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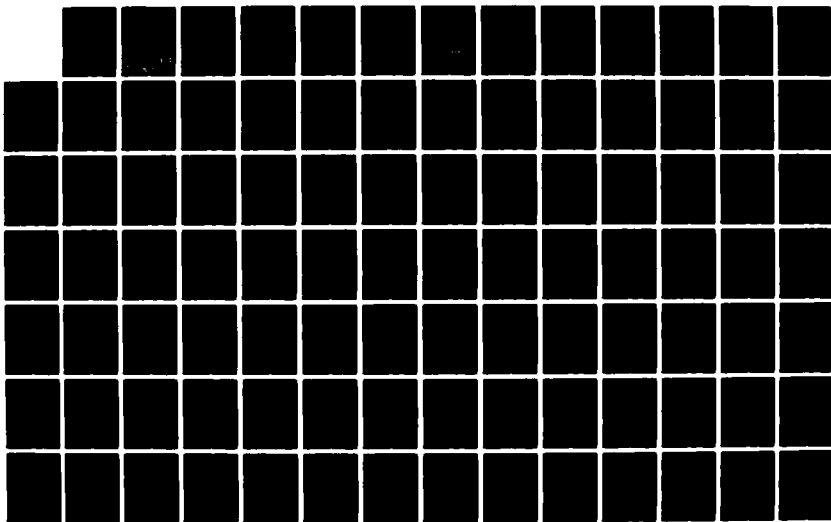
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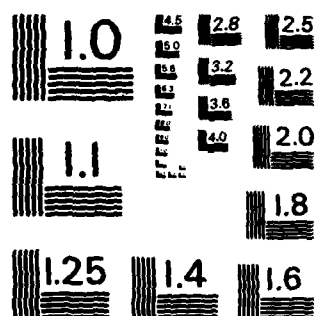
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THE ATTAINMENT OF A DOCTORAL DEGREE RELATIVE TO OTHER VARIABLES
IN THE PROMOTABILITY OF UNITED STATES AIR FORCE ACADEMY
GRADUATES TO THE RANK OF COLONEL.

A Dissertation

Presented to

the Faculty of the Graduate School of Arts and Sciences
University of Denver

In Partial Fulfillment
of the Requirement for the Degree
Doctor of Philosophy

by

Ruben Anthony Cubero

August 1983

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Ruben Anthony Cubero

August 1983



The study was designed to probe into the PhD's impact on the military promotion system. The study analyzed the overall effect of a doctoral degree on the promotion of USAF Academy graduates to colonel, and analyzed the discriminating role of specific characteristics related to the attainment of a PhD on the promotion of USAF Academy graduates to the rank of colonel. The study employed the discriminant function analysis subprogram of the computer program, Statistical Package for the Social Sciences (SPSS) for both analyses.

In the first analysis, the PhD proved to be a significantly negative factor by itself, but in a multivariate procedure was not statistically significant in discriminating between any of the criterion groups tested. The single most significant variable in deciding military promotion success was the average of the officer's effectiveness ratings.

In the second analysis, the study demonstrated that specific characteristics related to time were more negative the longer their duration. For example, long periods of academic time as an instructor, excessive academic time in pursuit of the PhD, and a long period of consecutive time as either a student or an instructor, all detracted from promotion opportunities. In contrast, completing one's PhD during the graduate schooling tour, and being stationed at the

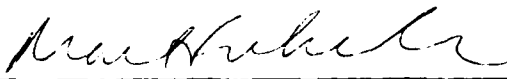
Air Force Academy directly before pursuing a PhD, were shown to be career enhancing.

The most fundamental concept to emerge from this study was that the Air Force tended to promote those individuals who devoted their energies to the successful accomplishment of all military endeavors. The second major conclusion was that the officer effectiveness ratings' average did exert the most powerful influence on the promotability of Academy graduates to colonel. Finally, the doctoral degree, although singularly a weak negative factor in the promotion process, seemed to be of little practical significance as a predictive variable to colonel. However, because this study's findings showed that the PhD variable probably was divisible into positive and negative specific characteristics, certain strategies emerged which tended to demonstrate that the overall impact of the PhD on promotability to colonel could be made more positive.

THE GRADUATE SCHOOL OF ARTS AND SCIENCES
OF
THE UNIVERSITY OF DENVER

Upon the recommendation of the Director of
the School of Education this dissertation
is hereby accepted in partial fulfillment
of the requirement for the degree of

Doctor of Philosophy



Professor in charge of dissertation



Dean, Graduate School of Arts and Sciences

August 1983

Date

To the memory of all my fallen
classmates who were never
given the opportunity.

"Man's flight through life is sustained
by the power of his knowledge."

Quotation at the base of the
Eagle and Fledglings statue,
Air Force Academy, Colorado.

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I also wish to acknowledge the all-inclusive support afforded me by the United States Air Force Academy. From the Dean of Faculty, Brigadier General William Orth, who made my PhD schooling possible, to Airman Cass Cunningham, who taught me the intricacies of the Burrough's 6900, their assistance was sincerely appreciated.

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THE PROBLEM AND ITS SETTING

Statement of the Problem

Although the majority of the military promotion literature supported the contention that graduate education was career enhancing, no studies have been conducted which demonstrated the unique long term effects of attaining a PhD on a military career. Most of the studies reviewed analyze doctoral degrees along with master's degrees under the single variable, "graduate education." However, because there were many more master's degree holders in the Air Force than PhD holders, the results of those studies obscured the individual impact of a doctoral degree on the promotion process.

Those who promoted doctoral study and those who made decisions about whether to pursue doctoral study were faced with a problem: Was the attainment of a doctoral degree a help or a hindrance in reaching the rank of colonel? Was the doctoral degree perhaps a greater (or lesser) advantage

in certain fields, in conjunction with certain assignments, or if completed in a short period of time?

At the rudimentary level, this study examined the relationship between the attainment of a PhD and the promotability of United States Air Force Academy graduates to the rank of colonel. The study, however, was also useful in focusing on the doctoral degree when it was not considered a credential for entry or advancement in a particular profession. The results of this study, therefore, could apply to many non-military professions where individuals faced the conflict of trying to resolve academic achievement with professional effectiveness, or trying to pursue an academic career in non-academic professions.

Purpose of the Study

↙ The dual purposes of this study were: 1) to analyze the role of graduate education as represented by an earned PhD degree among other discriminating variables in the promotion of USAF Academy graduates to the field grade rank of colonel, and 2) to analyze the discriminating role of specific characteristics related to the attainment of a PhD, eg., the length of time in pursuit of a PhD, the discipline →

of the PhD, PhD related assignments, etc., in the promotion of USAF Academy graduates to the field grade rank of colonel.

The Significance of the Study

In general, this study was important in investigating the relationship of PhD level higher education and military promotion. Graduate education and its impact on the promotion system should be clearly defined for Air Force members to avoid confusion and misunderstanding in career planning. Moreover, an officer with a doctorate represents a unique resource in the Air Force today. This study in part focused on the effective utilization and management of those resources.

This study has particular application to the United States Air Force Academy. Determining the impact of graduate education on military promotion would be valuable to both Academy cadets and faculty. Academy cadets spend approximately 80% of their four year training period satisfying academic requirements. Moreover, the cadets have always been encouraged to continue their education beyond their undergraduate preparation by taking advantage of the

many educational opportunities offered them later in their careers. In fact, the Academy for many years sought accreditation to grant master's degrees to those qualified cadets who could complete their baccalaureate and master's requirements in the prescribed four year period.

This comprehensive academic orientation has been the hallmark of the Academy for over 25 years. Through conscious design the Academy has cultivated a strong desire for academic achievement in all its graduates. The proposed study investigated how compatible advanced academic education was with the military career progression of Air Force Academy graduates. The results of the study would either reinforce the Academy's positive view of graduate education on military careers, or would suggest limitations of advanced education on military career progression.

This study would also be of great interest to the 475 member Academy faculty, of which 25% were Air Force Academy graduates. The majority of Academy instructors were selected from mainstream operational units in the Air Force and either had or obtained a master's degree before being assigned to Academy instructor duty. After being stationed at the Academy for two years, a few of the more outstanding instructors were considered for PhD sponsorship. Each department on the faculty was authorized from 20% to 50% of

its manning as PhD positions. These PhD billets were designed to teach the advanced courses within the discipline, and to raise the overall academic qualifications of the Academy faculty.

From this pool of PhD officers, approximately 10% of the department's manning was eligible for "tenure" status. Once tenure status was attained, the selected officers were able to remain at the Academy for consecutive four year teaching tours. The renewal of a four year tenure position required the mutual consent of both the Academy and the individual concerned. Those outstanding officers sponsored for PhD programs could easily spend half, and sometimes more than half, of their 20 year careers in an academic environment.

The overall effect of all this "academic" time may have been an instance when graduate education has a negative impact on promotion. Idiographic cases seemed to indicate that some Academy officers on the faculty with PhDs have excellent advancement opportunities to the lower and middle grades, but did not fare as well as mainstream operational officers to the rank of colonel. This study, therefore, would be extremely useful in specifying which variables unique to the attainment of a PhD would be compatible with the individual's promotion to the rank of colonel.

Finally, this study was important to the individual military member who considered a graduate education of value for personal and professional reasons. The results of the study allowed them to weigh the advantages and disadvantages of attaining a doctoral degree in the military relative to other variables against their promotability to high rank. The study also attempted to present any realistic "trade-offs" that might occur between variables and their equivalent influences when promoting individuals to high rank in the Air Force.

Background Information

The military services have always been vitally concerned with recruiting and retaining high quality personnel. The quality of their officer corps was of particular importance due to their hierarchal organizational structures which normally conferred decisionmaking on the "ranking" individual. Because decisions became more critical as one progressed up the chain of command, the services attempted to promote the most outstanding candidates from each pool of eligible officers. Once an individual was promoted he automatically began a quest for the next higher rank. This process continued until the individual either was not selected or he

retired from active service. This selection procedure was known as the military promotion process.¹

For each particular rank the military promotion process has three possible outcomes. First, an individual could be promoted "below the zone" (BTZ) indicating that s/he would be accelerated to the next grade one to three years before his/her primary zone eligibility period. Second, an individual could be promoted "on time" (ONT) indicating that s/he would progress to the next grade during his/her primary zone eligibility period. Third, an individual could be "passed over" (PDO) indicating that s/he would not be promoted to the next grade during his/her primary zone eligibility period.

The three promotion outcomes could be interpreted as representing three distinct levels of institutional quality. In this particular case the three outcomes represented how the Air Force viewed the value of the individual member. As a general rule those officers promoted below the zone were

¹Promotions in the military profession are the manifestations of a successful military career. As in any pyramidal organization, the higher the position, the greater the responsibility and rewards in terms of monetary consideration and job satisfaction. To advance higher in the military pyramid the individual officer must be promoted to a series of higher ranks. His consideration for promotion at each higher rank is known as the military promotion process.

considered officers of the highest quality, those promoted on time of high quality, and those passed over of acceptable quality. To the non-military reader this latter group might require additional explanation.

