefficients of the sub-sections that comprise both the Graduate Record Examination and the Graduate Management Admissions Test. Each sub-section reliability coefficient and the reliability coefficient associated with the total test score must be estimated to ensure that their relationship to a criterion variable can be properly interpreted.

Reliability can be estimated using either the test-retest method, the alternate forms method, or the split-half method (Dick & Hagerty, 1971).

The test-retest method is simply a correlation of the scores obtained from two administrations of the same test using the same subjects. The Product-moment correlation formula is used to compute correlations between two sets of test scores:

$$r=\frac{(N\Sigma XY-\Sigma X\Sigma Y)}{\sqrt{[(N\Sigma X^2-(\Sigma X)^2][N\Sigma Y^2-(\Sigma Y)^2]}} \tag{1}$$

where:
N=number of paired test scores
X=item score from first administration
y=item score from second administration

(Dick & Hagerty, 1971, p. 27)

When using this method to estimate instrument reliability, consideration must be given concerning the impact a subject's memory may have on the second set of test scores. Depending on the test content, Dick and Hagerty cite anywhere from one day to one year as a reasonable period between the test and retest (1971).

To minimize the effect that subject memory can have on the above estimation method, the alternative forms method can be used. This method is the same as the test-retest method except two similar versions of a test are used instead of the identical test being administered twice. Even though this method may better reflect the true differences in the abilities and characteristics of the subjects, the test-retest method and alternative-forms method both suffer from the effects of subject boredom and fatigue (Dick & Hagerty, 1971).

The split-half method seems unique because it requires the test instrument to be administered only once. In reality though, it resembles the alternate-form method. A single test is evenly divided then statistical methods are used to determine the internal consistency of the instrument after correlating scores from each half. The concept behind this method is that temporary environmental factors inducing errors between administrations can be minimized if a reliability coefficient can be determined from a single administration.

When the split-half method is used to estimate a correlation coefficient it is important to remember that the product-moment correlation calculated must be adjusted by the Spearman-Brown formula:

$$r_{tt}=\frac{nr_{11}}{1+(n-1)r_{11}} \qquad (2)$$

where:
n=total items on desired test/total items on original test
r_{11}=reliability of original test

(Dick & Hagerty, 1971, p. 28)

This is because when the split-half method is used, each subject's test score is based on one-half of the items on the test. Dick and Hagerty illustrate this in the following example:

> Therefore the correlation between the split-half scores on a 50-item test is based on two 25-item tests. This correlation equals r_{11}; the original test length upon which r_{11} is based is 25 items; the desired length of the test is 50 items (p. 28, 1971).

The Spearman-Brown formula is based upon the basic test theory equation:

$$X_0=X_t+X_e \qquad (3)$$

where:
X_0 = subject score
X_t = true score
X_e = score error

(Dick & Hagerty, 1971, p. 10)

The above equation explains that any subjects' test score is a function of ability and error. The split-half method capitalizes on the concept that while the true score is doubled when a subject completes the halves, the random error associated with each half is counteractive and produces a total variance around zero (Buckley, 1989). When using the split-half method though, the reliability of the differences between test scores can be questioned. Even if the scores from each half are reliable, they may be highly correlated if they measure the same thing since they are subsets of the same test. Cronbach has found that the reliability of the differences between two test scores will be decreased if the correlation between the scores is high. To estimate the reliability of the differences between test scores suffering from this problem, he developed the following formula:

$$r_{diff}=\frac{r_{AA}+r_{BB}-2r_{AB}}{2-2r_{AB}} \tag{4}$$

---

where:
r_{AA}=reliability of subtest A
r_{BB}=reliability of subtest B
r_{AB}=correlation between test scores

(Cronbach, 1973, p. 287)

Validity

The validity associated with a test instrument reflects the extent to which that instrument measures what it was designed to measure. A test can be very reliable but invalid if it consistently measures something that it was not designed to measure. It would be both reliable and valid if that "something" were to be measured by design.

Validity can be distinguished into three distinct types: content, construct, and criterion-related validity.

Content validity is described by Womer as, "a judgement as to whether a test, as a composite of the items in that test, is directly measuring some attribute(s) deemed to be of importance to the judge or to some other potential user (1968, p. 49). In other words, this concept is concerned with how well the test score reflects the subject's knowledge level in the subject the instrument was designed to test; content validity reflects the quality of an instruments' direct measurement of acquired knowledge.

Construct validity is not concerned with direct measurement, but the indirect measurement of some personal construct or attribute. A subject completing an instrument with high construct validity will be presented with a score that accurately reflects an inference about some quality the test was designed to measure. Standard constructs include, e.g., intelligence, introversion, and abstract reasoning (Womer, 1968).

Criterion-related validity is the underlying concept in the relationship between predictors and criteria. Criterion-related validity is a combination of concurrent and predictive validity. Its main concern is how well an instruments' score correlates to some future criterion defining success. Concurrent validity relates to a test scores' ability to reflect targeted performance in the present. Like concurrent, predictive validity relates to the same, but in the future. The two are combined in criterion-related validity. The focus is then shifted away from the time difference and toward the actual relationship between the test score and the criterion of success (Womer, 1968).

The criterion of success is some targeted performance that will take place in the future. Womer (1968) reports that graduate grade-point average, successful completion of a graduate program, and non-graduation have often been criteria used by schools to predict academic success of future students in consideration for admission.

The relationship between a predictor and the criterion results in a validity coefficient. It has a range from negative one to positive one. A validity coefficient of zero implies that the relationship between the predictor and the criterion is non-existent. Use of this relationship to predict future success for student admissions would result in the same amount of success from selecting students totally at random. A correlation of positive one and negative one is perfect positive and negative correlation, respectively. Such a perfect correlation between a predictor and criterion would enable an admissions committee to select students based on that predictor alone while being assured of total predictive success.

The reason for determining the correlation between a predictor and criterion is that it enables the prediction of the future event of interest better than could be predicted by pure chance. An increase in selection accuracy is assured when using a predictor that has a positive correlation with the criterion of success. Chronbach found that users of validity coefficients to predict success needed to assess the cost associated with the testing and determination of those coefficients when compared to how well they actually improved student selection (1973).

Others have written about the problems with evaluating and using validity coefficients to predict success. Womer (1973) states that improvement of selection should be the goal because perfect prediction is not possible. Validity coefficients are reported to usually be less than .60 in reality (Van Scotter, 1983). This can result from sampling problems. Chronbach (1970) and Womer (1973) both discuss sampling problems in relation to determining and evaluating a criterion-related validity coefficient. The main problem is that selection happens after a test score is recorded and before the criterion is recorded. This results in decreased correlation coefficients due to the decrease in the group variability. Womer states that, "the best way to get an unbiased estimate of the predictability of a test is to use it with all eligible students, make no selections, and then correlate it with a criterion measure secured for all eligible students" (p. 60, 1973). Even though Womer admits this is nearly impossible, Chronbach also says that validity coefficients are greater in groups that are more diverse in levels of ability. Narrower ranges result in lower validity coefficients because it becomes more difficult to record the differences between individual members within groups (Chronbach, 1973).

This is a common phenomenon referred to as restriction of range. It occurs when a smaller and more homogenous sample of a population is compared to the larger, more heterogenous, population itself. The entire process of selecting and accepting graduate students from all who apply inherently suffers from restriction of range. The goal of the process is to discriminate one individual from another until all chosen individuals possess a predetermined set of characteristics - making them a homogeneous group by definition. Graduate schools restrict their range during selection by not selecting applicants with low standardized test scores. It is also possible that the poorer students of the population never took the standardized test which could further contribute to the homogeneity of the admitted group (Kingston, 1979; Buckley, 1989). When estimating validity coefficients between test score predictors and academic success criteria, like Graduate Record Examination scores to graduate grade-point averages, the range restrictions in graduate students can result in artificial coefficients that will be lower than those found in the population. To compensate for these lower correlations research has found that combining standardized test scores with other factors in a prediction model can improve validity coefficients (Buckley, 1989; Van Scotter, 1983).

High validity coefficients are more likely when a large heterogeneous group is measured over a wide range of predictors and criteria.

<u>Predictors</u>

For many years researchers have attempted to validate predictors of success for graduate school. The majority of the research centers around standardized test scores as the predictors. This research includes work done by Covert & Chansky (1975), Mehrabian (1969), Borg (1963), and Camp & Clawson (1979).

A synopsis of 12 studies that investigated Graduate Record Examination Scores as predictors of success in graduate school was published by Thacker & Williams (1974). They reported that the "wide usage of the GRE as a selection instrument must be questioned" due to the reported correlation coefficients being so low (p. 943). They went on to state that the validity of the test and this practice must be further examined. They did acknowledge however that the results may be partially due to using graduate grade-point average as the criterion, but the use of an alternate criterion did not necessarily increase the correlation coefficients. They felt investigation of predictors other than standardized test scores was warranted.

Other studies have explored combinations of different predictors in addition to standardized test scores. Payne, Wells & Clarke (1971) used Miller Analogies Test scores, undergraduate grade point average, the National Teacher

Examination scores as predictors in addition to Graduate Record Examination scores. They found these predictors significantly correlated to their criteria of success in certain subgroups within their sample.

Lent, Aurbach & Levin found significance, which they termed "Significant Batting Averages," between their predictors and matched criteria to include, "General Mental Ability with Achievement (.98), Aptitude with Achievement (.97), Special Mental Ability with Achievement (.86), and General Personal Information with Supervisor's Evaluation (.24)" (1971, p.525).

Hountras (1957), in studying foreign students, examined predictors such as: sex, age upon admission, marital status, degree held at admission, and admission with or without financial aid. He found the last three to be significantly related to academic achievement.

The variety of predictors are as numerous as the studies. Discussions often recommend the need to develop multiple regression models in order to weight all the predictors found to be significantly correlated with the chosen criteria. Mehrabian, remarked in his research, "Also, results of the regression analysis provide a basis for differential weighting of the various criteria in attempts at assessing a candidate's promise in graduate studies" (1969, p 418).

Van Scotter (1983) and B[illegible] (1989) used standardized test scores as well as other predictors in trying to increase predictive ability when studying military officers in graduate school. Other predictors included: undergraduate grade-point average, number of years commissioned service, number of years enlisted service. They both found correlation coefficients that were significant, but stated that additional research was warranted.

Criteria

In order to determine the criterion-related validity of chosen predictor variables, the most appropriate criterion must be chosen. Properly doing this may be the most difficult and important step in validation studies (Chronbach, 1973; Furst, 1950). Graduate grade-point average has been used as the principal definition of "academic success" in a majority of the studies in this field (Michael, 1965; Thacker & Williams, 1974; Mehrabian, 1969; Camp & Clawson, 1979; Covert & Chansky, 1975). Researchers propose reasons for this include: graduate grades are easily attainable, they reflect the institutions' assessment of the students' performance, and they are consistent over time within graduate institutions (Hartnett & Willingham, 1979; Michael, 1965). Thacker and Williams (1974) noted that a few of the studies they reviewed used other than graduate grade point average as their criterion. Other criterion included ratings from faculty and comprehensive exams that were used for a pass/fail determination on doctoral students. They also cautioned future researchers on the drawback of using a criterion that may be knowingly restricted in range while citing that graduate grades are usually A's or B's. As previously stated though, they did not necessarily find correlation coefficients increasing when they changed the criterion to a variable other than graduate grade-point average.

Furst also agrees that graduate grade point average is the most popular criterion variable, but he feels that it is limited in validity:

> A grade in a course or program is, after all, a kind of summary evaluation which indicates the over-all success of the student. Such evaluations have some usefulness in prediction studies but, in general, suffer from the limitations of not being analytic, since they do not indicate the extent to which each one of a comprehensive array of desired outcomes has been achieved by individual students. . . Instead of describing the pattern of achievement over the various instructional objectives, it yields only a conglomerate the parts of which are rather non-descript (1950, p.649).

Though he is very critical of graduate grade-point average as a criterion of success, he does not offer a substitute. He makes the point though that each graduate school needs to "empirically validate" their selection procedures, along with their chosen predictors and criteria. This is so they will not assume selection procedures used at other institutions should be duplicated at their institution.

<u>Research Hypotheses</u>

1. Correlations of predictor variables with Graduate GPA vary between AFIT master's degree programs with some statistical differences between the programs themselves (Van

Scotter, 1983).

2. Multiple regression models developed for graduate degree programs differ in actual predictor sets.

3. GRE scores, GMAT scores, and undergraduate GPA (UGPA) are valid predictors of AFIT graduate student GPA (GGPA).

4. Demographic variables enhance the accuracy of at least one prediction model.

5. This study's predictors can be combined into models which produce significant results.

II. Methods

Subjects

The subjects of this study are the resident master's degree students at the Air Force Institute of Technology between 1975 and 1987. Included are military officers, civilians, and foreign officers who were students in the School of Engineering and the School of Systems and Logistics over this time period. The total sample size is 4507.

Predictor Variables

Based on information obtainable from the Air Force Institute of Technology registrar's office, the following 12 variables have been selected for research as predictors of graduate success.

GMTT. This is the total scaled score between the verbal and quantitative sections on the Graduate Management Admissions Test. It has a range from 200 to 800 even though scores below 300 and above 700 are reportedly rare (Educational Testing Service, 1982b).

GMTV. This variable is a subject's scaled score on the verbal portion of the GMAT. It's range is from 0 to 60 with scores below 10 and above 46 being rare.

GMTQ. This is the GMAT quantitative scaled score. The GMAT quantitative scaled score is subject to the same range as the GMTV.

GRET. This variable designates the total of the verbal and quantitative portions of the Graduate Record

Examinations score. Its maximum value is 1600.

GREV. This is the GRE verbal score. Its mean is 500 with a maximum of 800.

GREQ. This is the GRE qualitative score. It has the same characteristics as GREV.

GREA. This is the GRE analytical score. It also has the same characteristics as GREV.

EYRS. This variable identifies the total enlisted years of service of those students who were prior enlisted.

CYRS. Commissioned years of service is designated by this variable. This is the total time accumulated by military officers at the time they entered the resident graduate program.

UGPA. This variable is the subject's undergraduate grade-point-average. It is on a 4.00 scale.

AGE. This is the age in years of a subject at the start of his AFIT program.

It should be noted that not until after October 1, 1981 was the maximum score for the verbal, quantitative, and analytical portions of the Graduate Record Examination limited to 800 each. Scores before this date could be greater than 800, but this occurrence was rare (Buckley, 1989).

There are several missing values for the above variables due to uncontrollable factors which made them unavailable for collection. For example, many of the foreign students did not receive an UGPA. Their academic institutions gave them a "passing" grade based on a comprehensive exam. Also, the Air Force Institute of Technology requires an applicant to take either the Graduate Record Examination or the Graduate Management Admissions Test. Only 248 of 4507 in the sample completed both.

Criterion Variable

This thesis used graduate grade-point average as its criterion variable. As cited in the literature review, it has its limitations, but it is the most common criterion variable used in validity studies. Ratings from the subject's professors or job performance measured after completion of the graduate program were possible criteria as shown in other studies (Furst, 1950; Hartnett & Willingham, 1979).

Professor ratings would also be difficult to use for this particular situation. The Air Force Institute of Technology has a high percentage of military members on its faculty, so obtaining ratings on students from 1975 to 1987 would be impossible due to high faculty turnover. Also, records of job performance assessment would be difficult to use as the criterion variable. The Department of Defense civilians and military officers use two totally different appraisal systems both of which have been criticized as having reliability problems due to inflated ratings. Job performance assessment is not available on foreign students.

Data Collection

All data used for this thesis was obtained from student files in the Air Force Institute of Technology Registrar's office. Student files are kept on all individuals, military or civilian, that have completed education in connection with the United States Air Force. This includes all undergraduate, graduate and post-graduate academic records for individuals attending schools through an Air Force program. All data collected for this thesis was in connection with a student's application and acceptance to the Air Force Institute of Technology. Any other predictor variable data in connection with another Air Force educational program was not collected.

Table 1 provides the descriptive statistics for the predictor variables over the entire sample.

Table I

Descriptive Statistics for Entire Sample

VARIABLE	N SIZE	MEAN	STD DEV	MINIMUM	MAXIMUM
GGPA	4507	3.51	.337	0.0	4.0
UGPA	4278	3.04	.411	1.9	4.0
CYRS	4187	5.93	3.434	0.0	23.0
EYRS	761	6.11	3.385	1.0	16.0
GRET	3113	1199.0	141.568	487.0	1670.0
GREV	3113	536.28	89.552	200.0	870.0
GREQ	3112	663.44	82.761	340.0	870.0
GREA	1667	597.39	98.107	2[illegible]0.0	960.0
GMTT	831	541.16	70.304	275.0	740.0
GMTV	823	31.93	6.225	9.0	52.0
GMTQ	823	32.88	6.437	11.0	54.0
TOEF	61	554.92	64.631	446.0	780.0
AGE	2411	29.52	4.345	20.0	50.0

Appendix A provides the frequency distributions for those same variables. Appendix B provides the descriptive statistics for each graduate program.

Data Analysis

The first step in the analysis was to calculate correlation coefficients in order to identify variable relationships. Correlation matrices were calculated for all the variables over the entire sample and for each degree program. This was done using the SAS System for Elementary Statistical Analysis (SAS), Version 6, PROC CORR program to calculate Pearson's correlation coefficients (Schlotzhauer & Litteli, 1987).

Since the database included only those individuals selected to attend the resident graduate program, the effect of range restriction on the predictor variables must be considered. Thorndike (1949, p.173) offers a corrective algorithm developed specifically to combat this effect:

$$R=\frac{r(y/x)}{\sqrt{1-r^2+r^2(y/x)^2}} \tag{5}$$

where:
x=std dev for restricted predictor variable
y=std dev for unrestricted predictor variable
r=restricted correlation coefficient
R=unrestricted (corrected) correlation coefficient

After the correlation coefficients were corrected, the entire sample was sorted into groups by the specific academic program the student attended. Grouping the entire sample into subgroups has been done in previous criterion-related validity research where the range of the correlation coefficients was great. The wide range of coefficients indicates either problems with small sample instability (Van Scotter, 19[illegible]) or unacceptably low criterion reliability due to differences in departmental grading practices (Buckley, 1989).

Prediction models were calculated using stepwise multiple regression. This was accomplished with the SAS PROC STEPWISE program (Schlotzhauer & Littell, 1987).

This program uses basic regression techniques while taking into account high intercorrelations between the predictor variables themselves. The basic linear regression equation used in the PROC STEPWISE program is:

$$Y=\beta_0+\beta_1 X_1+\beta_2 X_2+\ldots\beta_n X_n \tag{6}$$

where:
Y=dependent variable
x_i=predictor(s)
B_0=Y intercept
B_n=weight of each predictor

Each predictor is weighted based on its correlation with the criterion and its intercorrelation with other predictor variables. In other words, the predictor's weights are directly proportional to their correlation with the criterion and indirectly proportional to their correlation with other predictors. This results in the predictor with the most weight for any given model being that predictor with the greatest validity and the least intercorrelation with other predictors.

High intercorrelation between several predictors, or multi-colinearity, can also induce a blocking effect on the SAS program when it tries to introduce additional predictors. The PROC STEPWISE program in SAS accounts for variables that exhibit multi-colinearity between other predictors and the criterion variable since this can result in an overall artificially low correlation coefficient. Each variable has its weight established during the regression procedure then it is disregarded as the other variables, or predictors, are evaluated. This approach within the PROC STEPWISE program helps identify if there is multi-colinearity between variables and reduce the effect it will have on the regression calculation (Schlotzhauer & Littell, 1987). Based on the correlation coefficients evaluated during the PROC STEPWISE regression program, models for the entire sample and each program were developed and are subsequently presented.

III. Results

Introduction

This chapter presents the results of the statistical analysis described in the previous chapter. All predictors that significantly correlate with graduate grade-point average are presented by graduate program. A prediction model for the entire sample is also presented. The prediction models for each program are in Appendix C.

Correlation Coefficients

Correlation analysis was done over the entire sample. All correlation coefficients related to the Graduate Record Examinations and the Graduate Management Admissions Test were corrected for restriction in range as described in chapter II. Correlation Coefficients are in Table II.

Table II

Correlation Coefficients for Total Sample: Predictors with GGPA

VARIABLE	CORRELATION	N	SIGNIFICANCE
UGPA	0.1912	4278	<0.0001
CYRS	0.0568	4187	<0.0002
EYRS	-0.1611	761	<0.0001
GRET	0.2314	3113	<0.0001
GREV	0.1458	3113	<0.0001
GREQ	0.2413	3112	<0.0001
GREA	0.2929	1667	<0.0001
GMTT	0.3104	831	<0.0001
GMTV	0.3039	823	<0.0001
GMTQ	0.2135	323	<0.0001
AGE	-0.0412	2411	<0.0429
TOEF	0.2991	61	<0.0592

All variables considered were significant predictors of graduate grade-point average. Commissioned years of service correlated positively while enlisted years of service correlated negatively along with age. When considering that all resident graduate students are currently commissioned officers, this would seem to indicate that there is a negative relationship between the age of the students in the resident graduate programs and success as measured by their graduate grade-point average. If age is assumed to be an indication of how long a student had been removed from formal education, it is logical that older graduate students have more difficulties in graduate school than those who were recently undergraduate students.

Table II further indicates that all total and subtotal standardized test scores were significantly correlated with graduate grade-point average for the entire sample. This confirms the concept of using standardized test scores as part of graduate admissions standards. Undergraduate grade-point average is also shown in Table II as being significantly correlated to graduate grade-point average over the entire sample. This would indicate that it too is worthy of consideration by the admissions committee.

The majority of resident graduate students in the sample chose to take the Graduate Record Examinations over the Graduate Management Admissions Test. 3113 of the 4507 member sample, or 69 percent, presented Graduate Record Examinations' test scores in conjunction with their application to graduate school while only 831 students, or 18 percent, show Graduate Management Admissions Test scores in their records. As mentioned previously in Chapter II, only 248 of 4507, or six percent, completed both. Since there are nearly five students in the School of Engineering for every one student in the School of Systems and Logistics, it would be expected that more students in the sample would have taken the Graduate Record Examination. This is because the Graduate Record Examination tests general abilities as opposed to the Graduate Management Admission Test which is more business oriented. But oddly enough, the Graduate Record Examination was also the test of choice in the School of Systems and Logistics. This statistic may be skewed by the fact that engineers are probably more likely to take the Graduate Record Examination and they are often admitted into the School of Systems and Logistics. This is possible because the Air Force Institute of Technology will accept either test for admission to the School of Systems and Logistics. However, 701 of the 823 students that took the Graduate Management Admissions Test, or 85 percent, attended the School of Systems and Logistics.

Table II shows the predictors that correlated strongest with graduate grade-point average were the Graduate Management Admissions Test total score and its verbal subtest score. Since 85 percent of the Graduate Management Admissions Test takers in this sample were students in the School of Systems and Logistics, it is logical that there would be a high correlation between these two predictors and graduate grade-point average. The School of Systems and Logistics, like other graduate management institutions, concentrates on teaching those skills that are qualitative in nature. Usually the better a student is in mastering those skills the better they will perform on graded exercises. This will be reflected in their graduate grade-point average. Since the Graduate Management Admissions Test total score and verbal score also reflect competency in qualitative skills it would be expected that graduate grade-point average and Graduate Management Admissions Test total and verbal scores would be positively correlated.

The third and fourth strongest correlations between the predictors and graduate grade-point average were the Graduate Record Examination analytical score and quantitative score, respectively. The Graduate Record Examination total score was a close fifth and the Graduate Record Examination verbal score was a distant ninth in strength. Following the same reasoning concerning the Graduate Management Admissions Test predictors, the majority of Graduate Record Examination test takers, 1892 out of 3113 (61 percent), were students in the School of Engineering where quantitative abilities are stressed and rewarded with the more competent receiving the better grades. This would account for the positive correlation between these predictors and graduate grade-point average.

Correlation matrices were calculated for each academic program as well as for the entire sample. Significant predictors with their corresponding pertinent information are presented in Table III. Not all predictors are presented for each program. Only those at the alpha=.05 level are presented.

Table III

Significant Predictors for Each Academic Program

Astronautical Engineering (N = 166)

VARIABLE	CORRELATION	N	SIGNIFICANCE
UGPA	0.2341	161	0.0028
GREV	0.3684	137	<0.0001
GREQ	0.4455	137	<0.0001
GREA	0.3710	60	0.0035

Table III (continued)

Aeronautical Engineering (N = 398)			
VARIABLE	CORRELATION	N	SIGNIFICANCE
UGPA	0.3172	371	<0.0001
GREQ	0.2812	282	<0.0001
GREA	0.2412	142	0.0038

Table III (continued)

Computer Science (N = 256)

VARIABLE	CORRELATION	N	SIGNIFICANCE
UGPA	0.2740	243	<0.0001
GRET	0.4313	201	<0.0001
GREV	0.2079	201	0.0031
GREQ	0.4885	201	<0.0001
GREA	0.4583	112	<0.0001
GMTT	0.6847	23	0.0003
GMTV	0.5701	23	0.0045
GMTQ	0.6409	23	0.0010

Electrical Engineering (N = 650)

VARIABLE	CORRELATION	N	SIGNIFICANCE
UGPA	0.3201	621	<0.0001
EYRS	-0.2279	162	0.0035
GRET	0.2298	483	<0.0001
GREV	0.1147	483	0.0117
GREQ	0.2768	483	<0.0001
GREA	0.1754	316	0.0017
AGE	-0.1822	347	0.0007

Table III (continued)

Electro-Optical Engineering (N = 90)

VARIABLE	CORRELATION	N	SIGNIFICANCE
UGPA	0.3222	90	0.0020
GRET	0.3662	52	0.0076
GREV	0.2912	52	0.0362
GREQ	0.3407	52	0.0134

Engineering Physics (N = 211)

VARIABLE	CORRELATION	N	SIGNIFICANCE
UGPA	0.3908	195	<0.0001
CYRS	-0.1400	203	0.0463
GRET	0.1706	157	0.0327
GREQ	0.2191	157	0.0058
GREA	0.3169	76	0.0053
GMTT	0.9191	5	0.0273
GMTQ	0.9864	5	0.0019

Table III (continued)

Nuclear Engineering (N = 123)			
VARIABLE	CORRELATION	N	SIGNIFICANCE
UGPA	0.2783	117	0.0024
GRET	0.4219	92	<0.0001
GREV	0.3273	92	0.0015
GREQ	0.3747	92	0.0002
GREA	0.3519	40	0.0262

Operations Research (N = 193)			
VARIABLE	CORRELATION	N	SIGNIFICANCE
UGPA	0.3840	173	<0.0001
GRET	0.3849	162	<0.0001
GREV	0.2179	162	0.0053
GREQ	0.4649	162	<0.0001
GREA	0.4754	109	<0.0001
GMTT	0.6428	15	0.0098
GMTV	0.5862	15	0.0217
GMTQ	0.7038	15	0.0034

Table III (continued)

Systems Engineering (N = 91)

VARIABLE	CORRELATION	N	SIGNIFICANCE
GRET	0.5860	63	<0.0001
GREV	0.4080	63	0.0009
GREQ	0.5384	63	<0.0001
GREA	0.6493	42	<0.0001

Strategy and Tactics (N = 178)

VARIABLE	CORRELATION	N	SIGNIFICANCE
UGPA	0.3204	177	<0.0001
EYRS	0.5744	20	0.0081
GRET	0.3845	153	<0.0001
GREV	0.3447	153	<0.0001
GREQ	0.2752	153	0.0006
GREA	0.2908	98	0.0037

Table III (continued)

Space Operations (N = 100)			
VARIABLE	CORRELATION	N	SIGNIFICANCE
UGPA	0.4065	95	<0.0001
GRET	0.2236	91	0.0331
GREQ	0.2594	91	0.0130
GREA	0.3380	66	0.0055
AGE	-0.2878	85	0.0076

Guidance and Control (N = 77)			
VARIABLE	CORRELATION	N	SIGNIFICANCE
UGPA	0.3437	72	0.0031
GRET	0.3913	54	0.0034
GREV	0.3289	54	0.0152
GREQ	0.3254	54	0.0154
GREA	0.7741	18	0.0002

Table III (continued)

Reliability Engineering (N = 7)			
VARIABLE	CORRELATION	N	SIGNIFICANCE
GRET	0.9999	3	0.0046

Systems Analysis (N = 48)			
VARIABLE	CORRELATION	N	SIGNIFICANCE
UGPA	0.4246	47	0.0029
CYRS	-0.3165	45	0.0342
AGE	-0.3384	48	0.0186

Table III (continued)

Space Facilities (N = 15)

VARIABLE	CORRELATION	N	SIGNIFICANCE

No significant predictors for this program

Computer Engineering (N = 42)

VARIABLE	CORRELATION	N	SIGNIFICANCE
UGPA	0.4163	42	0.0061
CYRS	-0.3544	40	0.0249
EYRS	0.9878	6	0.0002

Acquisition Logistics (N = 77)

VARIABLE	CORRELATION	N	SIGNIFICANCE

No significant predictors for this program

Table III (continued)

Contracting Management (N = 177)			
VARIABLE	CORRELATION	N	SIGNIFICANCE
GRET	0.2871	75	0.0125
GREQ	0.3890	75	0.0006
GREA	0.4458	34	0.0082
GMTT	0.3388	94	0.0008
GMTV	0.2463	94	0.0167
GMTQ	0.2908	94	0.0045

Facilities Management (N = 137)			
VARIABLE	CORRELATION	N	SIGNIFICANCE
GREQ	0.2382	95	0.0201
GREA	0.4645	39	0.0029

Table III (continued)

International Logistics Management (N = 35)			
VARIABLE	CORRELATION	N	SIGNIFICANCE
UGPA	0.3441	34	0.0463

Logistics Management (N = 834)			
VARIABLE	CORRELATION	N	SIGNIFICANCE
UGPA	0.1840	769	<0.0001
GRET	0.3206	543	<0.0001
GREV	0.2080	543	<0.0001
GREQ	0.3217	543	<0.0001
GREA	0.4382	145	<0.0001
GMTT	0.3788	264	<0.0001
GMTV	0.2923	262	<0.0001
GMTQ	0.3464	262	<0.0001

Table III (continued)

Maintenance Management (N = 87)

VARIABLE	CORRELATION	N	SIGNIFICANCE
UGPA	0.3529	87	0.0008
GRET	0.3919	43	0.0093
GREV	0.5204	43	0.0003
GREQ	0.5281	42	0.0003
GREA	0.5459	34	0.0008

Systems Management (N = 303)

VARIABLE	CORRELATION	N	SIGNIFICANCE
EYRS	-0.6776	49	<0.0001
GRET	0.4254	145	<0.0001
GREV	0.3534	145	<0.0001
GREQ	0.3851	145	<0.0001
GREA	0.3948	90	<0.0001
GMTT	0.4532	157	<0.0001
GMTV	0.3962	155	<0.0001
GMTQ	0.3381	155	<0.0001
AGE	-0.2953	132	0.0006

Table III (continued)

Transportation Management (N = 28)

VARIABLE	CORRELATION	N	SIGNIFICANCE
GRET	0.4882	17	0.0468
GREQ	0.5146	17	0.0345

Cost Analysis (N = 20)

VARIABLE	CORRELATION	N	SIGNIFICANCE
GRET	0.9960	4	0.0040
GREV	0.9960	4	0.0040
GREQ	0.9960	4	0.0040
GREA	0.9960	4	0.0040
GMTT	0.5712	18	0.0133
GMTV	0.5071	18	0.0317

Table III (continued)

Engineering Management (N = 110)

VARIABLE	CORRELATION	N	SIGNIFICANCE
UGPA	0.4297	108	<0.0001
GREQ	0.2189	92	0.0361
GMTT	0.3903	26	0.0487

Supply Management (N = 36)

VARIABLE	CORRELATION	N	SIGNIFICANCE
GMTT	0.4912	24	0.0148
GMTQ	0.6355	24	0.0008

Information Resources Management (N = 20)

VARIABLE	CORRELATION	N	SIGNIFICANCE
GMTT	1.000	4	<0.0001
GMTV	1.000	4	<0.0001
GMTQ	1.000	4	<0.0001

Regression Models

Prediction models were derived for all degree programs with significant predictors using the PROC STEPWISE procedure discussed in chapter II. Since the Graduate Record Examination was the standardized test chosen by the majority of students in both the School of Engineering and the School of Systems and Logistics, all academic program models included the variables associated with that test. However, the Graduate Management Admissions Test takers were almost exclusively students that attended the School of Systems and Logistics. Therefore, the variables associated with that test were included in the models derived for the School of Systems and Logistics programs only. The models for those programs are presented in Appendix C. Appendix D displays a matrix showing which predictors were significant for each academic program.

A model was also developed for the entire sample using the same PROC STEPWISE procedure. It is displayed in the table IV below.

Appendix C shows the diversity between the models for each academic program and the model for the entire sample. The R^2 range for the academic program models is from .9397 for the information resources management program to .1081 for the facilities management program. Since both these programs are in the School of Systems and Logistics, the models from programs in that school have a greater range than the models for academic programs in the School of

Engineering. This is because the students in the School of Systems and Logistics, as a group, have a greater diversity of academic backgrounds when compared to the students in the School of Engineering. The smaller sample sizes within the academic programs from the School of Systems and Logistics also contribute to the broader R^2 range because of the lack of stability small sample sizes can induce.