Winters (1978) commented that, officially, a promotion pass over was not to be considered a stigma. The "up or out" system was designed to provide more officers than were qualified to serve in the next grade. The services, therefore, could pick the best from a selection of fully qualified officers. Consequently, not all fully qualified officers advanced to the next rank. The Air Force, however, recognized the fully qualified value of the passed over officers and, correspondingly, allowed them to serve in their current rank for a specified tenure period. (p. 36)

The promotion process could, therefore, be viewed as a continuum from passed over officers to below the zone officers at each rank considered. Those variables having an impact on the officers promoted below the zone could be designated as exceedingly career enhancing, while those variables having an impact on the officers passed over for promotion could be said to be career detracting. It was on this continuum that this research attempted to place all the variables examined with special emphasis on the position of the doctoral degree variable.

The Conceptual Model

If quality, then, was the basis for military promotion, a working definition of quality was needed in order to understand the promotion system. Defining quality was not easy. Consider first a quotation from Robert Persig's book, Zen and the Art of Motorcycle Maintenance, in trying to come up with a personalized definition:

Quality...you know what it is, yet you don't know what it is. But that's self contradictory. But some things are better than others, that is they have more quality. But when you try to say what that quality is, apart from the things that have it, it all goes poof! (p. 178)

A more conventional approach, however, might provide some insight into this very illusive construct. The dictionary defined quality as "(1) character with respect to excellence, fineness, or grade of excellence; (2) high grade, superior excellence [in] an accomplishment or attainment; and (3) character or nature, as belonging to or distinguishing a thing," (Random House Dictionary of the English Language).

In applying these definitions to the military, the key words were "excellence," "accomplishment," and "distinguishing". Even these three concepts, however, might be quite

different. If a choice had to be made, "accomplishment" came closest to connoting what was usually viewed as quality in a military person. In the Air Officer's Guide (1959), the following passage revealed the key to a successful military career: "An officer may earn splendid reports which will lead to a successful and envied career by establishing a reputation of finding always a way of getting things done..." (p. 228).

The military officer was judged better or superior because of what s/he has accomplished, and because of his/her potential for greater accomplishment in the future. There were, quite naturally, different bases of judgment to this important assessment of quality. Quality might be either personal or institutional. For example, what a person believed quality to be (personal) might be very different from what his group or organization believed (institutional). For the purposes of studying the military promotion system, the institutional basis of judgment, or how the Air Force assessed quality in order to promote individuals to higher rank and responsibility, was of primary concern.

Quality assessment in the Air Force was generally accomplished by evaluating a military member's official record with regard to training received, performance of duty, and other situational factors. These training, performance, and

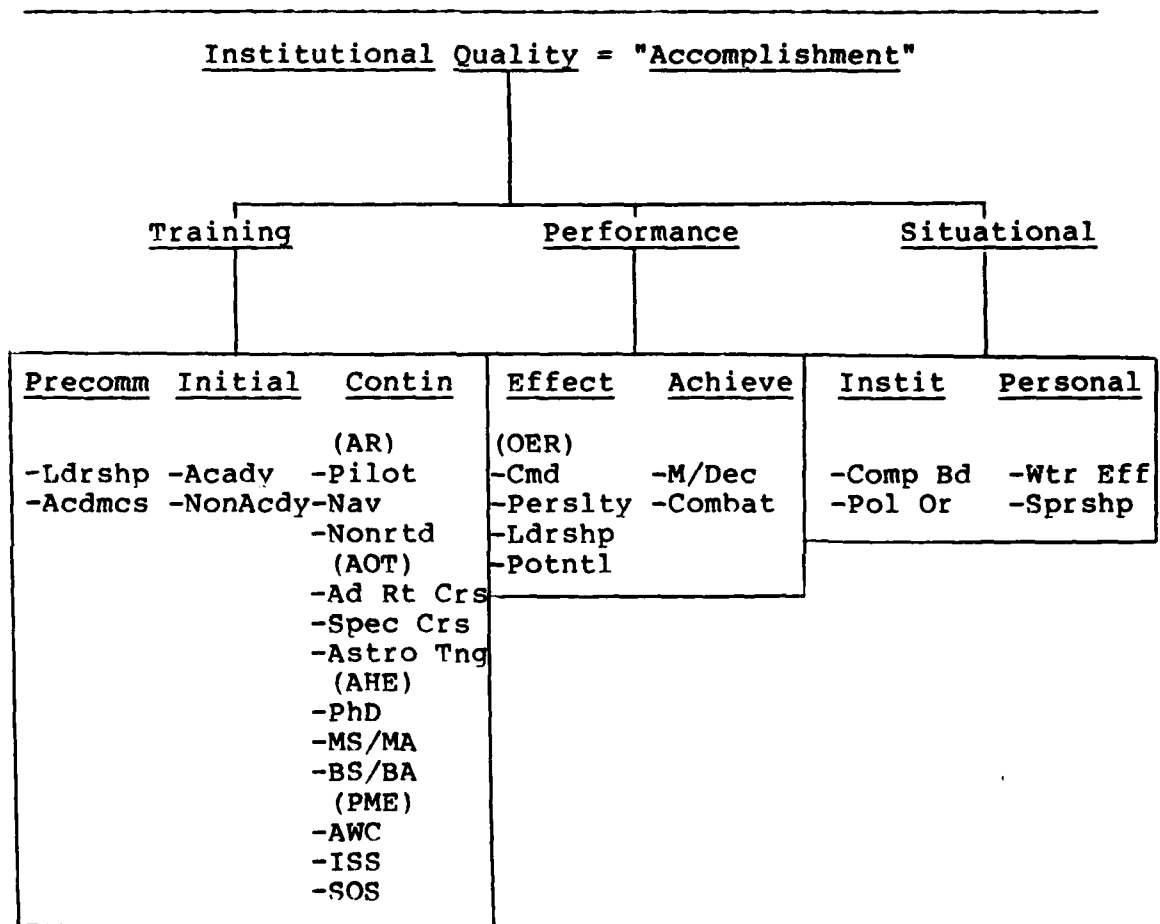
situational criteria could be further refined into subcategories, which, in turn, generated the specific variables that were used to compare and judge individuals by promotion board members. Diagram A presented a conceptual model of 26 variables that might have an impact on promotability. Understanding these variables would aid in understanding the military promotion process.

The training criterion was divided into precommissioning, initial, and continuing training subcategories. The precommissioning training subcategory entailed the entire spectrum of secondary and undergraduate education received by the military member. As factors or variables to consider in the promotion process, it would appear the degree of distinction in academic and leadership endeavors would tend to be the most relevant. Although the promotion boards would not evaluate this data directly, the variables of secondary and undergraduate academic and leadership success might correlate with later success in the military, and for that reason were considered in this study.

The initial training subcategory consisted, exclusively, of the source of commissioning. An officer candidate was normally tendered a commission in the United States Air Force through the Air Force Academy, the Reserve Officer Training Corps, or the Officer Training School. For this

Diagram A

POSTULATED VARIABLES



26 POSTULATED VARIABLES

study the population consisted entirely of Air Force Academy graduates. As a group these Air Force Academy graduates have undergone the most intensive training program in

preparation for their commissions, and represented the group most likely to assume Air Force leadership positions for the future.

The source of commissioning represented the first process by which the Air Force promotion boards perceived a quality distinction among its officers. The United States Air Force Academy was created to improve the quality of the officer corps, and Academy graduates, by definition, were considered quality officers. Logically, they were designated quality officers not because of their accomplishments, but rather because of their expected contributions and accomplishments in the future.

The continuing training subcategory reflected the training and education a military member received beyond the minimum level required for entry into the Air Force. This subcategory included the aeronautical rating (AR) of individuals, their advanced operational training (AOT), the completion of professional military education (PME), and the attainment of an earned degree, which was designated academic higher education (AHE) in this report.

Since its inception in 1947, the Air Force presumably has considered the aeronautical rating as a discriminator of quality among its officer personnel. With the straight

forward mission of the Air Force being "to fly and to fight," those who flew were seen as contributing directly to the primary mission, while those who were non-rated were relegated to a secondary role in support of the Air Force's primary mission.

Once a military member was assigned to an operational unit in the Air Force, there were additional opportunities for advanced operational training (AOT) in his rated specialty, or in non-rated specialized assignments. On the rated side, pilots and navigators were often enrolled in advanced flying courses in order to upgrade their rated proficiency, such as the Test Pilot School at Edwards AFB, CA. On the non-rated side, specialty training for officers existed in numerous career-broadening fields, such as advanced courses in management, transportation, comptroller, and logistics. Probably the most prestigious AOT in the services today was astronaut training under the supervision of the National Aeronautics and Space Administration (NASA).

In the Air Force, PME has been elevated practically to a "requirement" for promotion to high rank. The normal progression in the Air Force was to complete the Squadron Officer's School (SOS) as a Captain with five years of service, the Intermediate Service School (ISS) as a major with ten years of service, and the Air War College (AWC) as a

lieutenant colonel or colonel with 15 to 21 years of service, respectively. All the professional military courses in the Air Force were available to all officers and were offered in residence or by correspondence.

The performance subcategory was of particular importance in the promotion process and was identified most closely with the military's definition of quality within individuals. Job performance, demonstrated leadership, capacity for command, and analytical decision-making ability all played a significant role in an individual's successful rank progression. Also, the types of positions occupied, the number of subordinates directly under supervision, the level of authority exercised, and a diversified portfolio of military experience positively enhanced one's promotability.

Promotion boards viewed outstanding performance as the best indicator of a "quality" individual. Performance was reflected principally in the officer effectiveness reports (OERs), which were considered the most powerful discriminator in promotion to higher rank. The other performance-related variables which indicated achievement were medals and decorations, and a distinctive combat record.

Finally, the effects of the situational criterion variables on the promotion process were of seemingly lesser

importance than the performance variables. This criterion included all the unpredictable, difficult to measure factors which could influence the promotion of individuals to high rank. For example, on the institutional level, a shift in policy, such as the pressing need for scientists and computer operators, and the background and biases of the members of the promotion board themselves might have a significant effect on the promotion process.

Because promotion boards promoted the best records, the supervisor's writing ability, and the informal sponsorship by a superior officer in the form of high level endorsement and praise on the OER might also influence the promotion process. Sponsorship could account for "by name" assignments and increased job responsibility which, in turn, could indirectly affect an individual's promotability. Although the designation "situational" variables might impart a connotation of unimportance, nothing could be further from the truth. These variables many times assumed the role of "tie-breakers" in the event all the other selection criteria were considered equal. As such, their importance in the military promotion process should not be underestimated.

The individual effects of the variables listed in Diagram A on the military promotion process varied greatly. The literature suggested that the performance variables, and

in particular, the effectiveness ratings of the officers, constituted the single most important source of information for promotion purposes and change of assignments. (Air Officer's Guide, p. 221) Compared to the performance variables, the training variables would appear to have a secondary impact on the promotion board's decisions. The situational variables fluctuated in their importance based on the need to discriminate further. However, because the situational variables were also impossible to measure, the first part of this study attempted an evaluation of the relative importance of only the performance and training variables' impact on the military promotion process.

The overall effect of the PhD on promotability was assumed to be comprised of the individual effects of other PhD related subvariables, called specific characteristics. Moreover, because the overall effect of the PhD, relative to other variables, might mask the individual effects of these PhD related subvariables, the second part of this study proposed to analyze the role of specific characteristics related to the attainment of the doctoral degree, such as the length of time in pursuit of the PhD, the discipline of the PhD, PhD related assignments, etc., in the promotion of Air Force Academy graduates to the grade of colonel. Diagram B listed all these specific characteristics which

might effect promotability. The specific characteristics were listed in two reference groups, Time and Performance, with the Time group characteristics predicted to have greater discriminating power than the Performance group characteristics.

Diagram B

SPECIFIC CHARACTERISTICS RELATED TO THE ATTAINMENT OF A PHD

<u>Specific Characteristics</u>	<u>Quantification</u>	<u>Measure</u>
<u>Time Group</u>		
a) Time in pursuit PhD	No of years	Continuous
b) Total academic time	No of years	Continuous
c) Consecutive academic time	No of years	Continuous
d) Age PhD completion	No of years	continuous
e) Total commissioned time PhD completion	No of years	continuous
<u>Performance Group</u>		
a) Cmd duty before PhD	By class	Discrete
b) Cmd duty after PhD	By class	Discrete
c) Discipline of PhD	By division	Discrete
d) PhD related assignment	Yes-No	Discrete
e) Completion of PhD	By class	Discrete
f) Funding for PhD	by class	Discrete
g) AFA sponsorship	Yes-No	Discrete

The Variables Considered

The first part of the analysis attempted to determine the overall effect of attaining a doctoral degree relative to the effects of other training and performance variables (v. supra) in the promotion of United States Air Force Academy graduates to colonel. Diagram C1 depicted in three dimensions the interrelationships between the dependent variables--promoted below the zone (BTZ), promoted on time (ONT), and passed over (PDO); the primary independent variables--PhD, no PhD; and the other training, performance, and situational independent variables listed in Diagram A.

Second, the analysis attempted to determine how specific characteristics related to the attainment of a PhD (v. supra) influenced the promotion of Air Force Academy graduates to the rank of colonel. In like three dimensional fashion, Diagram C2 depicted the interrelationships between the dependent variables--promoted below the zone with PhD (BTZ&PhD), promoted on time with PhD (ONT&PhD), and passed over with PhD (PDO&PhD); the specific independent characteristics related to the attainment of the PhD listed in Diagram B; and the other training, performance, and situational independent variables listed in Diagram A. Note that the criterion groups for the first analysis dealt with the

Diagram C1 - INTERRELATIONSHIP OF VARIABLES FOR H1

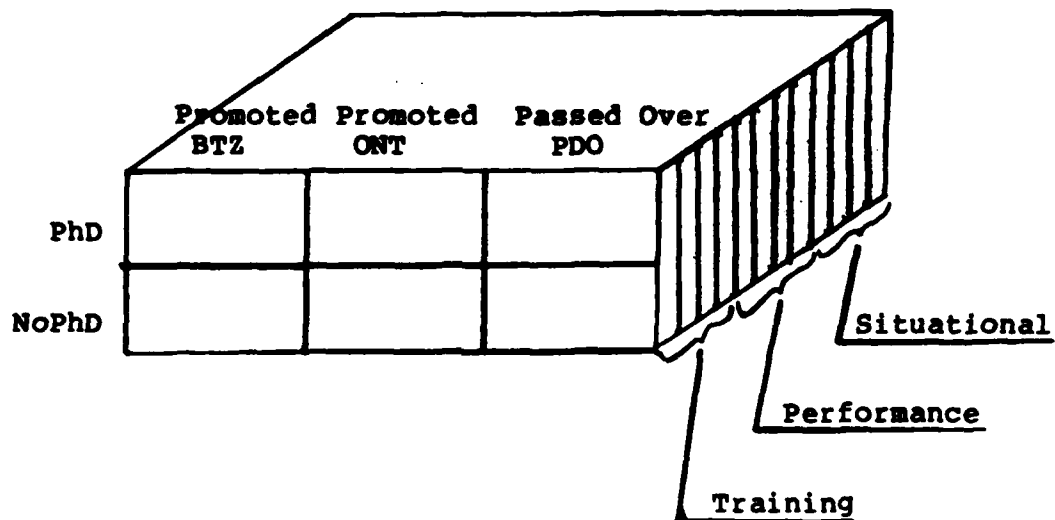
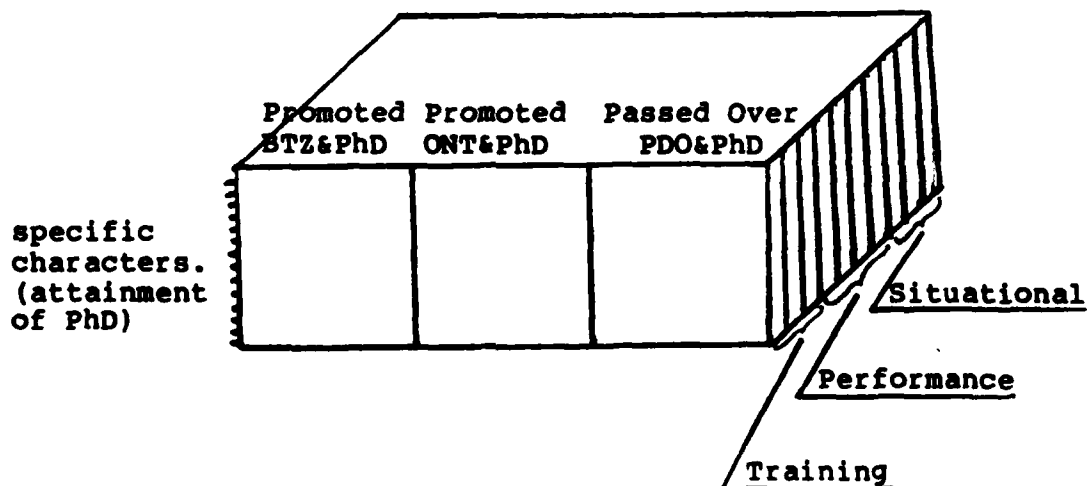


Diagram C2 - INTERRELATIONSHIP OF VARIABLES FOR H2



promotion of all Academy graduates considered, and in the second analysis the criterion groups dealt only with the promotion of Academy graduates with their PhDs.

The Abbreviations and Definition of Terms

The abbreviations, common to military terminology, were included in Appendix A. The specific military terms used in this research study were defined in Appendix B.

The Organization of the Remaining Chapters

Chapter 2 dealt with a review of related literature. Of importance were the references cited which substantially demonstrated the value of the postulated variables on the promotion process. A detailed review of the possible effects of a doctoral degree was also presented.

Chapter 3 reiterated the purpose of the study and described the independent and dependent variables considered in the analysis. Each hypothesis was then stated and a general overview was presented on how the independent variables were operationalized. The study population was defined as

were the data sources. Finally, the analysis of the data was explained along with the limitations encountered in the research project.

Chapter 4 presented the findings of the analysis in two parts. First, the study determined the relative importance of the doctoral degree variable relative to other variables in the promotion of Academy graduates to the rank of colonel. The conceptual model presented in Chapter 1 was reexamined and modified to include a rank ordering of the variables based on their relative importance in the military promotion process. Second, the results of testing the second hypothesis classified those specific characteristics related to the attainment of a PhD on a continuum from career enhancing on the one end, to career detracting on the other.

Chapter 5 summarized the previous chapters' content, and drew specific conclusions based on the results of the analyses. In addition, recommendations were suggested for future research and to specific organizations, like the Air Force Academy which could directly benefit from the study's research findings.

THE REVIEW OF RELATED LITERATURE

Overview

This review of related literature focused on three specific areas. First, attitudinal studies related to the perceived importance of graduate education in the Air Force at three levels-The Department of Defense (DOD)/Air Force Command, the United States Air Force Academy, and the individual military member-were discussed.

Second, the review focused on the unique impact of the postulated variables listed in Diagram A on the military promotion process. Each variable's effect on the promotion process was reported upon with the exception of the academic higher education variable (AHE) which, because of its central importance to this study, was discussed separately in the chapter's final section.

Military Attitudes Toward Graduate Education

The DOD/Air Force's Attitude

Generally, graduate education has been available to the Air Force member under two options. First, officers could enroll at a college or university in a volunteer or off-duty status. In addition, under the second option an officer might become officially assigned to the Air Force Institute of Technology (AFIT) and be enrolled in a college, university, or one of AFIT's own degree granting institutions as a full time student for the entire graduate schooling period.

As a general policy, the Air Force encouraged the voluntary off-duty pursuit of higher education as a means of career advancement. The guidance on voluntary off-duty education was set forth for all the services in DOD Directive 1322.8 (1975), which stated:

Voluntary educational programs are established (a) to improve the competence of active duty military personnel; (b) to assist career progression of military members; and (c) generally to strengthen the personnel base of the Armed Forces. The voluntary educational programs bring educational services and courses to service members at or near their places of duty. (p. 3)

Voluntary off-duty graduate education and officer performance were the subjects of a study by Freeh (1972). He tried to determine the effects of participating in an off-duty master's program on the performance of student officers attending the Air Force's Intermediate Service School, the Air Command and Staff Course (ACSC) at Maxwell Air Force Base, Alabama. Of the 1123 students in the classes of 1973 and 1975, 510 were enrolled in the cooperative master's program with a nearby university. Based on a "z" test at .05 level of confidence the participants in off-duty education were superior students in the ACSC curriculum.

The performance of ACSC students was directly related to previous academic qualifications, i.e., those with doctorates did better than those with master's degrees, and those with masters did better than those with bachelor's degrees. Interestingly, the Freeh's study concluded that superior officers earned graduate degrees and did not become superior as a result of having earned a graduate degree. The basis for this conclusion was that officers chosen for advanced educational training were required to be high performers whose dedicated efforts would continue after achieving the greater expertise provided by their advanced degree. Freeh found that mediocre and poor performers were not considered qualified for advanced education.

The policies on the other option of a fully funded graduate education assignment were covered in DOD Directive 1322.10 (1974):

The (fully funded) program is intended to benefit the Department of Defense and the individual officer by 1) insuring higher levels of professionalism and technical competence within the DOD, 2) recognizing the educational aspirations of individuals, and 3) providing incentives for recruitment and retention of personnel with ability, dedication, and capacity for growth. (p. 1)

Higher education in the military began to be emphasized after World War II and one way that ensured participation was to promote the concept that graduate education was career enhancing. Glidden (1975) reported on a drive by the AFIT during the 1940s to have its educational value recognized by placing emphasis on the promotion success of Institute graduates. (p. 169) Schwartz (1963) also reviewed promotions in the late 1950s and showed that a quasi official policy existed that gave considerations to advanced degrees in the promotion process. Figures cited were that officers with master's degrees considered for promotion to the field grade rank of lieutenant colonel, enjoyed a 58% promotion rate while those officers with bachelor's degrees had only a 36% selection rate. In addition, those with two to four years of college had a 33% promotion rate; and those with less than two years, a 23% promotion rate. (pp. 206-207)

Two inferences could be deduced from official attitudes toward graduate education. First, since the financial allocations available for fully funded graduate education competed with other financial needs, the Air Force encouraged the voluntary off-duty program as the less expensive alternative. Second, the Air Force has been very supportive of graduate education and has recognized the dual benefits accrued to the organization and individual.