The R^2 for the model derived for the entire sample was .2095. There were 21 academic program models that had a higher R^2 than that of the model developed for the entire sample. In other words, 80 percent of the academic program models accounted for more variation in the data than the model developed for the entire sample.

Table IV

Prediction Model for GGPA Over Entire Sample

VARIABLE	WEIGHT	SIGNIFICANCE
INTERCEPT	2.1213	<0.0001
UGPA	0.1488	<0.0001
GRET	0.0002	0.0007
GREA	0.0004	<0.0001
GMTT	0.0008	<0.0001
EYRS	-0.0128	<0.0001
AGE	0.0028	0.0251

$R^2 = 0.2095$

IV. Conclusions

Introduction

The hypotheses stated in Chapter I are reviewed along with the supporting evidence from Chapter III. After this, the implications of this research are discussed along with conclusions that are based on the findings.

Hypothesis Review

The first hypothesis is that correlations of predictor variables with graduate grade-point average vary between Air Force Institute of Technology master's degree programs with some statistical differences between the programs themselves (Van Scotter, 1983). As seen in Table III, the correlations between predictor variables and graduate grade-point average vary significantly across Air Force Institute of Technology master's degree programs. Support of this hypothesis is consistent with the findings both Van Scotter (1983) and Buckley (1989).

Many of the degree programs had correlations between predictors and graduate grade-point average that were not significant at the .05 level. For example, the Test of English as a Foreign Language variable (TOEF) correlated with graduate grade-point average, but not significantly over the sample as a whole or in any academic program.

Of the 26 academic programs with significant correlations between predictors and graduate grade-point average, the Systems Management program had the most with nine and Reliability Engineering and International Logistics

Management each had only one significant predictor. Two programs did not have any significant predictors. Interestingly enough, the Astronautical Engineering and Electro-Optical Engineering programs had the same set of significant predictors as did the Computer Science and Operational Research programs. This is not surprising because the skills of the students in these sets of academic programs are likely to be very similar. Even though the significant predictors were the same, the actual correlation coefficients differed.

The second hypothesis states that multiple regression models developed for graduate degree programs differ in actual predictor sets. This hypothesis is also supported as shown in Appendix C.

It is interesting that for each academic program the set of predictors that significantly correlated with graduate grade-point average and the set of predictors that comprise the regression models are not necessarily identical. This is due to the PROC STEPWISE procedure explained in Chapter II. As noted earlier, this procedure considers the intercorrelations between the predictor variables as well as their correlation with the criterion. If several variables are highly correlated with each other in a certain academic program, one or more of them may be dropped from the model during the model calculations. This would explain possible differences between two sets of predictors associated with a given academic program.

The third hypothesis states that GRE scores, GMAT scores, and undergraduate grade-point average (UGPA) are valid predictors of AFIT student graduate grade-point average. This is supported when considering the entire sample as seen in Table II. All of the relationships between standardized test score predictors and the criterion are significant past the 0.0001 level. Also, 21 of the 24 academic programs with significant predictors include some subset of standardized test scores in their predictor sets. Table V gives the details on which predictors were found significant in each AFIT school.

The fourth hypothesis is that demographic variables enhance the accuracy of at least one prediction model. This hypothesis is also supported. In fact, the demographic variables enlisted years of service (EYRS), commissioned years of service (CYRS), and age when entering the Air Force Institute of Technology (AGE), are include as members of the variable sets in 15 out of 26 models calculated. This information is included in Appendix C.

The fifth hypothesis is that this study's predictors can be combined into models which produce significant results. This last hypothesis is supported by the model calculated for the entire sample and the majority of the models calculated for the individual academic programs. Details on all models are in Appendix C.

18 of the 26 models calculated are significant beyond the 0.0001 level. Six of the remaining eight models are

significant beyond the 0.005 level.

The Transportation Management model and the International Logistics Management model are significant at the 0.0383 and 0.0336 levels respectively. The higher significance levels of these models are suspected to be partially due to the sampling bias of the academic program.

Table V

Number of Programs in which the Predictor is Significant

Predictor	AFIT School of Systems and Logistics	AFIT School of Engineering
CYRS	0	3
EYRS	1	3
UGPA	4	13
GRET	6	12
GREV	4	9
GREQ	8	12
GREA	6	10
GMTT	7	3
GMTV	5	2
GMTQ	5	3
AGE	1	3

Discussion

Table V divides the number of programs in which each predictor is significant by the School of Systems and Logistics and the School of Engineering. The numbers presented are based on the 16 programs analyzed in the School of Engineering and the 12 programs analyzed in the School of Systems and Logistics.

In the School of Engineering, UGPA was a significant predictor in 14 of the 16 programs. The two programs in which UGPA was not a significant predictor were the Reliability Engineering program and the Space Facilities program. The characteristics of these programs were based on sample sizes of seven and fifteen respectively. With the variability of grading procedures in undergraduate institutions, sample sizes this small can easily skew the characteristics of any group. It is understandable that a significant correlation between UGPA and GGPA was not found when the analysis was based on such a small sample size.

In the School of Systems and Logistics, UGPA was a significant predictor in only four of the 12 programs. This is a much smaller percentage of programs than in the School of Engineering.

This difference between the two schools could be due to the fact that most of the students in the School of Engineering have undergraduate degrees in engineering and fewer of the students in the School of Systems and Logistics have undergraduate degrees in their graduate area of study. For this reason, one would expect UGPA to significantly correlate with GGPA in a higher percentage of the engineering programs than the programs in the School of Systems and Logistics due to the greater homogeneity of the academic backgrounds of students within in the School of Engineering.

The lack of significance in the UGPA/GGPA relationship in the School of Systems and Logistics by no means indicates that these students do not have the ability to do well in their graduate programs. It only indicates that the lack of exposure in their undergraduate programs to the graduate material presented at the Air Force Institute of Technology makes UGPA a poor predictor of success for graduate students in the School of Systems and Logistics.

The research also indicates that a greater percentage of the programs in the School of Engineering found significant correlations between the Graduate Record Examination predictors and GGPA than the programs in the School of Systems and Logistics. However, in the school of Systems and Logistics, a greater percentage of the academic programs found the predictors associated with the Graduate Management Admissions Test significant than the academic programs in the School of Engineering. This would be expected since the skills to do well on the Graduate Record Examination are similar to the skills necessary to succeed in a graduate engineering school. Likewise for the Graduate Management Admissions Test and success in a graduate management school.

It is interesting that within the School of Systems and Logistics the Graduate Record Examination predictors were significant in comparatively as many academic programs as the Graduate Management Admissions Test predictors. As mentioned earlier, the Graduate Record Examination was overwhelmingly the standardized test of choice for both AFIT schools. Because a large percentage of Systems and Logistics students chose to take the Graduate Record Examination and the research shows significant correlations, it would seem reasonable to use the Graduate Record Examination as a predictor of success even in the AFIT School of Systems and Logistics.

The Graduate Management Admissions Test predictors were found to be significantly correlated with GGPA in only three engineering programs. Those programs are Computer Science (n=23), Engineering Physics (n=5), and Operations Research (n=15). This small number is expected since that test is designed to measure the abilities of a student for study in business and management. However, it is difficult to make conclusions based on the small number of students within these academic programs who accomplished the Graduate Management Admissions Test because the statistics could be skewed.

The students in the Operations Research and Computer Science programs may very well exhibit those abilities that would allow them to score well on the Graduate Management Admission Test. These academic programs require students to have an aptitude in some of the business and management disciplines.

There were only five students who took the Graduate

Management Admission Test in the Engineering Physics program. Due to the small sample size, no real conclusions can be based on the results.

The findings from this study are more significant than just answering questions concerning what academic programs found significant correlations between which predictor variables and GGPA. The analysis generated during this research strongly suggests that the Air Force Institute of Technology needs to consider different predictors for different academic programs.

It is intuitive that Graduate Record Examination scores should be considered when admitting applicants to the School of Engineering and Graduate Management Admissions Test scores should be considered when admitting applicants to the School of Systems and Logistics. But the point is that this is too general of a guideline. This research shows that the subscores of each standardized test do not always follow that intuitive guideline. For example, the analytical score on the Graduate Record Examination is a significant predictor for the Astronautical Engineering, Computer Science, and Engineering Physics programs, but it is not for the Aeronautical Engineering, Electrical Engineering, or Nuclear Engineering programs. This example is common in both schools and the findings echo those reported by others that have conducted similar research at the Air Force Institute of Technology (Van Scotter, 1983; Buckley, 1989).

This implies that different skills are required for success in different academic programs within the two schools themselves. It would seem logical to admit applicants based on standardized test scores that have been empirically linked to success in each program.

The admission committees at the Air Force Institute of Technology could refine the intuitive rules concerning the emphasis placed on Graduate Record Examination and Graduate Management Admissions Test scores submitted by applicants. Instead of taking an macro look at those test scores, they could also consider those subscores that have been shown to significantly relate to the success of students in that academic program. By using the predictive models presented in this research, they could estimate the success of each applicant and make more informed admission decisions while eliminating the use of cut-off scores in their admission policy. Since empirical research is available, the Air Force Institute of Technology registrar's office can refine their selection procedures.

Conclusions

This study indicates that the Air Force Institute of Technology currently admits applicants based on valid predictors of success. The study also shows that the use of all available predictors when considering applicants for admission to various programs is not warranted. Some predictors should be used in certain programs and others disregarded. No two programs should admit applicants based on the same set of predictors. When the relationships were determined between predictors and criterion within each program, it was discovered that the predictive ability of each variable significantly differed from one academic program to the next. The consideration of predictors in the admission process should reflect the established relationships with academic success as described in Table III. Predictive models for guidance in the application of the relationships between predictors and the criterion for each program are presented in Appendix C.

The selection of students for AFIT resident master's degree programs is a complicated process involving both the Air Force Military Personnel Center (AFMPC) and the AFIT registrar's office. Though complicated, the process is sound and the research supports that fact. However, the process can also be improved. Recognizing the real world constraints that the AFIT registrar's office has placed on it by AFMPC, AFIT should still reassess their selection procedure and determine the costs and benefits of changing that process. The selection process as it is now results in less than a one percent of the students not receiving a diploma from AFIT (Buckley, 1989). Obviously, all the students in the resident graduate programs do not graduate with their respective classes, but less than one percent do no graduate at all. This is a phenomenal success rate when considering average resident graduate programs as a whole. Since the success rate is so high, it may not be cost effective to change the applicant selection procedure at the

Air Force Institute of Technology. Instead, the emphasis should be on improving the selection process. New predictors should be tested to determine whether they can improve the predictive ability of the models. Even though the failure rate is very low, it could continually decrease. With every student that fails to graduate, taxpayer's dollars are wasted. With this in mind, further research to continually improve the process is warranted.

Future Research Suggestions

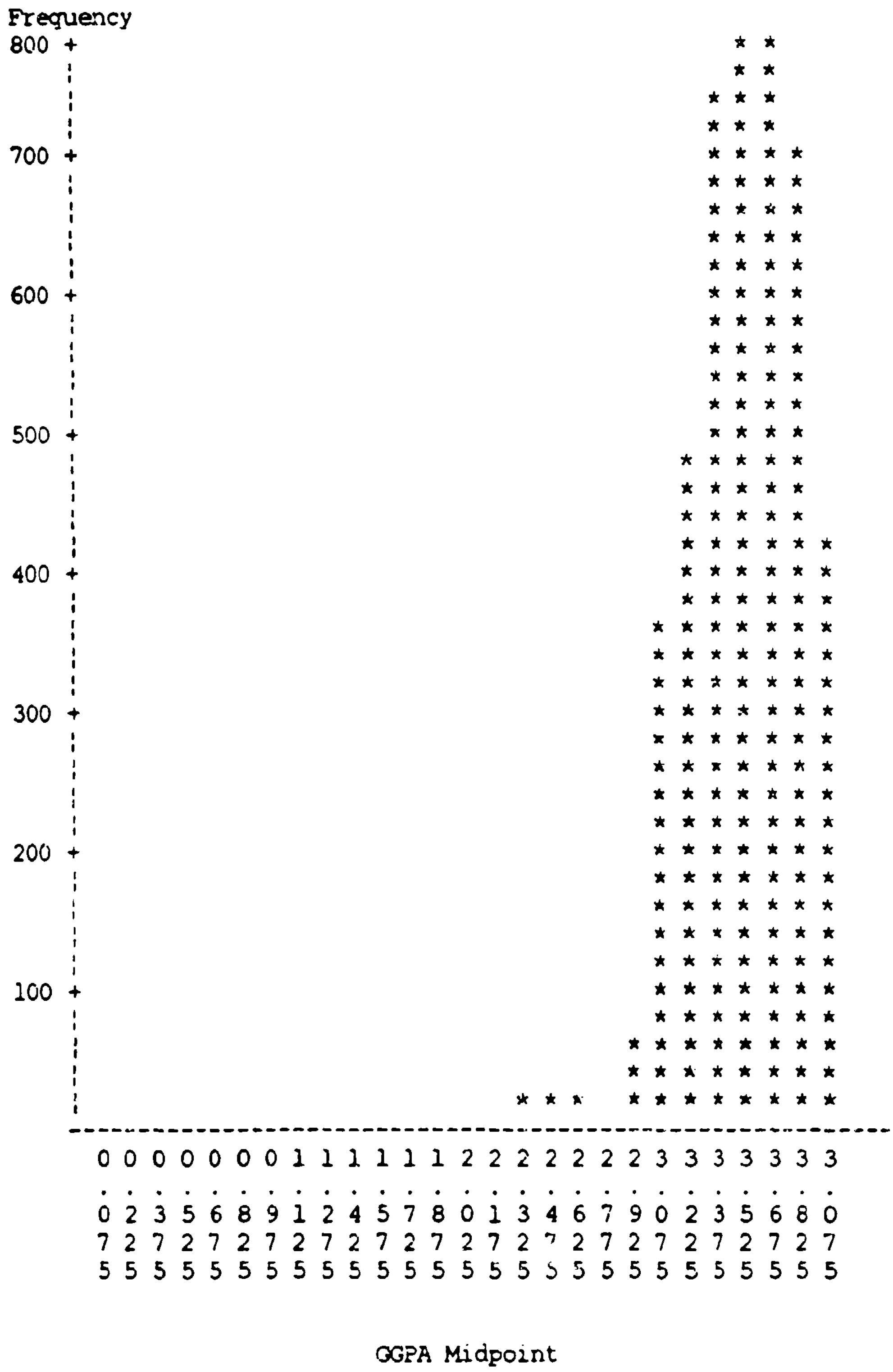
Small sample sizes were a problem in doing this research. This is because if not considered, they can skew statistical analysis and lead to incorrect conclusions. But small sample sizes are part of real world research and they have to be considered. Several of the academic programs had small sample sizes which contributed to reduced model significance and affected correlation coefficients. Research in the future should be reaccomplished as members of academic programs increase over time. Common academic degree types could be grouped together to combat this problem.