The Air Force Academy's Attitude

Assessing the Air Force Academy's attitude toward graduate education was more problematic because of the lack of direct documentation. Although the Air Force Academy was essentially an undergraduate institution, it has demonstrated a continued interest in graduate education throughout its history. In his historical study on the development of the Academy curriculum, General Woodyard (1965) identified three factors, the enrichment program, the master's degree concept, and the motivation for graduate study, which suggested the Air Force Academy's strong support for graduate education. (p. 191)

At its inception, the Air Force Academy did not want to follow in the mold of its two sister academies, West Point

and Annapolis, with regard to a fully prescribed curriculum. In 1959, therefore, an enrichment committee was formed to prepare a sequence of courses which would lead to a master's degree. The innovative idea called for students with prior college background to complete their bachelor's degree requirements by the end of their junior year, thereby devoting their entire senior year to the master's degree program. (p. 192) It quickly became apparent that only a handful of cadets would be able to complete their master's degree requirements in the one year. For the majority, however, it was hoped that once in the service, they could build upon the graduate base gained at the Academy, and attain their master's degrees.

The enrichment program led directly to the second factor which demonstrated the Air Force Academy's support of graduate education, the master's degree concept. For ten years, the Academy struggled to gain authorization to grant master's degrees to those select cadets who could complete both their bachelor's and master's degree requirements during the four year curriculum. Because of the great enthusiasm among the faculty and cadets generated by the enrichment program, the Air Force Academy submitted a formal request to Headquarters Air Force in 1962 to change the status of the Academy from an undergraduate to a graduate

institution. (p. 237) However, Headquarters Air Force refused the request citing the pressing need in the Air Force for Academy graduates in the rated specialty (pilots and navigators), and the resounding opposition to the graduate concept by the other service chiefs of staff, especially the chiefs of the Army and Navy. (p. 237)

Although the Air Force Academy continued to push for its own graduate program, in 1972 it embarked on a cooperative master's program with Purdue and Georgetown Universities. This new concept called for cadets to complete a prescribed number of graduate credits while at the Air Force Academy, and then to transfer immediately after graduation to either the Purdue or Georgetown campus to finish their master's degree requirements. The planned time of completion was estimated to be six to eight months after graduation from the Air Force Academy.

Glidden (1975) commented that the cooperative master's program was designed primarily as academic motivation for the flying qualified cadets. At that time in the Academy's development, flight-qualified cadets could not continue their academic programs after graduation until they had completed their flying obligation of approximately five years or had refused to enter flying training. (p. 269) Presumably, the cooperative master's program would motivate the

flight-qualified cadets to achieve both highly prized career accomplishments in a relatively short span of time, and during the early phase of their careers.

Eventually the cooperative master's program was discontinued because of official concerns that it did not fill specific "graduate" positions in the Air Force, nor did the program provide Academy graduates for careers within specialized units of the Air Force. It was, according to Glidden, intended primarily as motivation for the broadest career development. (p. 282)

The third factor which was indicative of the Air Force Academy's positive attitude toward graduate education was the number of cadets intending to seek a graduate degree while in the military. Woodyard, in the concluding chapter of his dissertation, remarked that an area in which the Academy was particularly successful was in implanting the desire among graduates for further education. (p. 280-281) To substantiate this claim, he calculated the percent of graduates intending to seek an AFIT assignment after graduation. He divided the graduates by graduation order of merit and found that 95 percent of the top quarter, 94 percent of the second quarter, 91 percent of the third quarter, and, amazingly, 94 percent of the bottom quarter indicated an intent to apply for graduate education as officers. (p. 281)

This fact also supported the "perceived" importance of advanced education in the military. Cadets, being highly motivated to succeed as officers, recognized the enhancing value of advanced degrees on their careers. Whether they were led to believe in the importance of graduate education or deduced it for themselves, the institutional value, seemingly, permeated the officer candidates.

In summary, the Air Force Academy has always fostered graduate education among its cadets. The Air Force Academy has been directly involved in conferring master's degrees through its cooperative master's program, and indirectly involved by cultivating the desire among cadets to attain a graduate degree at some point in their officer career. Interestingly, although the Air Force and Air Force Academy were both highly supportive of graduate education they seemed to be following divergent paths with regard to their underlying rationale of why graduate education was needed in the military today. The Air Force, it appeared, assumed a utilitarian approach which justified graduate education in the military based on the fulfillment of positions which specifically required the greater depth of knowledge acquired by pursuit of a graduate degree. This pragmatic approach also extended to training members in the military to serve in specialized units within the Air Force.

The Air Force Academy, on the other hand, seemed to encourage the pursuit of graduate education from a more "liberal" perspective. In justifying the need for graduate education in the military, the Air Force Academy recognized the benefits gained to the Air Force in increased motivation, the member's personal and professional development, as well as unit productivity. Moreover, for credibility and survival purposes, the Air Force Academy supported the wide spread attainment of graduate degrees in the Air Force. The Air Force Academy, however, has been limited in its ability to influence general Air Force policy due to its subordinated position within the Air Force Command structure.

The Military Member's Attitude

Graduate education, as viewed by the individual military member, was considered of value for a variety of personal and professional reasons. In the military, however, a person must weigh the advantages and disadvantages of higher education against his/her promotability, and be aware of any "trade-offs" that might realistically occur. Moreover, the literature seemed to corroborate the idea that Air Force officers were motivated to attain a graduate degree for the dual reasons of professional development and personal fulfillment. Eller (1963) surveyed 188 officers during 1960 to

1962. The officers were asked their "personal" motivation for enrolling in the George Washington University program while assigned to the United States Army War College. The highest number of officers responded with the answer: "to advance as far as possible in a military career." The second and third most frequent responses were: "to become better qualified for a civilian job" (2nd), and "to become better qualified for an academic job" (3rd). (p. 90)

A study covering all the Armed Forces undertaken by the Office of the Assistant Secretary of Defense/Manpower and Reserve Affairs (1966) surveyed the attitudes of some 11,568 officers in the ranks of first lieutenant to full colonel. The vast majority (93%) felt that their graduate degrees, master's and doctorates combined, had been useful in making them more effective officers. However, considering the influence of graduate education on promotion, their perceptions were very interesting. Only 6% of the officers believed that their degree had accelerated their promotion; 31% believed that their degree helped insure their own [on-time] promotion; and remarkably, 63% felt that their education had no effect on their promotion success. (p. 95)

In a similar study Hurst and Shaddix (1973) polled 826 graduate officers from either the Naval Postgraduate School or from civilian universities. The results showed that 39%

gave the answer "to remain competitive with contemporaries for future assignments and promotion," as the main reason officers sought graduate education. Other important reasons cited were "to become a more capable naval officer" (27%), and "to fulfill personal educational aspirations" (24%).

Silliman (1973) queried Air Force officers on their opinions about graduate education attained through the Air Force Institute of Technology (AFIT). Using a questionnaire he polled two groups: those officers who were identified for an AFIT assignment, and another group of resident AFIT students. Three hundred and seventy seven officers responded out of a total 610 questionnaires distributed. The analysis showed that 75% of the potential candidates and 77% of the resident students were motivated to earn graduate degrees for career development and improved personal performance. (p. 31) Moreover, 98% of the potential candidates, and 88% of the resident students viewed a graduate education as a major benefit for promotion to the top ranks in the Air Force.

Silliman, like Freeh, concluded that the majority of career motivated officers were an aggressive group for whom an advanced degree was viewed as one of the requirements, or stepping stones, to career progression. Dirmeyer (1976) also tried to determine the value of graduate education to

the individual Air Force officer. In his historical study he gathered information on the motivation of officers participating in cooperative graduate degree programs. His conclusions were similar to those reached by Silliman: (1) graduate education enhanced professional competence; (2) enhanced promotion opportunities influenced officers to obtain graduate degrees; and (3) graduate degrees contributed to optimum job performance. (pp. 52-53)

Summary of the Attitudes Toward Graduate Education

Generally speaking throughout the Air Force there was a consensus of opinion that graduate education was career enhancing. The DOD/Air Force attitude toward graduate education seemed to be positive in that the Air Force hierarchy recognized that the added education would be beneficial to both the individual and the Air Force. In practice, however, the Air Force appeared to subscribe to a utilitarian approach of sponsoring officers for graduate degrees primarily to satisfy specific job or unit requirements. This, probably, was due to funding constraints rather than a lack of commitment to the values of graduate education.

The Air Force Academy mirrored this same official positive attitude toward graduate education. The Air Force

Academy, however, has evolved a slightly different philosophical rationale for the need for graduate education in the military. The Air Force Academy's rationale for graduate education could be postulated as being based upon the more balanced perspective of individual growth and development along with more effective job performance. In contrast, the Air Force's rationale seemed to be based on a more singular perspective of effective job performance.

The military member's attitude seemed to combine the attitudes of the highest level of command and of the Air Force Academy. Early studies suggested that officers considered graduate education of value for both personal and professional development. In later studies, the military members began to view graduate education, primarily, as a vehicle for career progression. The question, however, remained as to how closely related this perception was to reality.

The Effects of the Postulated Variables on Promotability

The Training Criterion

Data on each of the postulated variables shown in Diagram A were sought in the literature to identify their individual effects on the military promotion process. Starting with the precommissioning subcategory, O'Connell (1978) examined a battery of predictors that compared Air Force Academy cadet performance with the performance of those same cadets as officers. Three main categories of predictive measures were studied; 1) high school academic, athletic, and leadership performance, 2) four years of Air Force Academy academic and military performance, and 3) various personality measures. (p. 248-249)

The related officer performance measures were three; 1) below the zone promotions, 2) awards and decorations, and 3) officer effectiveness ratings. O'Connell investigated only the Academy classes of 1964 and 1965 because of their size (approximately 1000 officers) and their sufficiently long history since graduation (ten years) to allow retention and performance behavior to stabilize. (p.250)

O'Connell found that high school academic performance (GPAs) was only weakly related to active duty loss rates ($r=.15$) and early promotions ($r=.24$), and not related at all to officer effectiveness ratings. (p. 253) The leadership index, consisting of athletic and non-athletic measures, had a slight relation to officer effectiveness ratings ($r=.12$), a moderate relation with early promotions ($r=.44$), and no relation with active duty loss rates. (p. 253)

In examining the officers' academic performance as cadets, he found that yearly departmental GPAs were fairly strongly related to all three criteria ($r=.44$, $.48$, $.38$), with the strongest relation occurring with officer effectiveness ratings ($r=.48$). Moreover, in the class of 1965 those cadets in the top ten percent of their class as measured by their senior year academic standing were four times more likely to be promoted below the zone than the remainder of the class.

In contrast, for the class of 1964, early promotions were related primarily to good military performance as a cadet. A reasonable explanation for this discrepancy might be that twice as many officers from the class of 1964 were promoted below the zone (72) as were promoted below the zone in the class of 1965 (38). Based on the numbers alone, O'Connell's study would suggest that cadet military

performance might be a better predictor of below the zone promotions than cadet academic performance.

Lanman (1980, 1981) dealt with the relationship between cadet graduation order of merit and promotion to colonel and above. The graduation order of merit was computed from the cadet's overall academic standing (80%) and military standing (20%). Because of the relative weights, the graduation order of merit reflected a cadet's academic ability more than leadership ability. He concentrated on the classes of 1959 and 1960 because, at that time, they were the only classes eligible for promotion to colonel in the primary zone. In his first study (1980), he showed that in the class of 1959, the cadet's graduation order of merit was a positive predictor of promotion to colonel and above for the top 20 percent of the class, and a negative predictor of promotion to colonel for the bottom ten percent of the class, i.e., those individuals in the lowest decile had the highest pass over rate to the rank of colonel. For the graduates in between other variables were apparently more important in predicting promotion success.

In his second study (1981) he examined the classes of 1959 and 1960 because of their primary zone eligibility to colonel, and the members of the class of 1961 who were promoted to colonel ahead of their contemporaries (BTZ). He

demonstrated again that there was a direct correlation between quartile ranking in the graduation order of merit and promotion to colonel. The graduates in the upper quartile were promoted to colonel at a 56 percent rate, the second quartile at 47 percent, the third at 41 percent, and the bottom quarter at only 25 percent. (p. 12)

In the initial training subcategory the source of an Air Force officer's commission was also an important factor to consider in the promotion process. By nature of the design of this study, however, the source of commissioning was not evaluated as an independent variable as the entire population consisted of Air Force Academy graduates. For background information, however, it should be mentioned that the main purpose of the Air Force Academy was to provide quality officers for a full career of military service to their country. Official promotion statistics showed that Air Force Academy graduates have lived up to Air Force expectations. Their promotion and retention rates to all ranks have been consistently higher than the averages for all other Air Force officers. (USAF Association of Graduates promotion records)

In the continuing training subcategory, the literature has documented a number of variables which appeared to have a direct influence on the military promotion process. The

Beishke and Lipsey study (1977) concluded that the aeronautical rating of military members enhanced the promotion rate to all ranks. In the last few years, however, with the advent of sophisticated navigational equipment in first line aircraft, the role of the navigator in the Air Force has diminished in importance.

The Air Force Times, which published the results of every promotion cycle, repeatedly has reported on the apparent trend of reduced promotion rates for officers in the navigational specialty. For example, the colonel promotion results reported on January 30, 1978 are fairly typical of the current pattern. Out of 1545 first time eligibles for colonel 530 were promoted for a 34 percent promotion rate. Disaggregating those promoted revealed that 39 percent of the first time eligible pilots were promoted compared to 25 percent of the first time eligible navigators and 35 percent of the first time eligible non rated officers. (p. 10)

There have been few, if any, studies undertaken in the Air Force on the effects of advanced operational training (AOT) on the promotion process. The training that a military member received in the service was more often related to job performance than to promotion rate. Astronaut training, however, was thought by many to be career enhancing in

and of itself. The rationale often put forth was that to become an astronaut one was subjected to a highly selective process. Therefore, merely being selected for astronaut duty was proof enough that the military member possessed the highest quality and potential required for promotion to higher rank. It was presumed that under the variable of advanced operational training, astronaut training would be a discriminator for promotion to colonel. However, the small number of astronauts among Air Force Academy graduates might prevent this variable from being statistically significant in the subsequent analysis.

The literature on the effects of professional military education (PME) also indicated a strong relationship with promotions. The Beishke and Lipsey (1977) and Curtis (1979) studies all yielded a positive correlation between promotion and the successful completion of the professional military courses offered by the Air Force; the Squadron Officer's School (SOS), the Intermediate Service School (ISS), and the Air War College (AWC), or their equivalents.

Promotion statistics reported in the Air Force Times demonstrated the importance of completing the appropriate professional military course prior to being considered for promotion. Assessing the impact of PME on the promotion to colonel was difficult as each officer eligible for promotion

in the primary zone could have seven possible combinations for completing the three professional military courses. To simplify the data, therefore, the statistics reflecting the officers who completed only one course were examined to provide some insight into the relative value of the three military schools in the promotion process.

For the promotion to colonel as reported in the December 5, 1978 Air Force Times, 34 percent of those officers who completed only the AWC were promoted as compared to 26 percent for those who completed only the ISS, 11 percent for those with only the SOS, and 6 percent for those who did not attend or complete any of the professional military courses. In the next year's promotion to colonel, the results were lower but the order among the selectees remained the same; 23 percent for AWC, 17 percent for ISS, 4 percent for SOS, and 4 percent for no PME. Surprisingly, in both cited years, the most influential combination of military courses was the completion of the AWC and ISS, contrary to the belief that the completion of all three courses would yield the highest promotion rate.

Townsend (1980) in his article exploring the decision-making dynamics of a promotion board, pointed out that board members have to judge the completion of professional military education in the context of how these achievements

enhanced individual potential to assume greater responsibility, and the mere completion of the courses should not be given disproportionate credit. (p. 95) The question remained as to why those officers who completed only the AWC and the ISS conveyed a sense of greater performance potential to the promotion board members. A possible explanation could be that many of the officers with only AWC and ISS could not attend SOS because of their involvement in the Vietnam crisis. Understandably, for this particular officer generation, their early career combat experience could have more than compensated for their lack of "first level" professional military education, SOS.

The Performance Criterion

The performance criterion was almost entirely embodied in the officer effectiveness ratings (OERs). A sample of the most current OER form was included in the Appendix C. In its section on promotion, the Air Officer's Guide counseled young officers that the measurement of an officer's effectiveness, and his potential, strengths and weaknesses, was a matter of the gravest importance to the Air Force as well as the individual. Effectiveness reports, therefore, constituted the most important single source of information for selection and assignment of individuals. (p. 221)

Promotion boards selected individuals for higher rank, primarily, on an interpretation and evaluation of the officer's official record. Therefore, it was important to understand how the official record was compiled in order to gain an appreciation for the importance of the OER in the promotion process. Townsend explained that each officer's official record (folder) contained all the effectiveness ratings and training reports received since the person was commissioned. In addition, the folder included an official photograph, the citations and orders for approved United States medals and decorations, the Air Force form 11 which was a historical assignment document, the officer's selection brief which was a computer printout encapsulating career data that must bear signature confirmation by the officer, professional military education letters explaining any non-attendance to military courses, and copies of administrative requests for missing documents. (p. 95)

The officer's folder was divided into two basic sections. The left side contained all OERs arranged chronologically with the most recent rating on the top. The official photograph was located under the stack of OERs. The right side of the folder contained all the other personnel data. (p. 95) During the promotion process, the folders were evaluated by each board member on the basis of 1 to 10, with

7.5 as the recommended average score. Townsend concluded the article by noting that the records were reviewed and evaluated in light of the "whole-man" concept, with the most important factor being consistent solid performance. (p. 96) The OER was singularly important because of its global nature in representing many other postulated variables.

The Situational Criterion

Little has been written on these situational variables because of the difficulty in measuring them. These variables, therefore, tended to be more unreliable in any analysis due to the wide variance in their interpretation. After discussing the OER in the promotion process one began to realize the importance of certain situational factors, such as the writing ability and rank of the OER supervisor, the predispositions of the promotion board members, and the impact of preselection briefings emphasizing current Air Force personnel needs.

In sum, it should be remembered that the promotion process in the military was designed to select the best qualified officers to higher rank. The assessment of quality, however, consisted of both objective and subjective aspects. Research allowed us to examine the more objective aspects of

the process, but the subjective considerations often eluded us and any attempt to quantify these situational variables would probably have been counterproductive.

The Effects of Academic Higher Education on Promotion

In this last part of the literature review the relationship between AHE and promotion to higher rank was investigated. Although this study was primarily concerned with the highest level of AHE, the doctoral degree, and its impact on promotion to colonel, the literature cited did not always deal specifically with the doctoral degree nor only with promotion to colonel. Much of the related literature dealt with the combination of master's and doctoral degrees and with the promotion to a variety of ranks.

The impact of attaining a PhD on the promotion process was a concern of many Air Force officers who were interested in higher academic achievement as well as career progression in the military. In hypothesizing the overall effect of a PhD on promotion there appeared to be three possibilities: a doctoral degree 1) enhanced promotion opportunities; 2) limited promotion opportunities; or 3) neither enhanced nor limited promotion possibilities.

Light (1970) found that possession of a graduate degree was career enhancing. His study concluded that line officers with advanced degrees did better than those officers holding only a bachelor's degree in selection to lieutenant colonel and colonel. (p. 9) Adams (1971) investigated the values that Air Force promotion board members attached to certain non-performance factors. Considering civilian education, he found that of 3134 first-time eligible majors considered for promotion to temporary lieutenant colonel in fiscal year 1971, promotion varied directly with the level of civilian education, i.e., 86% for doctoral degrees, 78% for master's degrees, 65% for bachelor's degrees, 54% for some college, and 49% for high school. (pp. 31-33)

In more recent promotions cycles, as reported in the Air Force Times for the temporary lieutenant colonel's promotion list in 1977, 59 percent of the officers with doctoral degrees, 50 percent of the officers with master's degrees, 25 percent of those with only bachelor's degrees, and 5 percent of the officers with a high school or some college were promoted. (Nov. 21, 1977, p. 4) In addition, similar results were registered in 1978 when 34 percent of the doctoral degree holders, 24 percent of the master's degree holders, and only 11 percent of the bachelor degree holders were promoted to the rank of colonel. (Jan. 30, 1978, p. 10)

There were, however, other data which suggested that graduate education might be of little consequence in the promotion to high rank. Duvall (1964) studied the relationship between graduate education and career advancement in the Air Force. He examined whether a master's degree influenced the careers of regular Air Force officers during the 1950s and early 1960s. Using matched pairs of 140 pilots with and without master's degrees, he found no significant difference in the promotion rate of the 280 officers ("t" > .05). (p. 34)

A later study by Zald and Simon (1964) concluded that graduate work and higher rank were only slightly related. (p. 265) Bullard (1971), using a sample of 401 officers during the era of 1948-1956, found that in the promotion to lieutenant colonel, 211 of the 234 graduate degree holders (90%) were selected, as compared to 133 of 153 officers without graduate degrees (87%). This was not significant based on the Chi-square test at the .05 level of confidence.

The studies reviewed which showed graduate education to be of little consequence in the promotability of officers were conducted from the late 1950s to the early 1960s. This period did not emphasize higher education as a vehicle for career enhancement or improved quality of the Air Force. Glidden (1975) pointed out that it was only after Sputnik in

the early 1960s, and under the strong leadership of General Curtis Lemay, that graduate education began to be emphasized as a primary means for upgrading the quality of personnel in the Air Force. (p. 234) Also in the matched pair study by Duvall, the aeronautical rating of pilots was a criterion variable for both groups in the analysis, and might have been an overpowering discriminator for promotion. Consequently, the strong effect of the aeronautical variable might have nullified the discriminating effect of the graduate education variable in the analysis.