Summary

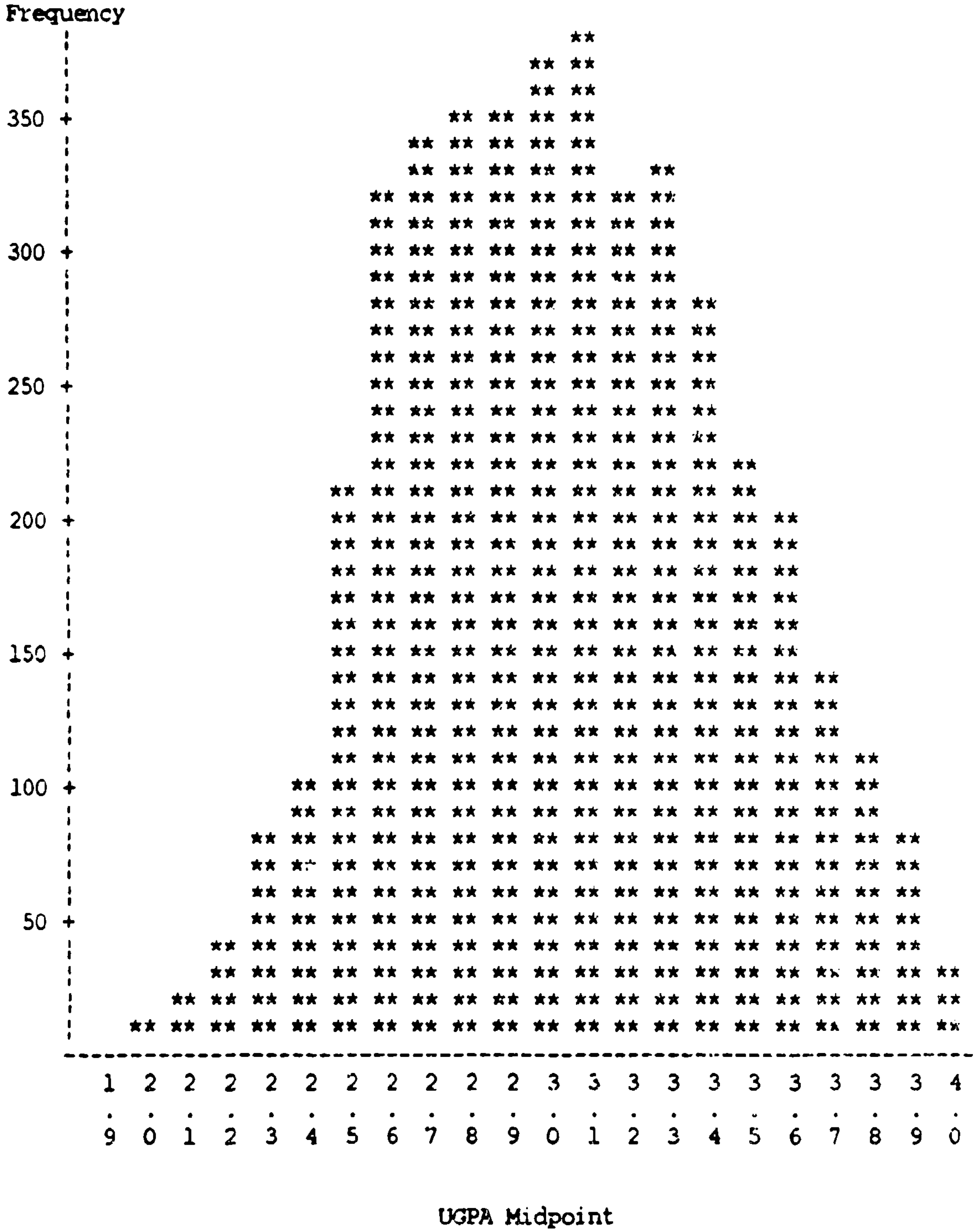
In summary, this thesis provided evidence that student selection to Air Force Institute of Technology resident graduate master's degree programs should be done at the academic program level. The research has shown that there are significant differences in what predicts student success between the School of Systems and Logistics and the School of Engineering as well as _within_ each school. The Air Force Institute of Technology should not use a single set of requirements to assess all applicant. An individual set of significant predictors should be used for each academic degree program when making admission decisions. Until the registrar's office recognizes these programmatic differences, they risk accepting applicants for specific academic programs that may not be as qualified as applicants they have rejected.

Appendix A: Criterion and Predictor Frequency Distributions

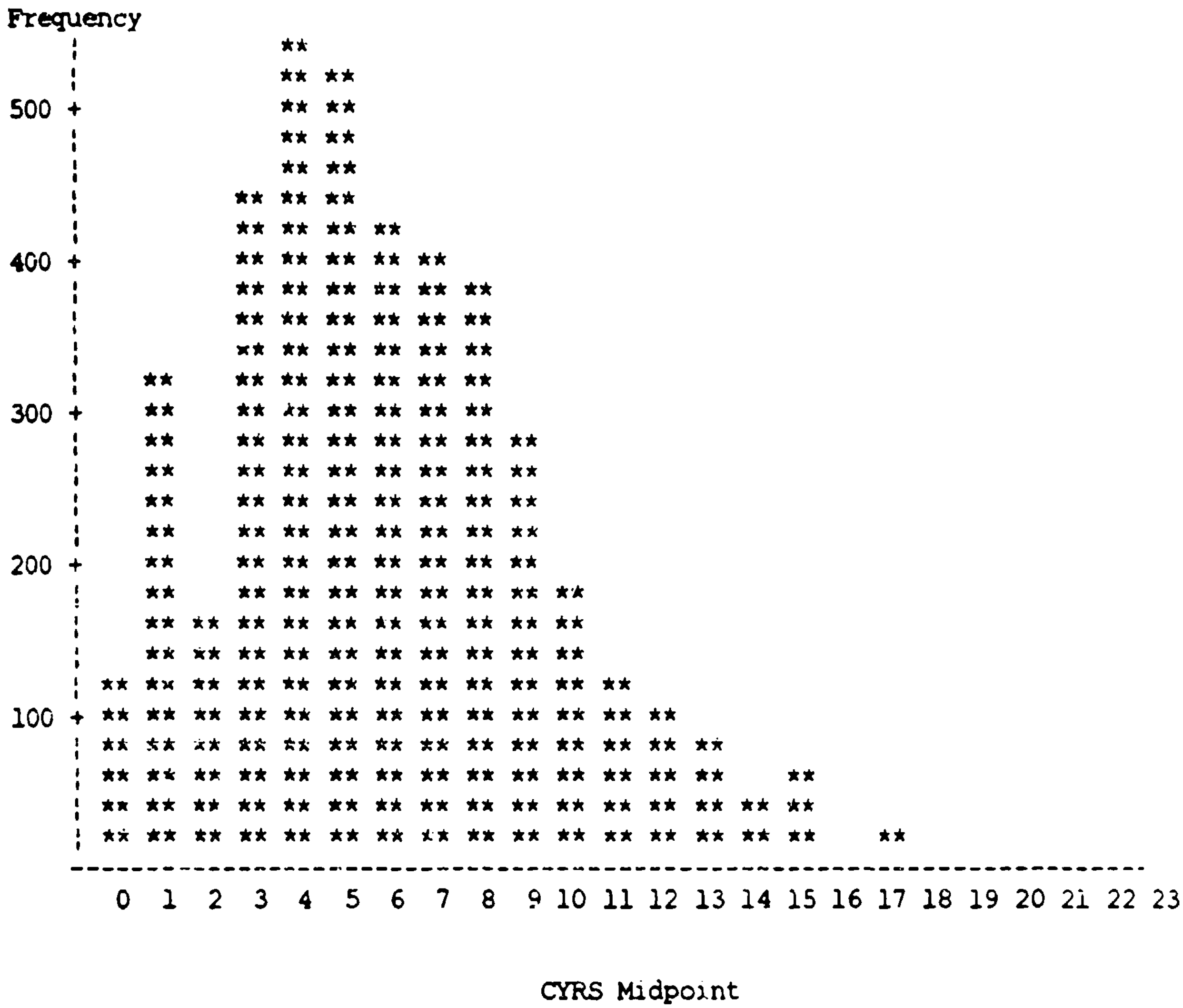
AFIT Graduate Grade Point Average Distribution (1975 - 1987)



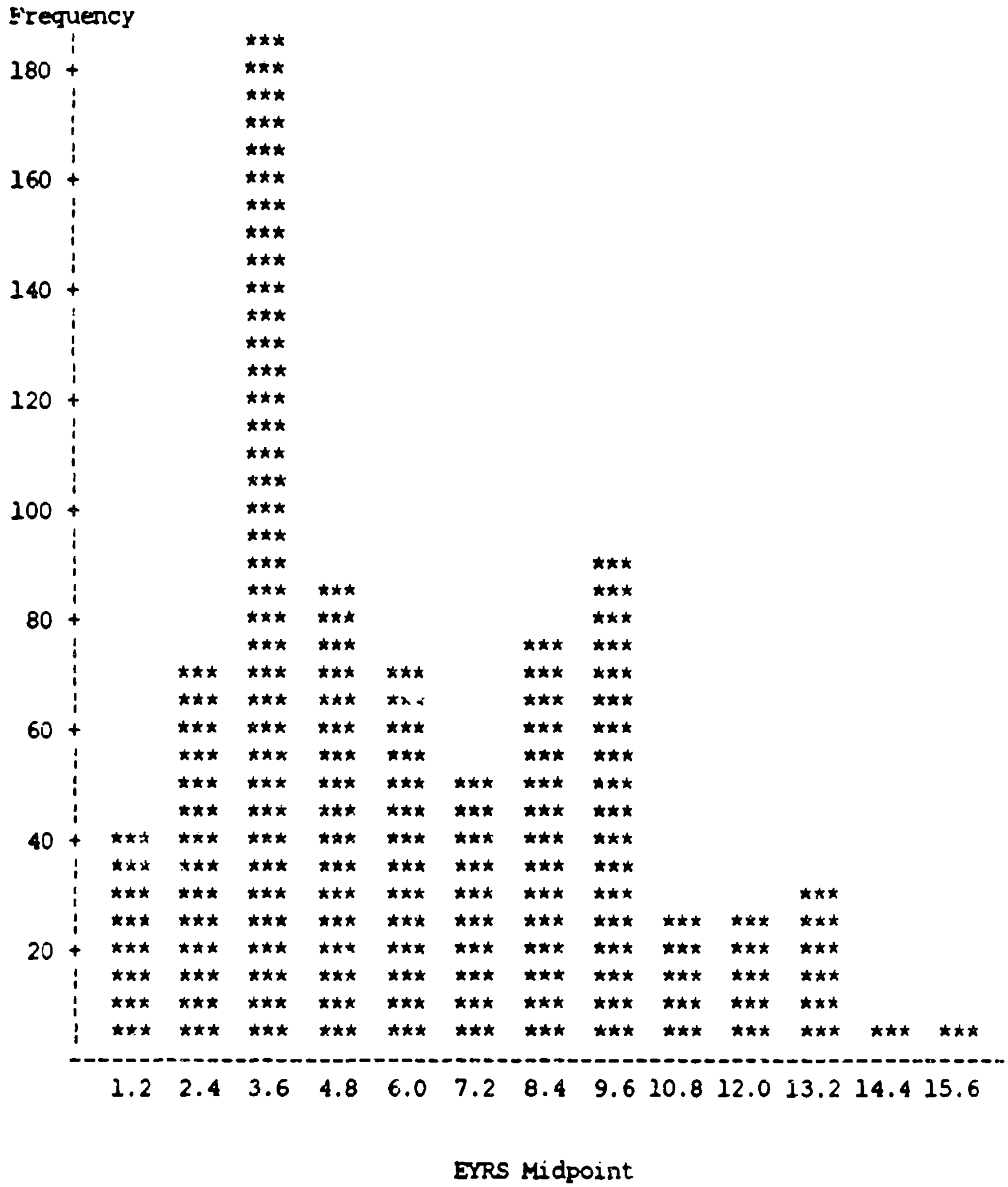
AFIT Undergraduate Grade Point Average Distribution (1975 - 1987)



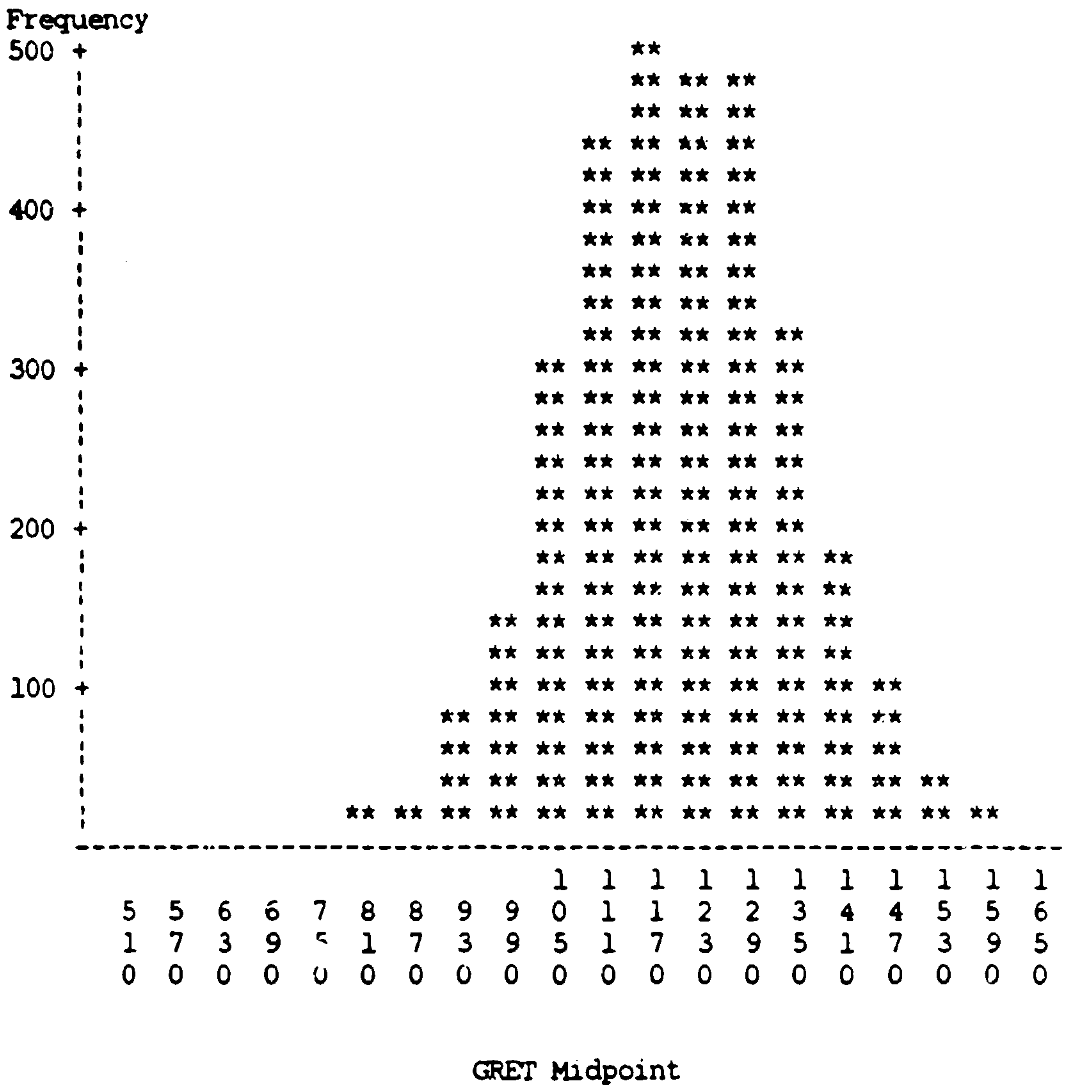
AFIT Commissioned Years of Service Distribution (1975 - 1987)



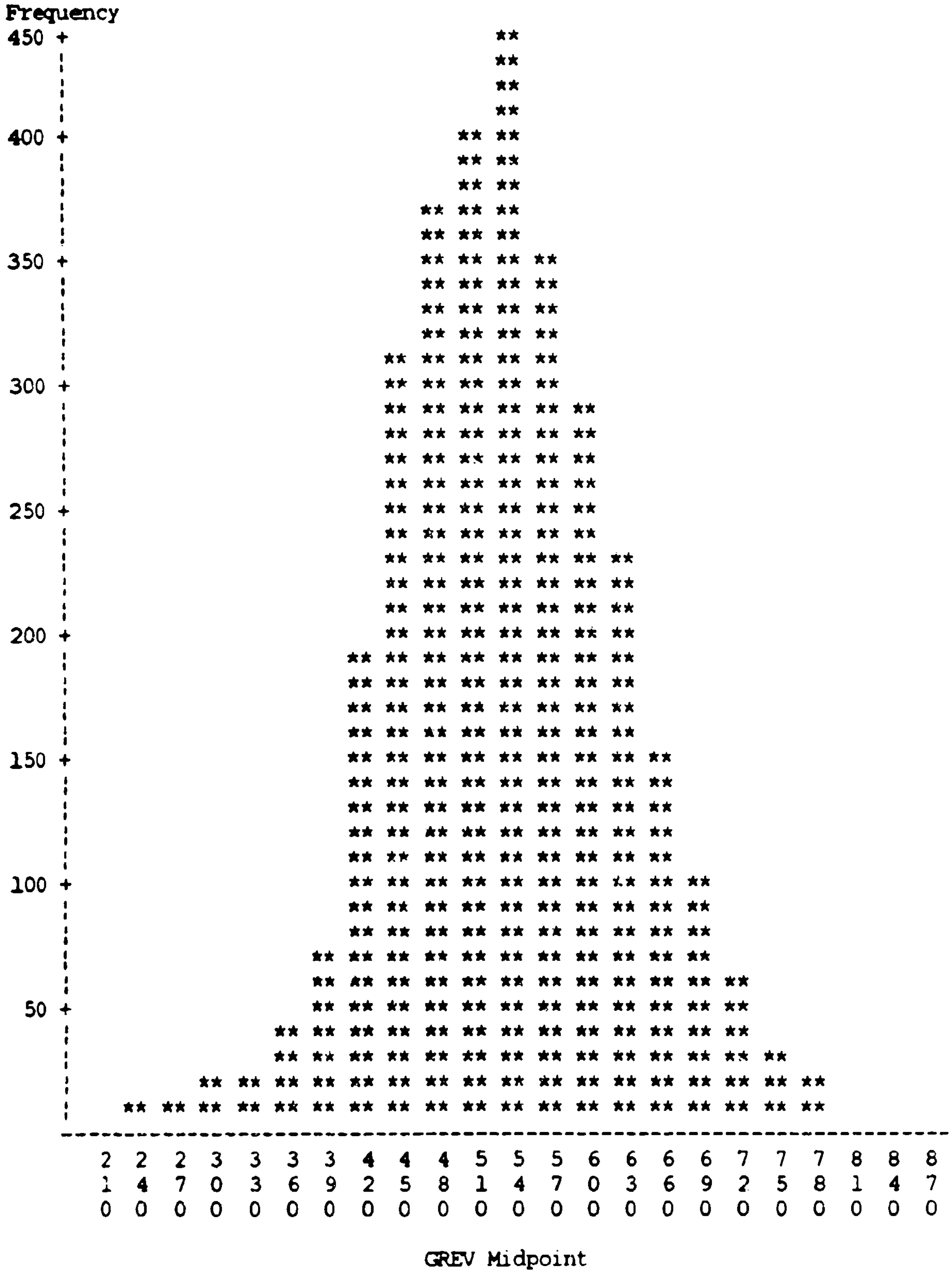
AFIT Enlisted Years of Service Distribution (1975 - 1987)