On the negative side, recent promotions to the rank of permanent¹ colonel revealed some noteworthy trends. In the Air Force Times, the last permanent colonel promotion results for 1978 reported that 663 officers were selected from a total pool of 3795 eligibles. This resulted in an overall promotion rate of 18 percent. Breaking down the

¹Under the previous dual promotion system in the Air Force temporary rank coincided with the changing of the insignia and pay grade of the individual promoted. After spending approximately two to three years in the temporary grade the officer was then considered for promotion to the permanent rank. In the permanent promotion process the officer underwent the same type of screening and selection procedures as in the temporary promotion process. The reward for being selected to the permanent rank was increased tenure in the service. With the passage of the Defense Officer Personnel Management Act (DOPMA) which was implemented on Sept 15 1981, the dual promotion system was replaced by a single-rank promotion process.

selectees by educational level showed that 28 percent of the master's degree holders, 25 percent of the doctoral degree holders, and 12 percent of the bachelor's degree holders were promoted. (Mar. 27, 1978, p. 28)

The same was true for the 1976 promotions, where 585 temporary colonels were considered for permanent grade, out of a total of 1210 officers. Of the selectees, 61 percent of the master's degree holders, 51 percent of the doctoral degree holders, and 46 percent of the bachelor's degree holders were promoted. Although the graduate degree was still career enhancing, these results showed a reversal in the relative importance of the two advanced graduate degrees.

Although no research literature could be found to indicate that the attainment of a graduate degree had a negative impact on promotability, there were opinions and perceptions throughout the Air Force that continued advanced education toward an earned PhD degree might be prejudicial to one's military career. At the academic institutions of the Air Force, and in particular, at the United States Air Force Academy, there has been a legitimate need for qualified officers with PhDs in teaching, research, and administration. These PhD officers brought with them a depth of knowledge and commitment to academic excellence that were vital for

the continuance of a meaningful academic curriculum and for the effective management of the Academy's administrative affairs.

Negative opinions concerning the PhD's impact on the promotion process began to surface after two tours of duty at the United States Air Force Academy, one as an instructor from 1972 to 1975, and another as the Acting Head of the Department of Foreign Languages from 1978 to 1981. Personal observations have led this writer to believe that there was a growing perception among Academy faculty officers that "too much" academic time could be detrimental to one's military career. Younger officers, in particular, felt that with the initial Academy tour, entry into a PhD program, and a subsequent follow-on Academy tour, seven to ten years might be "too much" academic time in an officer's 20 year military career.

Academy instructors also suspected that promotion boards viewed the entire "academic" period as non-operational Air Force time. The promotion boards, they felt, considered the attainment of PhDs for teaching purposes at the Air Force Academy of secondary importance when compared with the more pragmatic achievements of other officers who assumed command or staff responsibilities in operational Air Force units. It was also postulated that even PhDs which satisfied

Academy and Air Force needs, such as engineering and scientific doctoral degrees, were not favorably looked upon by promotion boards if there was not an adequate "pay-back" period in an operational assignment.

In summary, although the literature reviewed appeared to present conflicting results as to the overall effect of a PhD on promotability, the later studies reinforced the proposition that graduate education, particularly, at the master's level, had a positive correlation with promotion. Even though military members with doctoral degrees were relatively few in number, with only 1188 PhD officers out of approximately 100,000 total officer corps, their numbers were continually increasing each year. For this reason, the specific impact of the doctoral degree on promotion needed to be determined. If a doctoral degree was positively correlated with promotion, then an analysis should reveal the degree of enhancement. Moreover, in certain organizations such as the United States Air Force Academy, if the doctoral degree was perceived as being detrimental to promotion to high rank, further research should determine whether the perceptions of Academy officers were correct or whether they needed to be refined based on actual data.

THE STUDY DESIGN AND RESEARCH PROCEDURES

Overview

Chapter 3 restates the purpose of the research study and presents two research hypotheses for analysis. The variables considered in testing the two hypotheses are subsequently discussed in greater detail as are the two populations and their corresponding data sources. Finally, the actual data analysis is explained along with the limitations encountered in conducting this research.

Restatement of the Purpose

The first purpose of the study was to analyze the role of graduate education, as represented by a doctoral degree, among other discriminating variables in the promotion of USAF Academy graduates to the rank of colonel.

Specifically, the analysis attempted to determine the "overall" effect of a doctoral degree in the promotion process, and its relative ranking among the other variables with regard to discriminating power in predicting promotion results. The first analysis investigated the independent variables derived from the training and performance criteria depicted in Diagram A, Chapter 1. The dependent variable for the first analysis was the promotion group to which each member of the population was classified, ie., promoted below the zone (BTZ), promoted on time (ONT), or passed over (PDO) for promotion to colonel. For better interpretability of results, the promoted below the zone (BTZ) and promoted on time (ONT) criterion groups were combined into a single promoted (PRO) criterion group.

The second purpose of the study was to analyze the discriminating role of specific characteristics related to the attainment of a doctoral degree, such as, the length of time in pursuit of PhD, the discipline of the PhD, PhD related assignments, etc., in the promotion of USAF Academy graduates to the rank of colonel. Once the overall effect of a doctoral degree had been ascertained from the first analysis, a second investigation examined the subeffects of the specific characteristics that were presumed to comprise the "overall" effect. In this manner it was hoped that the

second analysis would yield those specific characteristics related to the attainment of a PhD that either enhanced or detracted from promotion possibilities.

In the second analysis, the independent variables were the specific characteristics related to the attainment of a PhD, and the dependent variable was, again three promotion groups¹ to which a member was classified at the outset of the analysis. The hypothesis also was tested by dividing the population into two criterion groups instead of three: those promoted to colonel (PRO), and those passed over to colonel (PDO). The promoted group (PRO) was formed by combining the below the zone (BTZ) and the on time promotees (ONT) into one group. This procedure enhanced the discriminating power of the variables selected.

The First Hypothesis

The corresponding first hypothesis (H1) was: There was a positive discriminating effect of the doctoral degree variable in differentiating membership between three groups of United States Air Force Academy graduates; those promoted below the zone (BTZ), those promoted on time (ONT), and those passed over (PDO) to the rank of colonel.

The Population (H1)

The research study was conducted at the United States Air Force Academy for two reasons: First, access to high quality computer facilities, and second, the availability of a complete data file on all individuals who gained admission. The data file was continually updated throughout the cadet's Academy and Air Force experiences. Information ceased to be added to the file when the individual separated from the Academy or the service.

The population for the testing of the first hypothesis consisted of 587 Air Force Academy graduates who competed in the primary and secondary promotion zones for advancement to the rank of colonel. The names of the 587 graduate officers were obtained from the historical records of the Association of Graduates at the United States Air Force Academy. A separate population file was created in the main computer system, the Burroughs 6900. In addition to the names of the selected officers, the population file contained the social security number, the year in which the individual was either promoted or considered for promotion, and the promotion group to which he belonged. The population was divided into 161 Academy officers promoted below the zone (27%), 277 Academy officers promoted on time (48%), and 149 Academy

officers passed over for promotion (25%). The sample for the analysis of H1 included the entire population.

The Data Sources (H1)

The data for the postulated variables listed in Diagram A, Chapter 1, were obtained from the personnel records at the Office of the Registrar (OOR), and the Association of Graduates (AOG) at the United States Air Force Academy, Colorado Springs, Colorado. Initially, the data list included all the cadets who graduated in the first nine classes ($n = 3400$). The nine class data bank contained pre-Academy, Academy, and Air Force career information on each individual, and was extracted from the Academy's main computer data bank, known as the Educational Research Data Base (ERDB). One source of information for the ERDB was the biographical histories provided by the AOG to the OOR. This information was mainly assignment data of a self-reported nature which was updated manually every year. A more important source to the ERDB, however, was the Uniform Officer Records (UOR), an extract from the main personnel records of the Air Force, on those Academy graduates who were on active duty. Each month the UOR extract arrived from the Air Force Military Personnel Center in Randolph AFB, Texas, and was combined with the ERDB by the OOR branch at the Academy.

For the analysis, the targeted population file of 587 Academy officers was merged with the ERDB to create a "research" data file which included each graduate's prior academic record (HI SCHOOL), Mathematical and English entrance scores (MATH, ENGLISH), graduation order of merit (GRAD MERIT), academic order of merit (ACAD MERIT), military order of merit (MIL MERIT), previous military service (MIL SERV), aeronautical rating (AERO RTG), professional military education (MIL EDUC), academic higher education (ACAD EDUC), combat duty (COMBAT), foreign language proficiency (LANG), officer effectiveness ratings (EFF RTG), controlled officer effectiveness ratings (CTRL EFF RTG), date of separation (SEPAR), and medals and decorations (MED DEC), as well as the promotion group to which they belonged (BTZ-ONT-PDO).

Diagram D depicted a listing of all the variables postulated as influencing the military promotion process (refer to Diagram A, Chapter 1) and the actual variables available from the ERDB. In Diagram D under the subcategory "Precommissioning" (ERDB VARIABLES), the GRAD MERIT, HI SCHOOL, ENGLISH, MATH, and MIL SERV were added to expand the number of precommissioning variables which might influence later success in the military.

Diagram D

COMPARISON OF POSTULATED AND ERDB VARIABLES

POSTULATED VARIABLES

Precommissioning

-Ldrshp

-Acdmcs

Continuing

-AR

-AOT

-PME

-AHE

Effectiveness

-OER

Achievement

-M/Dec

-Combat

Institutional

-Comp Bd

-Pol Or

Personal

-Eff Wrt Sup

-Sponsorship

ERDB VARIABLES

Precommissioning

-MIL MERIT

-MIL SERV (added)

-ACAD MERIT

-GRAD MERIT (added)

-HI SCHOOL (added)

-ENGLISH (added)

-MATH (added)

Continuing

-AERO RTG

(not available)

-MIL EDUC

-ACAD EDUC

-LANG (added)

-SEPAR (added)

Effectiveness

-EFF RTG

-CTRL EFF RTG (added)

Achievement

-MED DEC

-COMBAT

Institutional

(not available)

(not available)

Personal

(not available)

(not available)

Under the "Continuing" subcategory (POSTULATED VARIABLES), advanced operational training (AOT) was not available from the ERDB and, consequently, was not included in the

analysis. However, consideration was given to foreign language proficiency (LANG) as an additional career enhancing variable which should be investigated. The date of separation (SEPAR) was also examined to determine if any meaningful trend was established with regard to retention and the attainment of a PhD.

In the "Effectiveness" subcategory the ERDB only stored the last ten officer's effectiveness ratings (EFF RTG) for each person in the file. According to the literature, this variable should prove to be a strong discriminator between criterion groups. Moreover, in the variable input format a distinction was made between the officer's effectiveness ratings (EFF RTG) and the controlled officer's effectiveness ratings (CTRL EFF RTG)¹. A subanalysis of these two variables should lead to some interesting results for military members. There was a strong perception in the Air Force that the controlled effectiveness ratings, although no longer implemented, still played an important role in the

¹From 1975 to 1978 the Air Force instituted a controlled rating policy wherein commanders were forced by quota restrictions into rating all their subordinates in the following manner; 22% as outstanding (1-rating), 56% as good (2-rating), and 22% as fair (3-rating). Although the controlled ratings were modified and later abolished, this study investigated the lingering discriminating power of the controlled effectiveness ratings on officer promotion to colonel.

promotion process. The significance of the CTRL EFF RTG was that "quota" ratings used to evaluate military members five to eight years prior, were being used to differentiate individuals considered for promotion to colonel today.

For the "Achievement" subcategory combat duty (COMBAT) was recorded for each graduate in the population. Medal and decorations (MED DEC) were also recorded in the ERDB. However, due to their self-reported nature, the information was treated with some degree of caution. Finally, all the situational variables were not available from the ERDB, and, like the AOT, were excluded from the analysis.

Operationalizing the Variables (H1)

The first step in the analysis was to convert the 16 ERDB variables into numerical formats. This was needed to permit computer based statistical analysis of each discriminating variable. The numerical conversions reflected the order of precedence of the various levels or hierarchy within each discriminating variable (normally the higher the number, the higher the order or the greater the value of the variable). The numerical conversion tables for all the variables in the analysis to which reference was made in the text were contained in Appendix D.

The Class Standing Variables. The numerical conversion of the MIL MERIT, ACAD MERIT, and GRAD MERIT variables were listed in Table 1, Appendix D. The class standings first were converted to a percentile score utilizing the following formula:

$$\text{Percentile score} = 1 - \text{class standing/class size}$$

For example, if an individual was ranked 2nd in the class of 1959 in academic order of merit (ACAD MERIT) his percentile score would be:

$$\text{Percentile score} = 1 - 2/207 = .99$$

The percentile score was then converted to a numerical value based on the individual's decile ranking. The decile ranking, although arbitrarily selected, was thought to be sufficiently flexible in range to allow the numerical values of these variables to be collapsed into larger groups should the need arise, ie., quartile rankings versus decile rankings.

The Standard Score Variables. The individual's HI SCHOOL, MATH, and ENGLISH variables were all recorded on the ERDB as standard scores. The HI SCHOOL variable ranged from 200 to 800 with a mean of 500 and a standard deviation of 100. The ENGLISH and MATH variables ranged from 400 to 1600

with a mean of 1000 and a standard deviation of 200. All the standard score values were left in their original forms.

The Ordinal Variables. The numerical conversions of the MIL EDUC variable were displayed in Tables 2 and 3, Appendix D. The MIL EDUC variable was entered into the ERDB as three separate entries; MIL EDUC1, MIL EDUC2, and MIL EDUC3, indicating the three professional courses completed by the military member. In this study, however, two additional variables were generated with HI MIL EDUC reflecting the highest level of military schooling completed, and TOT MIL EDUC representing the total combination of military schools attended. In the military there was a definite rank order of the professional military courses offered to the officer corps. Air Force Regulation 36-23 stated that for optimum career progression, officers should complete Squadron Officer's School (SOS) as captains, Intermediate Service School (ISS) as majors, and the Air War College (AWC) as lieutenant colonels. (p. 2-2) The professional schools, therefore, were assigned values which corresponded to their respective military pay grade, ie., because captain was also designated as the 03 pay grade in the military, SOS was likewise designated a value of 3. (Major/ISS=04, LtCol/AWC=05)

The academic education variable, ACAD EDUC, was numerically converted in Table 4, Appendix D. Like MIL EDUC, the generic ACAD EDUC variable was recorded in the ERDB as three entries; ACAD EDUC1, ACAD EDUC2, and ACAD EDUC3. For the analysis HI ACAD EDUC was created to indicate the highest level of academic education attained by the individual in the military. The numerical conversion for this variable was based on the normal progression through the academic degrees.

According to Air Force Manual 300-4 (Jan. 1981) the military member attained the minimum foreign language proficiency necessary to satisfy representation requirements as a military attache when awarded the rating 3-3 in listening and reading comprehension. (p. 34) The language variable, LANG, was numerically converted in Table 8, Appendix D. This variable was trichotomized to indicate three levels of language competency; 1) no language proficiency, 2) the minimum standard of language proficiency acceptable to the Air Force, and 3) proficiency exceeding the minimum standard acceptable to the Air Force.

The Dichotomous (Dummy) Variables. The prior military service variable, MIL SERV, was calculated as either a yes or no response with the yes response equaling a numerical value of 1, and the no response equaling a value of 0.

MASTERS was a generated variable which assigned a value of 1 for all officers who attained a master's degree or above, and a 0 for all others. In like fashion, PHD indicated a 1 for all officers with their PhD or equivalent degree, and a 0 for all others. These latter academic education variables were dichotomized because the study was interested in differentiating between and comparing the effects of the master's versus the doctoral degree in the promotion of Air Force officers. Finally, the combat duty variable, COMBAT, assigned a value of 1 for those officers who served a tour in Southeast Asia, and a 0 for those who did not.

The variables which represented the aeronautical status of the military individual were numerically converted in Table 6, Appendix D. On the ERDB the aeronautical rating variable had alphanumeric designators which were converted to four subvariables based on the individual's aeronautical status. The ratings of non rated, NONRTD, navigator, NAVIG, pilot, PILOT, and astronaut, ASTRO, were awarded a 1 or 0 value depending on what status was recorded on the ERDB. Although these variables could have been formatted as a single ordinal variable, the need to investigate the effects of each aeronautical rating made it appropriate to dichotomize each rating as a separate variable.

The date of separation information, SEPAR, was converted to a numerical yes-no response. If the Academy officer retired from active service before 21 years and six months after their graduation from the Academy, the conversion value was a 1. For those officers still on active duty after that date the conversion was a 0. This SEPAR variable was also used to identify those officers who retired from active service prior to their primary zone consideration for promotion to colonel. In other words, those officers who retired at or near the 20 year point and did not compete in the colonel selection process were not considered in the analysis.

The Continuous Variables. The officer effectiveness rating variable, EFF RTG, was difficult to convert because of two modifications to the military rating system. First, before the summer of 1975 the officer rating system utilized a 1 to 9 rating scale with 1 being the lowest rating and 9 being the highest. After that date the present 1-2-3 rating scale was implemented with 1 being the highest and 3 being the lowest. For this study the 1 to 9 system ratings were converted to the current 1 to 3 scale ratings. Second, the officer effectiveness ratings appearing after a military member was considered for promotion to colonel in the primary zone were not considered. The reason for this

exclusion was that individuals passed over for promotion were normally given "inflated" ratings in an attempt to promote them the second or third time around. These higher than normal ratings would tend to neutralize the discriminating effect of the EFF RTG variable and, therefore, were not converted to numerical values. Table 7, Appendix D, showed the numerical conversion of the EFF RTG variable. Because the present 1-2-3 system of effectiveness ratings was in reverse order of this study's numerical convention of higher numbers being of greater value, a 10-9-8 scale was adopted to avoid confusion with the present system, and to keep the best ratings in the tenth decile.

The "controlled officer effectiveness rating" policy in the Air Force was in effect from approximately 1 September 1975 until 1 October 1978. The numerical conversion of the controlled effectiveness ratings, CTRL EFF RTG, was identical to the values listed in Table 7, Appendix D. The only difference between CTRL EFF RTG and EFF RTC was that the effectiveness ratings received during the controlled period were examined separately. A second controlled effectiveness rating variable, CTRL 3 RTG, was generated in order to indicate the number of 3 ratings (the lowest rating) a person received during the controlled period. The CTRL 3 RTG variable was the only variable in the analysis which, by design,

deviated from the general convention of higher numbers being of greater value.

The medals and decorations an officer received were converted to numerical values in Table 8, Appendix D. The medals and decorations data were arranged according to military prestige as stated in Air Force Manual 35-10A. The final variable, MED DEC, used in the analysis was a weighted composite² of all the medals and decorations received in each category multiplied by the numerical conversion for that medal or decoration.

The Second Hypothesis

Quite independent of the overall effect of attaining a PhD found in H1, the second hypothesis (H2) was: There were differences in the characteristics of attaining a doctoral degree for three groups of United States Air Force Academy graduates with their PhDs; those promoted below the zone (BTZ), those promoted on time (ONT), and those passed over

²A sample calculation for one medal follows. In reversed order of importance, the Air Force Air Medal was listed fifth from the bottom and was, therefore weighted by a factor of five. An individual with 10 Air Medals to his credit would receive a MED DEC variable value of 50 ($5 \times 10 = 50$).

(PDO) to the rank of colonel. Although the literature provided no guidance with regard to the directionality of the second hypothesis, idiographic data suggested that the specific characteristics pertaining to the time group (refer to Diagram E) would significantly discriminate between criterion groups.

These specific characteristics were generally divided into two categories; those related to temporal factors, and those related to performance or operational factors. The temporal characteristics dealt with variables pertaining to the pursuit of the PhD, the time spent in an academic environment, or the chronological age or career point of the individual pursuing the PhD. In contrast, the performance characteristics dealt with variables pertaining to operational aspects of the military member, such as, the command to which a member was assigned before and after the attainment of the PhD, the type of PhD awarded, and the source of funding for the graduate schooling.

The Population (H2)

The population for the testing of the second hypothesis was comprised of 51 Academy graduates who attained their doctoral degrees and were eligible for primary selection or

were selected below the zone to colonel. The sample for the analysis of H2 included the entire population.

The Data Sources (H2)

The Office of the Registrar (OOR) first provided a listing of all Academy graduates from the first nine classes who attained their doctoral degree. This PhD list was merged with the 587 promotions list to determine those officers with PhDs who were also considered for primary promotion to the rank of colonel, or were selected below the zone. A final listing of 51 officers constituted the research population for testing the second hypothesis.

The variables related to the attainment of the PhD were listed in Diagram E. The ERDB and the biographical narratives were thought to provide the needed career information to allow quantification of the new variables. However, a cross check revealed that the information was, at times, incomplete. Thus, a questionnaire was devised which requested the needed information from the PhD officer population. The questionnaire was included in the Appendix E.

Operationalizing the Variables (H2)

The first step in the analysis of the second hypothesis was finalizing the specific characteristics related to the attainment of the PhD. Diagram E displayed the 22 specific characteristics that were analyzed in testing the second hypothesis. The basic rationale for classifying the specific characteristics into temporal and performance groups was that in pursuing a PhD in the military, the critical issue appeared to be that officers were utilizing valuable "career" time which could have been applied to more "military" activities. Therefore, the longer one spent in pursuit of a PhD, or in a predominantly academic environment, the more possibility the PhD would have a negative effect on promotion opportunities. In similar fashion, there were other considerations of an operational nature, which could also influence the promotion process, such as, having a PhD in a field that was of critical importance to the Air Force, or working in an Air Force assignment which directly utilized the individual's PhD specialty. Of all the specific characteristics listed in Diagram E, the age of the individual at PhD completion (AGE), and the total commissioned time at PhD completion (COMM TIME) were the only two characteristics obtained from the historical files of the Association of Graduates. All the other specific

characteristics were obtained and operationalized from the questionnaire.