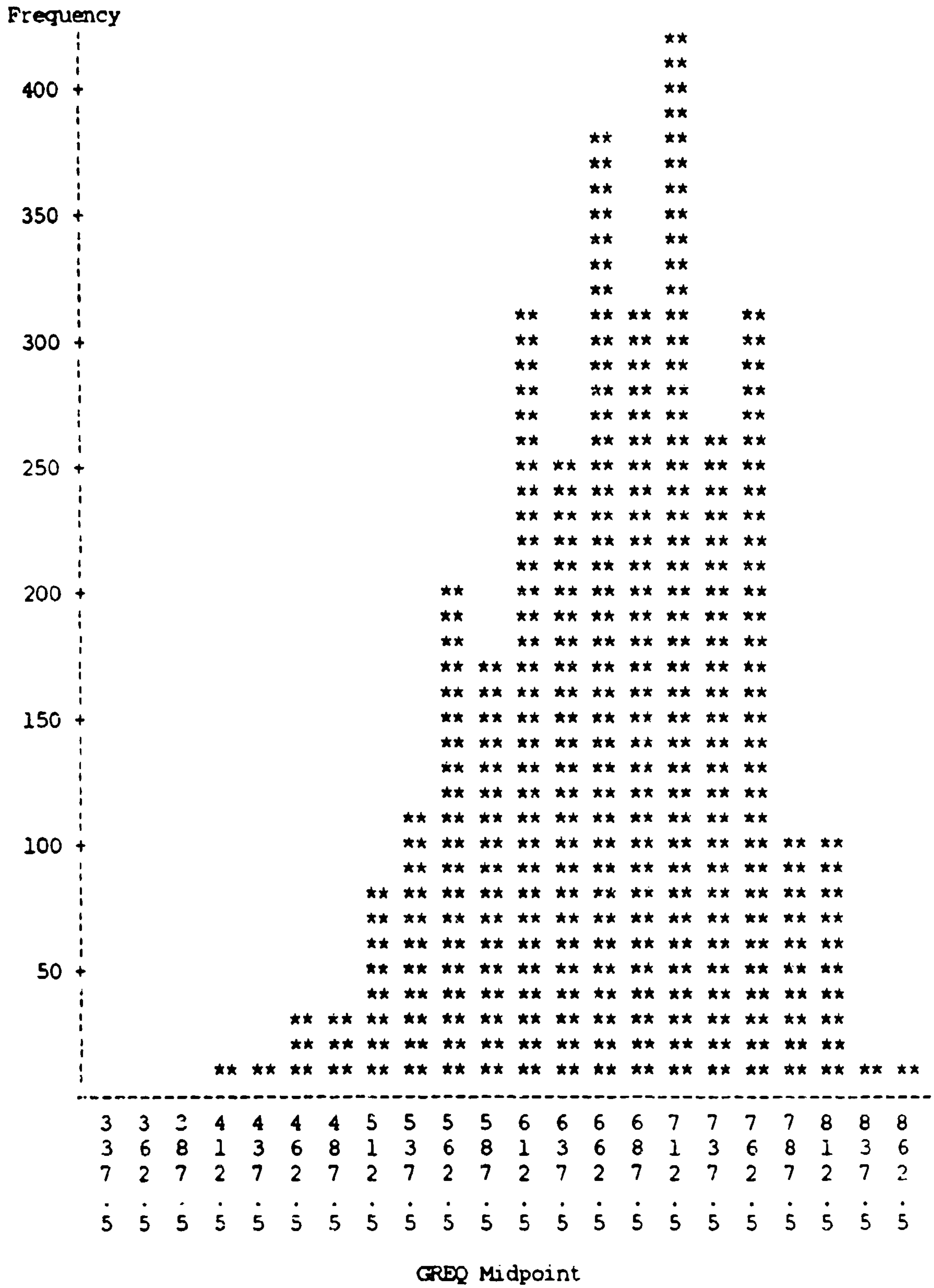
AFIT GRET Score Distribution (1975 - 1987)



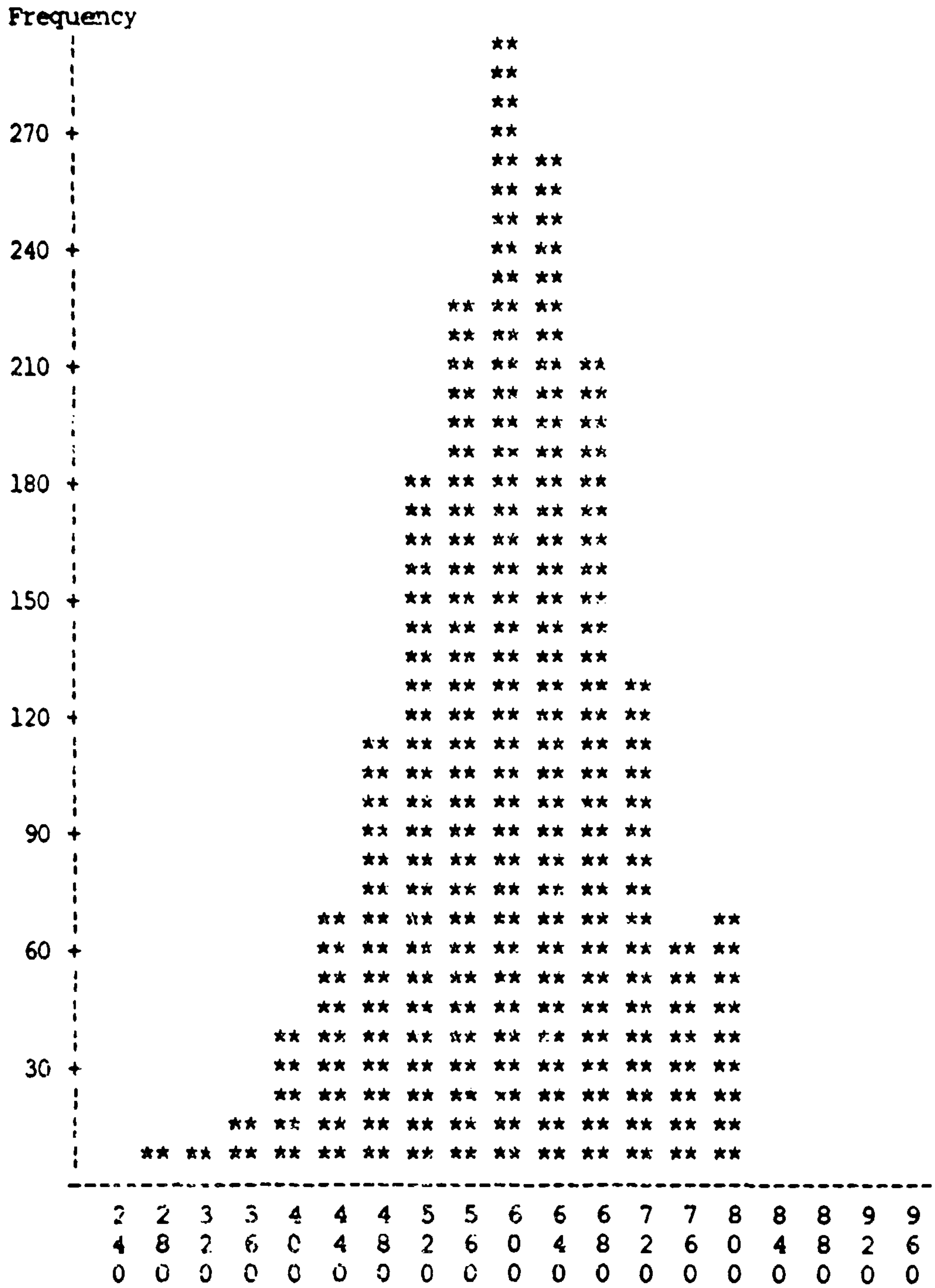
AFIT GREV Score Distribution (1975 -1987)



AFIT GREQ Score Distribution (1975 - 1987)



AFIT GREA Score Distribution (1975 - 1987)



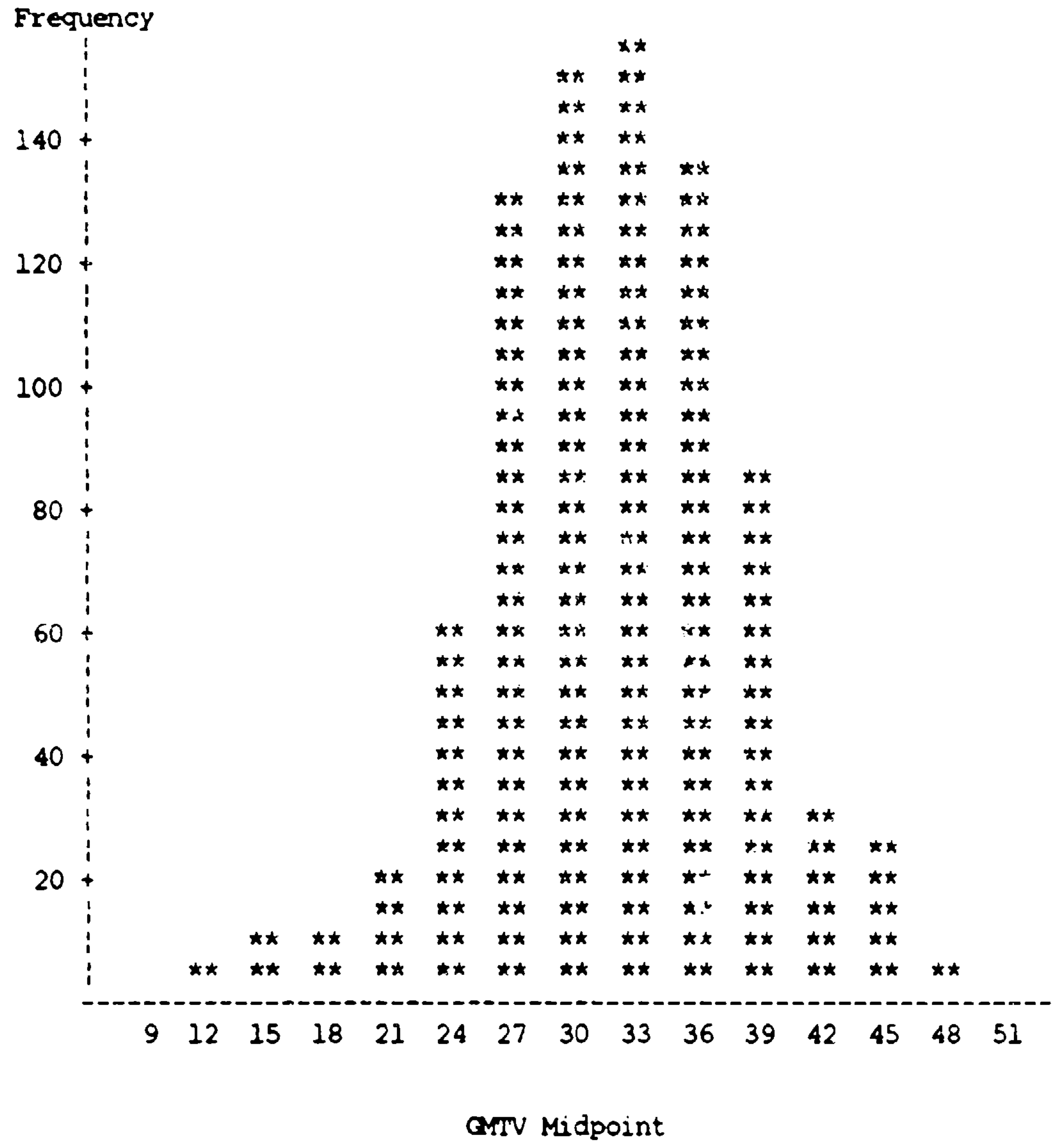
GREA Midpoint

AFIT GMTT Score Distribution (1975 - 1987)

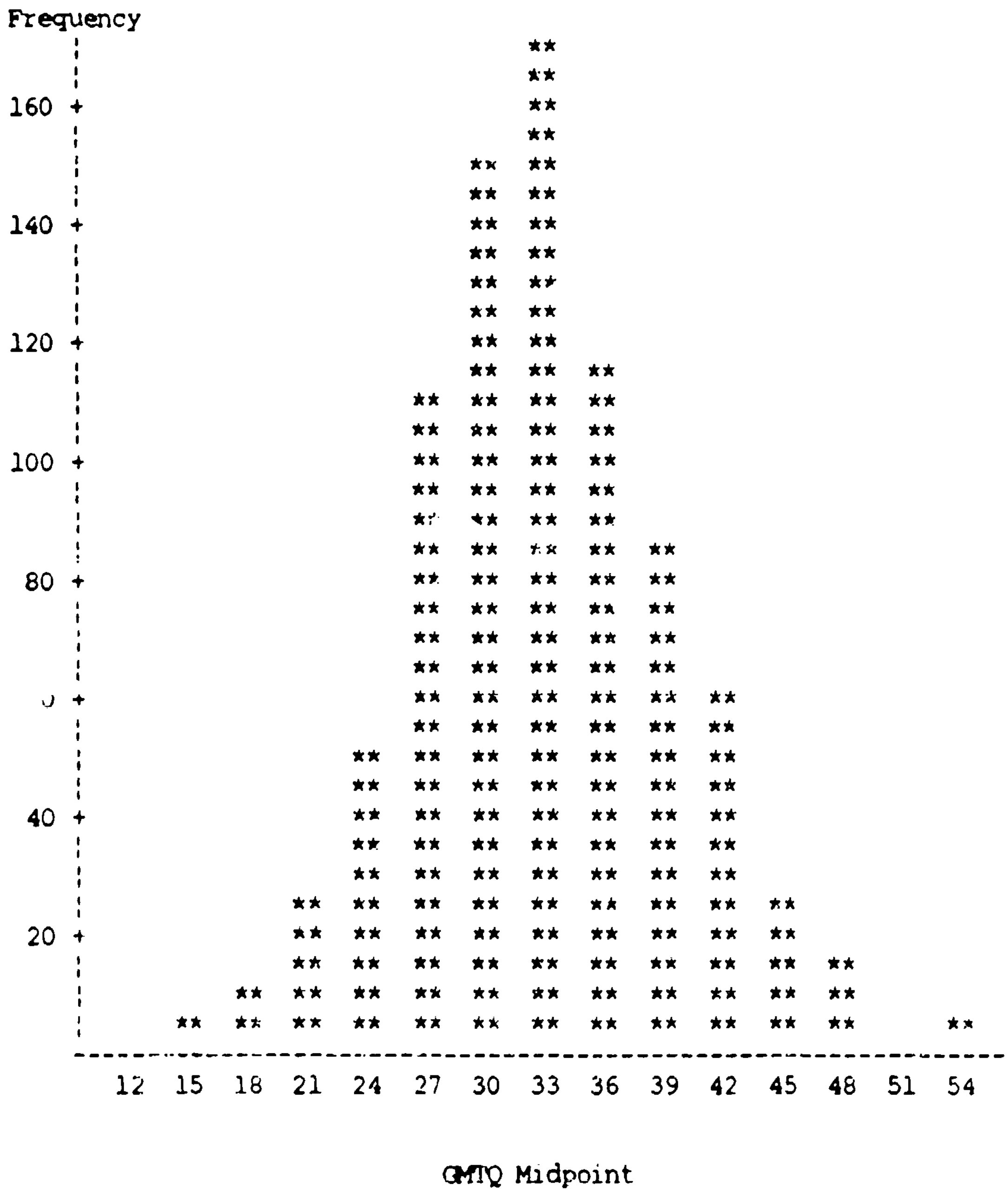
```
Frequency
    |                             **
140 +                             **
    |                             **      **
    |                             **  **  **
    |                             **  **  **
120 +                             **  **  **
    |                             **  **  **
    |                             **  **  **
    |                             **  **  **
100 +                             **  **  **  **
    |                             **  **  **  **
    |                         **  **  **  **  **
    |                         **  **  **  **  **  **
 80 +                         **  **  **  **  **  **
    |                         **  **  **  **  **  **
    |                         **  **  **  **  **  **
    |                         **  **  **  **  **  **
 60 +                         **  **  **  **  **  **
    |                         **  **  **  **  **  **
    |                         **  **  **  **  **  **  **
    |                         **  **  **  **  **  **  **
 40 +                         **  **  **  **  **  **  **
    |                         **  **  **  **  **  **  **
    |                         **  **  **  **  **  **  **
    |                         **  **  **  **  **  **  **
 20 +                     **  **  **  **  **  **  **  **  **
    |                 **  **  **  **  **  **  **  **  **  **
    |             **  **  **  **  **  **  **  **  **  **  **  **  **
    |     **      **  **  **  **  **  **  **  **  **  **  **  **  **
    ------------------------------------------------------------------
     285 315 345 375 405 435 465 495 525 555 585 615 645 675 705 735
```

GMTT Midpoint

AFIT GMTV Score Distribution (1975 - 1987)



AFIT GMTQ Score Distribution (1975 - 1987)

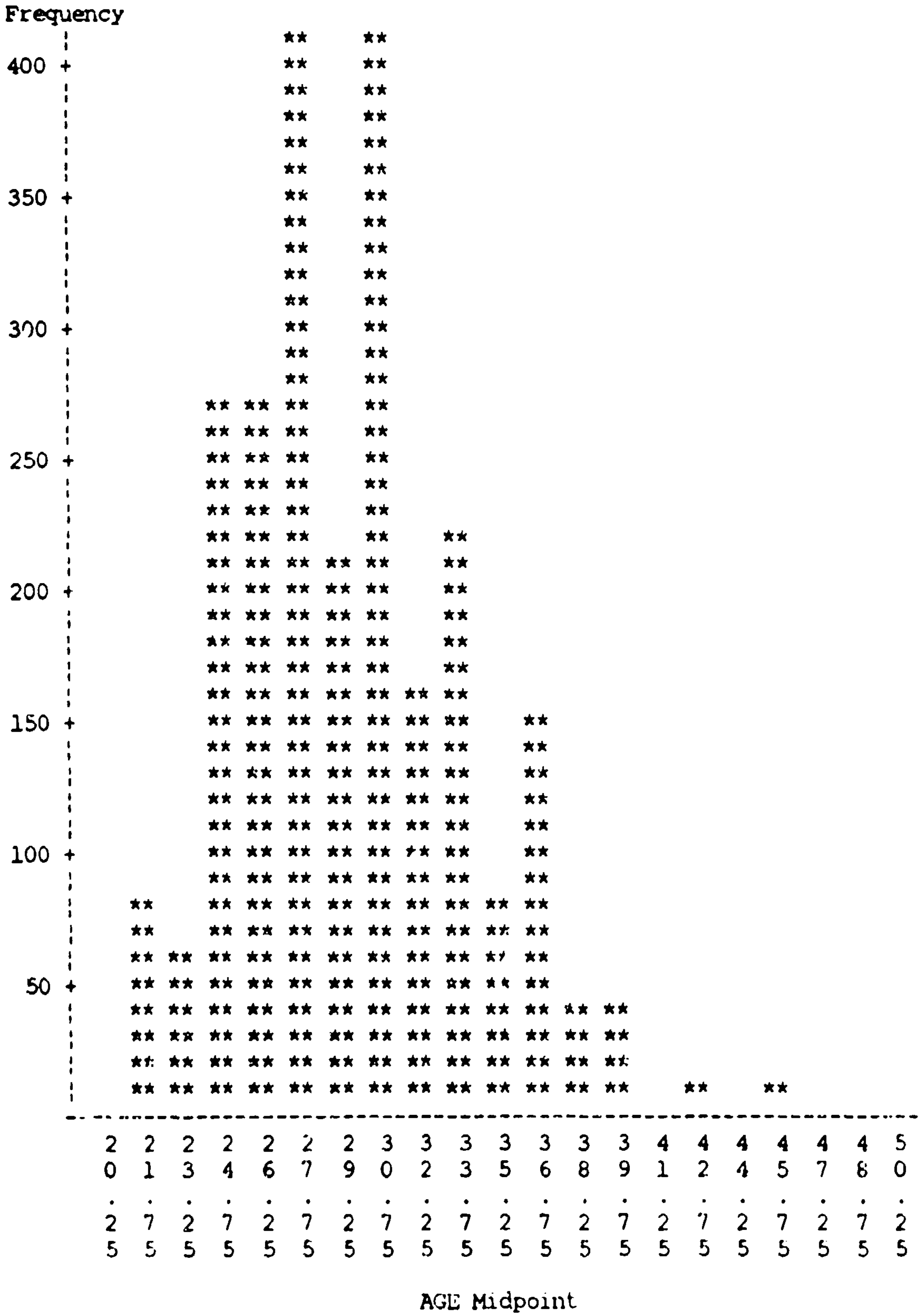


AFIT TOEF Score Distribution (1975 - 1987)

```
Frequency
21 +                         *****
   |                         *****
20 +                         *****
   |                         *****
19 +                         *****
   |                         *****
18 +                         *****
   |                         *****
17 +                         *****
   |                         *****
16 +               *****     *****
   |               *****     *****
15 +               *****     *****
   |               *****     *****
14 +               *****     *****
   |               *****     *****
13 +               *****     *****     *****
   |               *****     *****     *****
12 +               *****     *****     *****
   |               *****     *****     *****
11 +               *****     *****     *****
   |               *****     *****     *****
10 +               *****     *****     *****
   |               *****     *****     *****
 9 +               *****     *****     *****
   |               *****     *****     *****
 8 +               *****     *****     *****     *****
   |               *****     *****     *****     *****
 7 +               *****     *****     *****     *****
   |               *****     *****     *****     *****
 6 +               *****     *****     *****     *****
   |               *****     *****     *****     *****
 5 +               *****     *****     *****     *****
   |               *****     *****     *****     *****
 4 +               *****     *****     *****     *****
   |               *****     *****     *****     *****
 3 +               *****     *****     *****     *****
   |               *****     *****     *****     *****
 2 +               *****     *****     *****     *****
   |               *****     *****     *****     *****
 1 +     *****     *****     *****     *****     *****     *****     *****
   |     *****     *****     *****     *****     *****     *****     *****
--------------------------------------------------------------------------
          420       480       540       600       660       720       780

                                TOEF Midpoint
```

AFIT AGE Distribution (1975 - 1987)



Appendix B: Simple Statistics for Criterion and Predictor Variables By Program

-----------------------------------PROG=11-----------------------------------

Astronautical Engineering Program

Simple Statistics

Variable	N	Mean	Std Dev	Sum	Minimum	Maximum
GGPA	166	3.4435	0.3507	571.6200	1.7500	4.0000
UGPA	161	3.2061	0.3478	516.1800	2.3000	3.8800
CYRS	162	5.0926	3.4584	825.0000	0	18.0000
EYRS	22	5.6364	3.4989	124.0000	1.0000	13.0000
GRET	137	1259	113.6323	172475	920.0000	1500
GREV	137	550.3139	84.8899	75393	360.0000	750.0000
GREQ	137	707.6058	67.4384	96942	430.0000	840.0000
GREA	60	595.3333	88.1729	35720	360.0000	780.0000
GMTT	5	560.8000	78.0493	2804	507.0000	689.0000
GMTV	5	32.2000	7.3280	161.0000	25.0000	42.0000
GMTQ	5	38.8000	3.7683	194.0000	35.0000	45.0000
TOEF	0	.	.	.	.	.
AGE	87	28.2874	3.9175	2461	22.0000	37.0000

----------------------------------PROG=12----------------------------------

Aeronautical Engineering Program

Simple Statistics

Variable	N	Mean	Std Dev	Sum	Minimum	Maximum
OGPA	398	3.3890	0.2987	1349	2.0000	4.0000
UGPA	371	3.0849	0.3839	1144	2.0200	3.9400
CYRS	371	5.0970	3.2192	1891	0	15.0000
EYRS	54	5.2037	2.7153	281.0000	1.0000	11.0000
GRET	282	1216	131.3339	343040	780.0000	1560
GREV	282	530.3546	94.7325	149560	280.0000	780.0000
GREQ	282	685.5319	67.6754	193320	500.0000	850.0000
GREA	142	612.2535	99.2553	86940	300.0000	930.0000
GMTT	16	579.1875	74.2377	9267	454.0000	690.0000
GMTV	16	34.3125	6.1505	549.0000	25.0000	44.0000
GMTQ	16	36.3750	6.6920	582.0000	25.0000	47.0000
TOEF	10	558.9000	62.1297	5589	452.0000	633.0000
AGE	219	28.0594	3.8158	6145	21.0000	43.0000

--------------------------------PROG=13--------------------------------

Computer Science Program

Simple Statistics

Variable	N	Mean	Std Dev	Sum	Minimum	Maximum
OGPA	256	3.6155	0.2567	925.5700	2.4400	4.0000
UGPA	243	3.1749	0.3708	771.5000	2.1800	4.0000
CYRS	239	5.5858	3.0747	1335	0	17.0000
EYRS	33	5.9394	3.1119	196.0000	2.0000	14.0000
GRET	201	1222	148.0004	245530	830.0000	1510
GREV	201	543.6816	95.2700	109280	320.0000	760.0000
GREQ	201	676.8159	84.7397	136040	410.0000	820.0000
GREA	112	617.6786	92.9786	69180	400.0000	800.0000
GMTT	23	560.8696	84.0613	12900	440.0000	720.0000
GMTV	23	31.7826	9.3758	731.0000	19.0000	49.0000
GMTQ	23	36.0000	4.7098	828.0000	26.0000	46.0000
TOEF	4	528.7500	9.0692	2115	520.0000	538.0000
AGE	112	29.0536	4.1173	3254	22.0000	38.0000

-------------------------------- PROG=14 ----------------------------------

Electrical Engineering Program

Simple Statistics

Variable	N	Mean	Std Dev	Sum	Minimum	Maximum
GGPA	650	3.4651	0.3289	2252	1.8600	4.0000
UGPA	621	3.1352	0.3961	1947	2.0000	4.0000
CYRS	615	4.8780	3.1374	3000	0	17.0000
EYRS	162	6.4753	3.3347	1049	1.0000	16.0000
GRET	483	1215	131.3405	586770	810.0000	1580
GREV	483	534.0994	86.6203	257970	260.0000	800.0000
GREQ	483	680.2484	71.0819	328560	470.0000	820.0000
GREA	316	604.1456	94.4032	190910	340.0000	810.0000
GMTT	18	569.3333	65.6327	10248	465.0000	683.0000
GMTV	18	31.1667	5.9136	561.0000	21.0000	41.0000
GMTQ	18	37.9444	5.1845	683.0000	29.0000	46.0000
TOEF	7	574.7143	103.0109	4023	473.0000	780.0000
AGE	347	28.6859	4.0875	9954	22.0000	40.0000

------------------------------- PROG=15 -------------------------------

Electrical-Optical Engineering Program

Simple Statistics

Variable	N	Mean	Std Dev	Sum	Minimum	Maximum
GGPA	90	3.4598	0.3168	311.3800	2.3700	4.0000
UGPA	90	3.2348	0.3892	291.1300	2.3800	3.9400
CYRS	85	3.7176	3.2900	316.0000	0	13.0000
EYRS	12	5.1667	3.1575	62.0000	2.0000	13.0000
GRET	52	1223	135.2139	63580	930.0000	1560
GREV	52	538.8462	86.8095	28020	360.0000	770.0000
GREQ	52	683.8462	71.1572	35560	520.0000	810.0000
GREA	32	608.4375	88.6133	19470	420.0000	730.0000
GMTT	3	585.0000	34.7707	1755	548.0000	617.0000
GMTV	3	33.6667	1.1547	101.0000	33.0000	35.0000
GMTQ	3	37.6667	4.1633	113.0000	33.0000	41.0000
TOEF	0	.	.	.	.	.
AGE	18	27.6667	5.0176	498.0000	22.0000	37.0000

---------------------------------- PROG=16 ----------------------------------

Engineering Physics Program

Simple Statistics

Variable	N	Mean	Std Dev	Sum	Minimum	Maximum
GGPA	211	3.3700	0.4163	711.0700	0.9300	4.0000
UGPA	195	3.1270	0.4045	609.7600	2.0500	3.9600
CYRS	203	4.2463	3.2834	862.0000	0	14.0000
EYRS	19	5.0526	3.0817	96.0000	2.0000	12.0000
GRET	157	1254	144.5958	196920	920.0000	1670
GREV	157	564.5223	101.7819	88630	300.0000	870.0000
GREQ	157	688.7898	66.4614	108140	500.0000	870.0000
GREA	76	619.7368	95.8885	47100	280.0000	860.0000
GMTT	5	590.4000	109.1710	2952	435.0000	730.0000
GMTV	5	34.4000	7.6026	172.0000	29.0000	45.0000
GMTQ	5	37.2000	10.1341	186.0000	20.0000	47.0000
TOEF	3	543.0000	87.7895	1629	485.0000	644.0000
AGE	106	26.5000	3.4867	2809	20.0000	37.0000

------------------------------------ PROG=17 ------------------------------------

Nuclear Engineering Program

Simple Statistics

Variable	N	Mean	Std Dev	Sum	Minimum	Maximum
GGPA	123	3.3836	0.4011	416.1800	1.1800	4.0000
UGPA	117	3.0508	0.3604	356.9400	2.1100	3.9600
CYRS	120	6.5167	3.7191	782.0000	0	16.0000
EYRS	8	3.3750	2.5600	27.0000	1.0000	9.0000
GRET	92	1244	136.2714	114480	1020	1570
GREV	92	560.5435	83.7102	51570	380.0000	760.0000
GREQ	92	682.2826	80.4944	62770	510.0000	830.0000
GREA	40	617.0000	93.6770	24680	400.0000	780.0000
GMTT	3	580.6667	16.7730	1742	570.0000	600.0000
GMTV	3	32.3333	1.1547	97.0000	31.0000	33.0000
GMTQ	3	38.6667	2.0817	116.0000	37.0000	41.0000
TOEF	0	.	.	.	.	.
AGE	72	29.1389	3.7578	2098	22.0000	37.0000

------------------------------------ PROG=18 ------------------------------------

Operations Research Program

Simple Statistics

Variable	N	Mean	Std Dev	Sum	Minimum	Maximum
OGPA	193	3.6221	0.2502	699.0700	2.8700	4.0000
UGPA	173	3.2283	0.3889	558.4900	2.2000	4.0000
CYRS	183	5.4754	2.9628	1002	0	12.0000
EYRS	15	4.7333	3.6148	71.0000	1.0000	13.0000
GRET	162	1214	139.1414	196629	760.0000	1570
GREV	162	522.9630	99.0507	84720	200.0000	790.0000
GREQ	162	691.7284	72.5454	112060	470.0000	870.0000
GREA	109	603.3945	101.6308	65770	220.0000	800.0000
GMTT	15	603.9333	88.2006	9059	500.0000	720.0000
GMTV	15	36.0667	7.0959	541.0000	27.0000	45.0000
GMTQ	15	37.8667	6.1280	568.0000	29.0000	45.0000
TOEF	9	548.8889	49.4708	4940	487.0000	639.0000
AGE	90	28.0000	3.5156	2520	22.0000	35.0000

---------------------------------- PROG=19 ----------------------------------

Systems Engineering Program

Simple Statistics

Variable	N	Mean	Std Dev	Sum	Minimum	Maximum
GGPA	91	3.4269	0.4396	311.8500	1.7300	4.0000
UGPA	88	3.1636	0.3663	278.4000	2.2600	3.8600
CYRS	89	5.1910	2.9189	462.0000	1.0000	12.0000
EYRS	10	7.0000	3.1972	70.0000	1.0000	12.0000
GRET	63	1217	140.1612	76650	920.0000	1650
GREV	63	538.2540	87.9065	33910	400.0000	840.0000
GREQ	63	674.7619	91.1549	42510	350.0000	830.0000
GREA	42	590.9524	102.9992	24820	280.0000	750.0000
GMTT	5	576.6000	64.0882	2883	475.0000	631.0000
GMTV	5	31.6000	5.5498	158.0000	24.0000	37.0000
GMTQ	5	38.8000	4.5497	194.0000	31.0000	42.0000
TOEF	0	.	.	.	.	.
AGE	32	28.6250	3.0454	916.0000	25.0000	37.0000

---------------------------------- PROG=20 ----------------------------------

Strategy and Tactics Program

Simple Statistics

Variable	N	Mean	Std Dev	Sum	Minimum	Maximum
GGPA	178	3.5515	0.2477	632.1700	2.9600	4.0000
UGPA	177	2.9989	0.3521	530.8000	2.1600	4.0000
CYRS	178	9.1404	3.1600	1627	1.0000	17.0000
EYRS	20	7.1000	3.8648	142.0000	1.0000	13.0000
GRET	153	1226	138.8468	187550	760.0000	1570
GREV	153	546.2745	88.7477	83580	310.0000	790.0000
GREQ	153	678.8889	82.3867	103870	430.0000	830.0000
GREA	98	604.5918	106.2303	59250	400.0000	790.0000
GMTT	20	584.4000	62.2342	11688	460.0000	696.0000
GMTV	19	34.9474	4.9382	664.0000	28.0000	48.0000
GMTQ	19	36.5263	6.2749	694.0000	26.0000	47.0000
TOEF	0	.	.	.	.	.
AGE	106	32.1509	3.0450	3408	25.0000	38.0000

------------------------------- PROG=21 -------------------------------

Space Operations Program

Simple Statistics

Variable	N	Mean	Std Dev	Sum	Minimum	Maximum
GGPA	100	3.5562	0.2143	355.6200	2.9100	3.9200
UGPA	95	3.1065	0.2890	295.1200	2.5200	3.8800
CYRS	96	6.8333	3.1176	656.0000	3.0000	15.0000
[illegible]YRS	11	6.0909	2.9480	67.0000	1.0000	9.0000
GRET	91	1237	110.1195	112600	1000	1510
GREV	91	554.0659	79.6657	50420	420.0000	790.0000
GREQ	91	685.1648	68.4164	62350	510.0000	840.0000
GREA	66	612.1212	87.7148	40400	410.0000	800.0000
GMTT	7	562.8571	78.3676	3940	476.0000	665.0000
GMTV	7	34.5714	6.8765	242.0000	25.0000	41.0000
GMTQ	7	33.1429	6.4402	232.0000	22.0000	41.0000
TOEF	0	.	.	.	.	.
AGE	85	29.5529	3.3005	2512	25.0000	39.0000

---------------------------------- PROG=22 ----------------------------------

Guidance and Control Program

Simple Statistics

Variable	N	Mean	Std Dev	Sum	Minimum	Maximum
GGPA	77	3.4021	0.2834	261.9600	2.9500	4.0000
UGPA	72	3.0935	0.3562	222.7300	2.3000	3.9900
CYRS	73	3.5479	2.8628	259.0000	0	15.0000
EYRS	30	4.3000	2.6542	129.0000	1.0000	11.0000
GRET	54	1224	130.1330	66120	940.0000	1530
GREV	54	528.3333	87.0643	28530	330.0000	710.0000
GREQ	54	696.1111	68.4716	37590	510.0000	820.0000
GREA	18	626.6667	105.2728	11280	490.0000	960.0000
GMTT	3	609.6667	24.0069	1829	582.0000	625.0000
GMTV	2	35.0000	1.4142	70.0000	34.0000	36.0000
GMTQ	2	39.0000	2.8284	78.0000	37.0000	41.0000
TOEF	1	486.0000	.	486.0000	486.0000	486.0000
AGE	56	27.0714	4.0714	1516	21.0000	43.0000

---------------------------------- PROG=25 ----------------------------------

Reliability Engineering Program

Simple Statistics

Variable	N	Mean	Std Dev	Sum	Minimum	Maximum
GGPA	7	3.5157	0.3125	24.6100	2.9100	3.8600
UGPA	7	3.0386	0.2638	21.2700	2.6800	3.4500
CYRS	7	6.1429	4.9809	43.0000	2.0000	17.0000
EYRS	0	.	.	.	.	.
GRET	3	1170	124.9000	3510	1070	1310
GREV	3	496.6667	51.3160	1490	440.0000	540.0000
GREQ	3	673.3333	105.9874	2020	560.0000	770.0000
GREA	0	.	.	.	.	.
GMTT	0	.	.	.	.	.
GMTV	0	.	.	.	.	.
GMTQ	0	.	.	.	.	.
TOEF	0	.	.	.	.	.
AGE	7	28.8571	4.7056	202.0000	25.0000	39.0000

---------------------------------- PROG=26 ----------------------------------

Systems Analysis Program

Simple Statistics

Variable	N	Mean	Std Dev	Sum	Minimum	Maximum
GGPA	48	3.4956	0.2456	167.7900	3.0300	3.9700
UGPA	47	3.0017	0.3797	141.0800	2.0000	3.7500
CYRS	45	6.2444	4.2166	281.0000	0	17.0000
EYRS	10	4.3000	2.7508	43.0000	1.0000	9.0000
GRET	29	1220	153.0985	35370	930.0000	1510
GREV	29	543.7931	102.8318	15770	340.0000	730.0000
GREQ	29	675.8621	72.0871	19600	550.0000	780.0000
GREA	5	582.0000	86.7179	2910	450.0000	660.0000
GMTT	8	595.0000	56.8909	4760	479.0000	656.0000
GMTV	8	34.3750	5.5533	275.0000	23.0000	41.0000
GMTQ	8	38.2500	3.4949	306.0000	33.0000	43.0000
TOEF	0	.	.	.	.	.
AGE	48	29.2917	4.6263	1406	22.0000	42.0000

------------------------------------ PROG=27 ------------------------------------

Space Facilities Program

Simple Statistics

Variable	N	Mean	Std Dev	Sum	Minimum	Maximum
GGPA	15	3.2420	0.2351	48.6300	2.9000	3.6800
UGPA	15	2.9953	0.1974	44.9300	2.6500	3.3200
CYRS	15	4.5333	4.5177	68.0000	0	13.0000
EYRS	2	5.5000	0.7071	11.0000	5.0000	6.0000
GRET	9	1247	88.3176	11220	1130	1400
GREV	9	524.4444	66.9162	4720	410.0000	630.0000
GREQ	9	722.2222	61.5991	6500	610.0000	820.0000
GREA	3	580.0000	17.3205	1740	570.0000	600.0000
GMTT	0	.	.	.	.	.
GMTV	0	.	.	.	.	.
GMTQ	0	.	.	.	.	.
TOEF	0	.	.	.	.	.
AGE	15	27.5333	4.9981	413.0000	21.0000	38.0000

---------------------------------- PROG=29 ----------------------------------

Computer Engineering Program

Simple Statistics

Variable	N	Mean	Std Dev	Sum	Minimum	Maximum
GGPA	42	3.6755	0.2336	154.3700	2.9500	3.9000
UGPA	42	3.3305	0.3554	139.8800	2.5800	3.8500
CYRS	40	4.0000	2.8102	160.0000	0	10.0000
EYRS	6	6.3333	1.3663	38.0000	5.0000	8.0000
GRET	38	1289	117.8397	49000	1020	1500
GREV	38	585.7895	87.5687	22260	410.0000	710.0000
GREQ	38	703.6842	50.4263	26740	610.0000	790.0000
GREA	36	653.3333	98.7927	23520	410.0000	800.0000
GMTT	0	.	.	.	.	.
GMTV	0	.	.	.	.	.
GMTQ	0	.	.	.	.	.
TOEF	0	.	.	.	.	.
AGE	42	27.6190	3.6489	1160	22.0000	36.0000

---------------------------------- PROG=30 ----------------------------------

Acquisition Logistics Program

Simple Statistics

Variable	N	Mean	Std Dev	Sum	Minimum	Maximum
GGPA	77	3.5843	0.2905	275.9900	2.6200	4.0000
UGPA	72	2.9757	0.4243	214.2500	2.1000	3.8400
CYRS	64	7.7344	3.0822	495.0000	1.0000	15.0000
EYRS	14	7.2143	3.6200	101.0000	1.0000	14.0000
GRET	40	1151	110.6667	46050	910.0000	1420
GREV	40	538.5000	64.2731	21540	430.0000	710.0000
GREQ	40	612.7500	73.3446	24510	460.0000	740.0000
GREA	22	561.5909	77.5117	12355	430.0000	750.0000
GMTT	33	556.7273	63.0448	18372	408.0000	647.0000
GMTV	32	34.0938	5.2262	1091	21.0000	43.0000
GMTQ	32	33.1875	6.9349	1062	19.0000	50.0000
TOEF	0	.	.	.	.	.
AGE	18	33.1111	5.8298	596.0000	28.0000	46.0000

---------------------------------- PROG=31 ----------------------------------

Contracting Management Program

Simple Statistics

Variable	N	Mean	Std Dev	Sum	Minimum	Maximum
GGPA	177	3.6540	0.2227	646.7500	3.0000	4.0000
UGPA	170	2.9952	0.4576	509.1800	1.9000	3.9500
CYRS	158	6.7658	2.7696	1069	1.0000	14.0000
EYRS	30	5.8667	3.1703	176.0000	1.0000	13.0000
GRET	75	1184	131.5592	88790	870.0000	1530
GREV	75	557.6000	76.5796	41820	410.0000	760.0000
GREQ	75	627.6000	81.4537	47070	460.0000	770.0000
GREA	34	608.8235	64.5621	20700	500.0000	780.0000
GMTT	94	534.2766	56.8515	50222	441.0000	656.0000
GMTV	94	32.9362	4.8744	3096	22.0000	45.0000
GMTQ	94	30.6596	5.9071	2882	20.0000	45.0000
TOEF	2	607.0000	24.0416	1214	590.0000	624.0000
AGE	78	30.6667	3.5627	2392	25.0000	43.0000

---------------------------------- PROG=32 -----------------------------------

Facilities Management Program

Simple Statistics

Variable	N	Mean	Std Dev	Sum	Minimum	Maximum
GGPA	137	3.5726	0.2565	489.4400	2.9800	4.0000
UGPA	132	2.8311	0.4113	373.7100	1.9600	3.8700
CYRS	132	5.9242	3.0382	782.0000	1.0000	13.0000
EYRS	24	8.2917	2.9997	199.0000	3.0000	13.0000
GRET	95	1164	114.4266	110540	900.0000	1430
GREV	95	509.6842	80.8525	48420	310.0000	690.0000
GREQ	95	655.1579	72.7406	62240	480.0000	780.0000
GREA	39	538.7179	76.9545	21010	380.0000	670.0000
GMTT	29	513.4483	71.3055	14890	341.0000	614.0000
GMTV	29	29.5862	7.1789	858.0000	14.0000	43.0000
GMTQ	29	31.5517	5.0042	915.0000	19.0000	40.0000
TOEF	2	494.0000	2.8284	988.0000	492.0000	496.0000
AGE	0	.	.	.	.	.

---------------------------------- PROG=33 ----------------------------------

International Logistics Management

Simple Statistics

Variable	N	Mean	Std Dev	Sum	Minimum	Maximum
GGPA	35	3.5223	0.2234	123.2800	3.1400	4.0000
UGPA	34	2.8676	0.3799	97.5000	2.2300	3.8000
CYRS	28	6.3571	3.2457	178.0000	3.0000	15.0000
EYRS	11	6.2727	4.3380	69.0000	1.0000	14.0000
GRET	19	1169	149.4982	22220	970.0000	1530
GREV	19	543.6842	95.1146	10330	440.0000	770.0000
GREQ	19	622.1053	83.6380	11820	490.0000	800.0000
GREA	9	564.4444	75.5167	5080	480.0000	680.0000
GMTT	13	505.3846	117.2060	6570	275.0000	670.0000
GMTV	12	28.2500	9.1067	339.0000	9.0000	41.0000
GMTQ	12	31.7500	10.8387	381.0000	14.0000	54.0000
TOEF	0	.	.	.	.	.
AGE	0	.	.	.	.	.

------------------------------------ PROG=34 ------------------------------------

Logistics Management Program

Simple Statistics

Variable	N	Mean	Std Dev	Sum	Minimum	Maximum
GGPA	832	3.5493	0.3695	2953	0	4.0000
UGPA	769	2.8785	0.4030	2214	2.0000	3.9600
CYRS	705	7.0596	3.4722	4977	1.0000	23.0000
EYRS	134	6.3060	3.7441	845.0000	1.0000	15.0000
GRET	543	1132	145.2354	614870	670.0000	1590
GREV	543	522.6169	91.7825	283781	200.0000	790.0000
GREQ	543	609.7053	85.5302	331070	340.0000	850.0000
GREA	145	557.8621	113.4263	80890	230.0000	800.0000
GMTT	264	530.7992	65.6526	140131	318.0000	709.0000
GMTV	262	31.7901	5.7554	8329	16.0000	52.0000
GMTQ	262	31.3359	5.9681	8210	15.0000	48.0000
TOEF	17	559.8235	69.9654	9517	446.0000	695.0000
AGE	478	30.9854	4.9447	14811	24.0000	50.0000

---------------------------------- PROG=35 ----------------------------------

Maintenance Management Program

Simple Statistics

Variable	N	Mean	Std Dev	Sum	Minimum	Maximum
GGPA	87	3.5887	0.2492	312.2200	3.0100	3.9900
UGPA	87	3.0694	0.4849	267.0400	2.0100	4.0000
CYRS	86	6.3605	2.4103	547.0000	1.0000	11.0000
EYRS	26	8.3462	3.6215	217.0000	1.0000	13.0000
GRET	43	1048	174.0291	45084	487.0000	1320
GREV	43	496.7442	70.7013	21360	400.0000	660.0000
GREQ	42	576.4286	85.1060	24210	410.0000	770.0000
GREA	34	537.3529	96.6502	18270	400.0000	710.0000
GMTT	32	503.4688	57.5477	16111	312.0000	642.0000
GMTV	32	29.8125	4.7887	954.0000	19.0000	40.0000
GMTQ	32	28.9688	5.9811	927.0000	11.0000	45.0000
TOEF	0	.	.	.	.	.
AGE	59	31.4576	3.0644	1856	26.0000	37.0000

------------------------------------ PROG=36 ------------------------------------

Systems Management Program

Simple Statistics

Variable	N	Mean	Std Dev	Sum	Minimum	Maximum
GGPA	303	3.5103	0.4361	1064	0.7500	4.0000
UGPA	288	2.9627	0.3901	853.2600	2.1100	4.0000
CYRS	293	6.7133	3.1924	1967	1.0000	16.0000
EYRS	49	5.6939	3.6067	279.0000	1.0000	15.0000
GRET	145	1201	136.7727	174180	680.0000	1480
GREV	145	546.5517	83.2615	79250	300.0000	700.0000
GREQ	145	657.9310	74.0673	95400	380.0000	810.0000
GREA	90	588.5556	100.0400	52970	330.0000	780.0000
GMTT	157	548.9682	73.5013	86188	371.0000	740.0000
GMTV	155	31.4968	7.3955	4882	10.0000	48.0000
GMTQ	155	34.7742	5.6827	5390	22.0000	53.0000
TOEF	6	558.1667	52.1744	3349	496.0000	641.0000
AGE	132	30.1439	4.3670	3979	23.0000	43.0000

------------------------------------ PROG=37 ------------------------------------

Transportation Management Program

Simple Statistics

Variable	N	Mean	Std Dev	Sum	Minimum	Maximum
GGPA	28	3.5018	0.2282	98.0500	2.9500	3.9000
UGPA	28	3.2075	0.4307	89.8100	2.5300	4.0000
CYRS	28	5.7857	3.2244	162.0000	2.0000	15.0000
EYRS	17	6.1176	2.7812	104.0000	1.0000	13.0000
GRET	17	1111	104.9685	18880	920.0000	1250
GREV	17	537.6471	61.4949	9140	450.0000	670.0000
GREQ	17	572.9412	67.6170	9740	470.0000	720.0000
GREA	17	575.8824	27.6267	9790	540.0000	630.0000
GMTT	6	433.8333	72.7858	2603	312.0000	498.0000
GMTV	6	25.6667	3.8816	154.0000	19.0000	29.0000
GMTQ	6	23.5000	7.6092	141.0000	11.0000	32.0000
TOEF	0	.	.	.	.	.
AGE	18	32.3333	2.3764	582.0000	29.0000	36.0000

------------------------------------ PROG=39 ------------------------------------

Cost Analysis Program

Simple Statistics

Variable	N	Mean	Std Dev	Sum	Minimum	Maximum
GGPA	20	3.4770	0.2808	69.5400	2.9500	3.9100
UGPA	20	2.7570	0.4686	55.1400	2.1300	3.6300
CYRS	18	7.0000	3.3255	126.0000	2.0000	14.0000
EYRS	8	9.0000	0.7559	72.0000	8.0000	10.0000
GRET	4	1050	92.3760	4200	970.0000	1130
GREV	4	470.0000	57.7350	1880	420.0000	520.0000
GREQ	4	580.0000	34.6410	2320	550.0000	610.0000
GREA	4	600.0000	23.0940	2400	580.0000	620.0000
GMTT	18	544.4444	46.0463	9800	490.0000	610.0000
GMTV	18	31.2222	4.0228	562.0000	24.0000	37.0000
GMTQ	18	34.2222	5.6104	616.0000	26.0000	43.0000
TOEF	0	.	.	.	.	.
AGE	20	32.5000	4.1359	650.0000	26.0000	39.0000

---------------------------------- PROG=40 ----------------------------------

Engineering Management Program

Simple Statistics

Variable	N	Mean	Std Dev	Sum	Minimum	Maximum
GGPA	110	3.6753	0.2023	404.2800	3.1900	3.9800
UGPA	108	2.9080	0.4155	314.0600	2.0000	3.9200
CYRS	98	5.4490	2.2618	534.0000	2.0000	12.0000
EYRS	20	4.8000	1.6416	96.0000	1.0000	8.0000
GRET	92	1180	111.4531	108520	920.0000	1390
GREV	92	511.5217	61.7676	47060	370.0000	640.0000
GREQ	92	668.0435	71.5486	61460	520.0000	800.0000
GREA	88	580.9091	93.9997	51120	380.0000	800.0000
GMTT	26	556.1538	63.5658	14460	470.0000	670.0000
GMTV	26	31.6154	4.2622	822.0000	25.0000	38.0000
GMTQ	26	35.1538	6.1299	914.0000	27.0000	47.0000
TOEF	0	.	.	.	.	.
AGE	110	29.6545	3.4011	3262	25.0000	39.0000

Supply Management Program

Simple Statistics

Variable	N	Mean	Std Dev	Sum	Minimum	Maximum
GGPA	36	3.6092	0.2152	129.9300	2.9700	3.8800
UGPA	36	2.9250	0.4205	105.3000	2.1800	3.7600
CYRS	36	7.6667	4.0988	276.0000	2.0000	15.0000
EYRS	12	5.1667	1.2673	62.0000	3.0000	7.0000
GRET	14	1143	124.2472	16000	990.0000	1360
GREV	14	538.5714	66.1998	7540	460.0000	640.0000
GREQ	14	604.2857	91.4595	8460	490.0000	760.0000
GREA	12	581.6667	43.6585	6980	510.0000	640.0000
GMTT	24	516.1667	38.8304	12388	450.0000	574.0000
GMTV	24	30.2500	3.9370	726.0000	22.0000	36.0000
GMTQ	24	30.5833	5.3154	734.0000	21.0000	40.0000
TOEF	0	.	.	.	.	.
AGE	36	31.0556	3.8318	1118	25.0000	37.0000

------------------------------- PROG=42 -------------------------------

Information Resources Management Program

Simple Statistics

Variable	N	Mean	Std Dev	Sum	Minimum	Maximum
GGPA	20	3.6330	0.2447	72.6600	3.2100	4.0000
UGPA	20	3.1550	0.4540	63.1000	2.3100	3.7700
CYRS	20	8.2000	3.5482	164.0000	4.0000	14.0000
EYRS	2	13.0000	0	26.0000	13.0000	13.0000
GRET	20	1161	104.3728	23220	990.0000	1300
GREV	20	574.0000	78.9670	11480	450.0000	710.0000
GREQ	20	587.0000	47.4730	11740	510.0000	680.0000
GREA	18	588.8889	101.8008	10600	430.0000	750.0000
GMTT	4	535.0000	40.4145	2140	500.0000	570.0000
GMTV	4	35.0000	11.5470	140.0000	25.0000	45.0000
GMTQ	4	28.5000	8.6603	114.0000	21.0000	36.0000
TOEFL	0	.	.	.	.	.
AGE	20	32.2000	4.7195	644.0000	26.0000	39.0000

Appendix C: Prediction Models for GGPA by Academic Program

Prediction Model for

Astronautical Engineering (N = 166)

VARIABLE	WEIGHT	SIGNIFICANCE
INTERCEPT	1.3551	0.0002
UGPA	0.1610	0.0160
GREQ	0.0016	<0.0001
GREA	0.0010	0.0321
CYRS	-0.0133	0.0496
EYRS	-0.0589	<0.0001

MODEL R^2 = 0.3571

MODEL SIGNIFICANCE = <0.0001

Aeronautical Engineering (N = 398)

VARIABLE	WEIGHT	SIGNIFICANCE
INTERCEPT	1.9970	<0.0001
UGPA	0.3118	<0.0001
GREQ	0.0006	0.0254
CYRS	0.0111	0.0131
EYRS	-0.0191	0.0044

MODEL R^2 = 0.2302

MODEL SIGNIFICANCE = <0.0001

Prediction Model for

Prediction Model for

Computer Science (N = 256)

VARIABLE	WEIGHT	SIGNIFICANCE
INTERCEPT	2.1224	<0.0001
UGPA	0.1389	0.0062
GRET	0.0006	0.0115
GREA	0.0005	0.0490

MODEL R^2 = .3502

MODEL SIGNIFICANCE = <0.0001

Prediction Model for

Electrical Engineering (N = 650)

VARIABLE	WEIGHT	SIGNIFICANCE
INTERCEPT	2.3648	<0.0001
UGPA	0.2502	<0.0001
GREQ	0.0006	0.0043
EYRS	-0.0186	<0.0001

MODEL R^2 = 0.2320

MODEL SIGNIFICANCE = <0.0001

Prediction Model for

Electro-Optical Engineering (N = 90)

VARIABLE	WEIGHT	SIGNIFICANCE
INTERCEPT	5.2492	<0.0001
UGPA	0.1608	0.0136
GREQ	0.0017	0.0415
EYRS	0.1580	<0.0001

MODEL R^2 = .8308

MODEL SIGNIFICANCE = <0.0001

Prediction Model for

Engineering Physics (N = 211)

VARIABLE	WEIGHT	SIGNIFICANCE
INTERCEPT	1.4351	<0.0001
UGPA	0.3025	<0.0001
GRET	-0.0008	0.0123
GREQ	0.0018	0.0131
GREA	0.0014	0.0004

MODEL R^2 = 0.3022

MODEL SIGNIFICANCE = <0.0001

Prediction Model for

Nuclear Engineering (N = 123)

VARIABLE	WEIGHT	SIGNIFICANCE
INTERCEPT	1.8237	<0.0001
UGPA	0.2054	0.0228
GRET	0.0007	0.0027

MODEL R^2 = 0.2188

MODEL SIGNIFICANCE = 0.0002

Prediction Model for

Operations Research (N = 193)

VARIABLE	WEIGHT	SIGNIFICANCE
INTERCEPT	1.2906	<0.0001
UGPA	0.1685	0.0005
GREQ	0.0010	<0.0001
GREA	0.0012	<0.0001
AGE	0.0122	0.0190

MODEL R^2 = 0.5982

MODEL SIGNIFICANCE = <0.0001

Prediction Model for

Systems Engineering (N = 91)

VARIABLE	WEIGHT	SIGNIFICANCE
INTERCEPT	2.5078	0.0002
GRET	0.0539	0.0050
GREV	-0.0542	0.0046
GREQ	0.0528	0.0056
CYRS	-0.0284	0.0363

MODEL R^2 = 0.4910

MODEL SIGNIFICANCE = 0.0024

Prediction Model for

Strategy and Tactical Sciences (N = 178)

VARIABLE	WEIGHT	SIGNIFICANCE
INTERCEPT	2.3957	<0.0001
UGPA	0.1699	0.0100
GREV	0.0012	<0.0001

MODEL R^2 = 0.2262

MODEL SIGNIFICANCE = <0.0001

Prediction Model for

Space Operations (N = 100)

VARIABLE	WEIGHT	SIGNIFICANCE
INTERCEPT	2.3888	<0.0001
UGPA	0.3475	<0.0001
GREA	0.0009	0.0003
AGE	-0.0169	0.0050

MODEL R^2 = 0.3549

MODEL SIGNIFICANCE = <0.0001

Prediction Model for

Guidance and Control (N = 77)

VARIABLE	WEIGHT	SIGNIFICANCE
INTERCEPT	1.7430	<0.0001
UGPA	0.2664	0.0131
GREA	0.0013	0.0300

MODEL R^2 = 0.3339

MODEL SIGNIFICANCE = <0.0001

Prediction Model for

Systems Analysis (N = 48)

VARIABLE	WEIGHT	SIGNIFICANCE
INTERCEPT	2.9861	<0.0001
UGPA	0.2154	0.0159
AGE	-0.0168	0.0201

MODEL R^2 = 0.2913

MODEL SIGNIFICANCE = 0.0016

Prediction Model for

Computer Engineering (N = 42)

VARIABLE	WEIGHT	SIGNIFICANCE
INTERCEPT	3.5298	<0.0001
GRET	0.0025	0.0006
GREV	-0.0019	0.0275
CYRS	-0.1483	<0.0001
EYRS	-0.0316	0.0192
AGE	0.1033	<0.0001

MODEL R^2 = 0.5952

MODEL SIGNIFICANCE = <0.0001

Prediction Model for

Acquisition Logistics (N = 77)

VARIABLE	WEIGHT	SIGNIFICANCE
INTERCEPT	3.0977	<0.0001
GREA	-0.0017	0.0176
GMTV	0.0448	0.0043

MODEL R^2 = 0.5735

MODEL SIGNIFICANCE = 0.0016

Prediction Model for

Contracting Management (N = 177)

VARIABLE	WEIGHT	SIGNIFICANCE
INTERCEPT	2.0229	<0.0001
UGPA	0.0967	0.0386
GREA	0.0014	0.0072
GMTT	0.0016	0.0002
AGE	-0.0117	0.0332

MODEL R^2 = 0.2958

MODEL SIGNIFICANCE = <0.0001

Prediction Models for

Facilities Management (N = 137)

VARIABLE	WEIGHT	SIGNIFICANCE
INTERCEPT	3.3647	<0.0001
EYRS	-0.0232	0.0003

MODEL R^2 = 0.1081

MODEL SIGNIFICANCE = 0.0005

Prediction Model for

International Logistics Manaqement (N = 35)

VARIABLE	WEIGHT	SIGNIFICANCE
INTERCEPT	2.6814	<0.0001
UGPA	0.2465	0.0168

MODEL R^2 = 0.1911

MODEL SIGNIFICANCE = 0.0336

Prediction Model for

Logistics Management (N = 834)

VARIABLE	WEIGHT	SIGNIFICANCE
INTERCEPT	2.4254	<0.0001
UGPA	0.1399	<0.0001
GRET	0.0003	0.0272
GMTQ	0.0079	0.0044
CYRS	0.0130	0.0007
AGE	-0.0086	0.0027

MODEL R^2 = 0.1930

MODEL SIGNIFICANCE = <0.0001

Prediction Model for

Maintenance Management (N = 87)

VARIABLE	WEIGHT	SIGNIFICANCE
INTERCEPT	0.9783	0.1676
UGPA	0.1307	0.0301
GREV	0.0020	0.0005
GMTT	0.0013	0.0455

MODEL R^2 = 0.3187

MODEL SIGNIFICANCE = 0.0003

Prediction Model for

Systems Management (N = 303)

VARIABLE	WEIGHT	SIGNIFICANCE
INTERCEPT	3.2778	<0.0001
UGPA	0.1840	0.0011
GMTQ	0.0158	0.0019
AGE	-0.0288	0.0003

MODEL R^2 = 0.2320

MODEL SIGNIFICANCE = <0.0001

Prediction Model for

Transportation Management (N = 28)

VARIABLE	WEIGHT	SIGNIFICANCE
INTERCEPT	2.6477	<0.0001
GREQ	0.0014	0.0383

MODEL R^2 = 0.2416

MODEL SIGNIFICANCE = 0.0383

Prediction Model for

Cost Analysis (N = 20)

VARIABLE	WEIGHT	SIGNIFICANCE
INTERCEPT	-14.0514	<0.0001
GREA	0.0253	<0.0001
GMTT	0.0044	<0.0001

MODEL R^2 = 0.8941

MODEL SIGNIFICANCE = <0.0001

Prediction Model for

Engineering Management (N = 40)

VARIABLE	WEIGHT	SIGNIFICANCE
INTERCEPT	3.0877	<0.0001
UGPA	0.2066	<0.0001
EYRS	-0.0155	0.0402

MODEL R^2 = 0.2068

MODEL SIGNIFICANCE = <0.0001

Prediction Model for

Supply Management (N = 36)

VARIABLE	WEIGHT	SIGNIFICANCE
INTERCEPT	2.9697	<0.0001
UGPA	-0.1156	0.0396
GMTQ	0.0311	<0.0001

MODEL R^2 = 0.4257

MODEL SIGNIFICANCE = <0.0001

Prediction Model for

Information Resources Management (N = 20)

VARIABLE	WEIGHT	SIGNIFICANCE
INTERCEPT	6.1477	0.0032
UGPA	0.3655	<0.0001
GREV	-0.0030	<0.0001
GREQ	0.0012	0.0343
GREA	0.0024	<0.0001
GMTQ	-0.0518	<0.0001
AGE	-0.0129	0.0293

MODEL R^2 = 0.9397

MODEL SIGNIFICANCE = <0.0001

Appendix D: Significant Predictors by Academic Program

	PREDICTORS (ALPHA = 0.05)										
PROGRAM	UGPA	CYRS	EYRS	GRET	GREV	GREQ	GREA	GMTT	GMTV	GMTQ	AGE
ASTRONAUTICAL ENGINEERING	X			X	X	X					
AERONAUTICAL ENGINEERING	X					X	X				
COMPUTER SCIENCE	X			X	X	X	X	X	X	X	
ELECTRICAL ENGINEERING	X		X	X	X	X	X				X
ELECTRO-OPTICAL ENGINEERING	X			X	X	X					
ENGINEERING PHYSICS	X	X		X		X	X	X		X	
NUCLEAR ENGINEERING	X			X	X	X	X				
OPERATIONS RESEARCH	X			X	X	X	X	X	X	X	
SYSTEMS ENGINEERING				X	X	X	X				
STRATEGY AND TACTICAL SCIENCES	X		X	X	X	X	X				
SPACE OPERATIONS	X			X		X	X				X

PREDICTORS (ALPHA = 0.05)

PROGRAM	UGPA	CYRS	EYRS	GRET	GREV	GREQ	GREA	GMTT	GMTV	GMTQ	AGE
GUIDANCE AND CONTROL	X			X	X	X	X				
RELIABILITY ENGINEERING				X							
SYSTEMS ANALYSIS	X	X									X
SPACE FACILITIES	---NO SIGNIFICANT PREDICTORS---										
COMPUTER ENGINEERING	X	X	X								
ACQUISITION LOGISTICS	---NO SIGNIFICANT PREDICTORS---										
CONTRACTING MANAGEMENT				X		X	X	X	X	X	
FACILITIES MANAGEMENT						X	X				
INTERNATIONAL LOGISTICS MANAGEMENT	X										
LOGISTICS MANAGEMENT	X			X	X	X	X	X	X	X	
MAINTENANCE MANAGEMENT	X			X	X	X	X				
SYSTEMS MANAGEMENT			X	X	X	X	X	X	X	X	X
TRANSPORTATION MANAGEMENT				X		X					
COST ANALYSIS				X	X	X	X	X	X		
ENGINEERING MANAGEMENT	X					X		X			
SUPPLY MANAGEMENT								X		X	
INFORMATION RESOURCES MANAGEMENT								X	X	X	

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Vita

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13. ABSTRACT (Maximum 200 words)
The purpose of this thesis was to determine the validity of the selection procedures that AFIT uses for admission to their resident graduate programs by discovering if the variables considered by the AFIT registrar's office can predict success at AFIT. The study was based on a collection of 4507 academic records of US military officers, foreign officers, and civilians who attended as AFIT students between 1975-1987. The academic records provided the predictor variables to include each graduate student's undergraduate GPA, standardized test scores, and demographics. Through correlation analysis, this study examined the relationships between the criterion, graduate GPA, and the predictor variables. The entire sample was analyzed and then divided by academic program to determine predictor suitability across all programs. The study found that all predictors were not equally weighted across all academic programs. The study found that all predictors were significantly correlated with graduate GPA. Models were developed, by program, for use by the Institute during their student selection procedures.

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3. The benefits of AFIT research can often be expressed by the equivalent value that your agency received by virtue of AFIT performing the research. Please estimate what this research would have cost in terms of manpower and/or dollars if it had been accomplished under contract or if it had been done in-house.

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4. Often it is not possible to attach equivalent dollar values to research, although the results of the research may, in fact, be important. Whether or not you were able to establish an equivalent value for this research (3 above), what is your estimate of its significance?

   a. Highly Significant   b. Significant   c. Slightly Significant   d. Of No Significance

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