Diagram E

THE FINAL SPECIFIC CHARACTERISTICS RELATED
TO THE ATTAINMENT OF THE PHD

THE TIME GROUP

- AGE AT PHD COMPLETION (AGE).
- TOTAL COMMISSIONED TIME AT PHD COMPLETION (COMM TIME).
- ACADEMIC TIME IN PURSUIT OF PHD (ACAD TIME).
- TOTAL TIME IN PURSUIT OF PHD (TOTAL TIME).
- TOTAL ACADEMIC TIME AS STUDENT (STUD TIME).
- TOTAL ACADEMIC TIME AS INSTRUCTOR (INSTR TIME).
- CONSECUTIVE ACADEMIC TIME/STU AND INSTR (CONSEC).

THE PERFORMANCE GROUP

- DISCIPLINE OF PHD (DISC-HUM,-ENG,-SOC,-SCI,-OTH).
- AFIT FUNDED PHD TOUR (AFIT).
- AFA SPONSORSHIP (AFA).
- COMPLETION OF PHD REQUIREMENTS/AFIT TOUR (COMPLETE)
- COMMAND BEFORE PHD AT ACADEMY (CMD BEFORE AFA).
- COMMAND BEFORE PHD IN OPERATIONS (CMD BEFORE OPS).
- COMMAND AFTER PHD AT ACADEMY (CMD AFTER AFA).
- COMMAND AFTER PHD IN OPERATIONS (CMD AFTER OPS).
- PHD RELATED ASSIGNMENT AT ACADEMY (PHD AFA).
- PHD RELATED ASSIGNMENT IN OPERATIONS (PHD OPS).
- OFFICER'S ATTITUDE TOWARD PHD AND PROMOTION (ATTIT).

22 Specific Characteristics

The Continuous Variables. All the "time" group variables were left in their raw score form for the analysis. These "time" group variables were thought to be of greater

significance in discriminating between criterion groups. The numerical values for the academic time in pursuit of the PhD variable (ACAD TIME) was recorded in months. All the other time variables were recorded in years because of their longer durations.

The Dichotomous Variables. The numerical conversion of the command assignments received before and after the attainment of the PhD (CMD BEFORE, CMD AFTER) were listed in Table 9, Appendix D. The numerical conversion of the disciplines of the PhDs (DISC-) were recorded in Table 10, Appendix D. Because of the wide variety of disciplines, it was decided to categorize the disciplines by academic divisions found at the Air Force Academy and assign each division a 1-0 value based on a yes-no response. The PhD related assignment (PHD AFA,-OPS) and Air Force Academy sponsorship (AFA) variables, likewise, were converted to a 1-0 value based on a yes-no response. If the individual completed all the requirements for the doctoral degree during his/her AFIT schooling tour, the COMPLETE variable was registered as a 1. For all other possibilities, the COMPLETE variable was recorded as a 0. The one exception was the individual who submitted his/her dissertation prior to completion of the AFIT tour and only required the oral defense. These individuals were considered as "completed."

The funding of the PhD variable (AFIT) attempted to discover the financial burden incurred by either the individual or the Air Force in attaining a PhD. If the Air Force Institute of Technology (AFIT) was primarily responsible for the schooling expense, a value of 1 was assigned. All other graduate programs involving personal expense were awarded a value of 0.

Finally, question 14 in the questionnaire dealt with the officer's attitude of the PhD and promotion to colonel (ATTIT). The attitudes of Academy officers who possessed a PhD were deemed important as possible discriminators and as corroboration of the attitudes of other military officers as revealed in the literature review. The numerical conversion for question 14 in the questionnaire was displayed in Table 11, Appendix D.

Data Analysis

Discriminant Function Analysis

The study employed the discriminant function analysis subprogram of the computer program, "Statistical Package for the Social Sciences" (SPSS) as developed and described by

Klecka (1975, pp. 434-467). A brief review of discriminant function analysis would facilitate understanding the general procedures followed.

Klecka (1975) stated that "the mathematical objective of discriminant analysis was to weight and linearly combine the discriminating variables in some fashion so that the groups were forced to be as statistically distinct as possible." (p. 435) This linear combination was based on the discriminating variables that showed large differences in group means, and took the algebraic form:

$$D(i) = d(i1)Z(i1) + d(i2)Z(i2) + d(ip)Z(ip)$$

where D was the score on the discriminant function i , the d 's were the weighting coefficients, and the Z s were the standardized values of the p discriminating variables.

After the discriminant function had been derived, the researcher could pursue two research techniques; analysis and classification. (p. 435) In the analysis technique two objectives were desirable. First, the relative importance of each discriminating variable could be measured by examining the weighting coefficients. Second, in the stepwise procedure, the minimum number of variables could be determined which would satisfactorily discriminate between criterion groups. This procedure, according to Klecka was

similar to determining the minimum number of factors in factor analysis and was useful in determining the most powerful discriminators from the least powerful ones.

The use of discriminant analysis as a classification technique would follow the initial analysis computations. After a set of variables had been found that satisfactorily discriminated for cases with known group membership, a set of classification functions could then be derived which would allow classification of new cases with unknown membership. (p. 436) This classification procedure could predict group membership when only the values of the discriminating variables were known. The classification technique could also act as a test of validity for the derived discriminant function. By classifying the actual cases used to derive the function and then comparing predicted group membership with actual group membership, one could empirically measure the success in discrimination by observing the proportion of correct classifications. (p. 445)

General Procedures

In testing both hypotheses, a two part process was followed. First, preliminary analyses were performed on the independent variables, and, second, multivariate analyses were conducted using the discriminant function analysis

subprogram of the SPSS. During the preliminary portion of the analysis of the first hypothesis, an F-ratio test showed which variable means were significantly different among the criterion groups considered. A Scheffe test was also conducted to determine which two criterion groups, within each variable, significantly differed. In addition, by incorporating the crosstabs subprogram of SPSS, the frequency distribution, and linearity of the independent variables were determined by performing the Chi-square and Kendall's tau tests. These preliminary analyses showed which variables had the greater potential for being strong discriminators in the multivariate analysis.

The preliminary phase of the analysis also compared the independent variables to each other to determine the correlations that existed. A modified correlation matrix served to show both the negative and positive correlations in excess of $r = \pm .25$ between variables. The matrix was also used to eliminate certain variables which did not provide sufficiently unique discriminating variance due to their high positive correlation with other independent variables. In addition, understanding the correlations associated with the PhD variable, allowed the formation of a more complete picture of the possible "tradeoffs" inherent in the attainment of a PhD in the military.

The final procedure in the preliminary phase was performing a Pearson's product-moment correlation between each independent variable and two sets of criterion groups; those promoted below the zone, on time, and passed over to colonel (BTZ-ONT-PDO), and those promoted and passed over to colonel (PRO-PDO). The promoted criterion group (PRO) was formed by combining the subpopulations of those promoted below the zone (BTZ) and those promoted on time (ONT). These last correlations yielded the direction, either positive or negative, of the variable's influence in the promotability of officers to colonel. Once the direction was calculated, the multivariate analysis determined which of the variables were the significant discriminators of the criterion groups.

Prior to conducting the multivariate analysis, it was necessary to cross validate the discriminant function procedure to determine the error effects from the real treatment effects. For the cross validation procedure the total population was divided into two random groups; one called the developmental group, and the other the cross validation group. The first step was to determine that the two groups were approximately alike. An F-ratio test was conducted between the variables of both groups to demonstrate that no significant differences were present between variables. A discriminant function analysis was performed on the

developmental group which yielded the discriminating variables, their unstandardized canonical discriminant function coefficients, and a "hit-rate" percentage of properly classified group members. The "hit-rate" percentages of both the developmental and cross validation groups were evaluated using the chance model calculations developed by Hair (1982). The unstandardized canonical discriminant function coefficients of the developmental group, then, were multiplied to the raw scores of the variables in the cross validation group.

A second discriminant function was performed on the cross validation group members utilizing the modified "raw score" variables in a repeat of the discriminant analysis and classification procedures. If the cross validation group members were correctly classified with only a slight reduction in the "hit-rate" percentage of the developmental group, the discriminant function procedure could be considered cross-validated. The difference in the two "hit-rate" percentages would indicate the error effects of the discriminating variables selected.

Once validated, the discriminant function analysis was applied to the entire population to determine if the PhD variable was a significant discriminator in the promotion of Academy graduates to colonel. The entire population was

THE ATTAINMENT OF A DOCTORAL DEGREE RELATIVE TO OTHER
VARIABLES IN THE PR. (U) AIR FORCE INST OF TECH
WRIGHT-PATTERSON AFB OH R A CUBERO AUG 83
AFIT/CI/NR-83-49D F/G 5/9

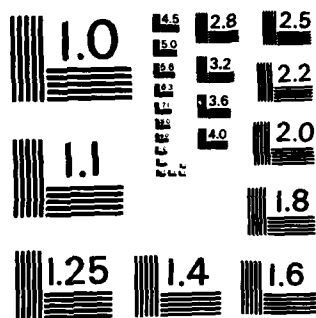
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MICROCOPY RESOLUTION TEST CHART
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used for the multivariate analysis for two reasons. First, it was felt that the results of the multivariate analysis would be more accurate if the entire population were used versus only 60% of the population that was used for the developmental group. Second, in comparing the similarity of the randomly selected developmental and cross validation groups, not all the variables proved to be approximately equal. As a conservative measure, therefore, the multivariate analysis was conducted with the entire population, rather than with a segment of the population which could have contained a bias in two of the variables considered.

During the first discriminant run on the computer, all the variables were used to discriminate between three criterion groups of officers; those promoted below the zone, on time, and passed over to colonel (BTZ-ONT-PDO). However, because of the difficulty in determining how the variables differentiated between three groups of officers, a second discriminant run was performed for two groups of officers; those promoted, and those passed over to colonel (PRO-PDO). The promoted group (PRO) was formed by collapsing together the subpopulations of those officers promoted below the zone (BTZ) and on time (ONT).

As the final step in the multivariate analysis of the first hypothesis, a discriminant function analysis was

performed with an F default value of zero (0). This default value allowed all the variables to be considered in the discriminant function without fear of rejection. This procedure also provided a rank order all the variables according to their discriminating power.

For the second hypothesis the computer analyzed all the Academy graduates who were eligible for promotion to colonel in the primary zone, or who were selected to colonel below the zone, and concurrently possessed an earned PhD. The total population consisted of 51 officers. Interestingly, along with the three expected criterion groups (BTZ, ONT, and PDO), a fourth criterion group emerged reflecting those Academy graduates who separated from the Air Force prior to their entry into the primary zone for selection to colonel. This latter group was designated "retired prior to selection" (RPS). The final breakdown of the targeted population of 51 PhD officers consisted of four criterion groups; 20 BTZs, 10 ONTs, 11 PDOs, and 10 RPSs. This latter group of 10 RPS officers was eventually eliminated from consideration in the analysis because the retired officers did not compete in the military promotion process. In addition, three other officers were eliminated because they were awarded the rank of colonel through congressional legislation when they were selected as permanent professors at the Air Force Academy.

With one other individual unaccounted for, the final population was 37 PhD officers.

In considering the second hypothesis, similar preliminary and multivariate procedures were followed. In the preliminary phase the F-ratio, Scheffe, Chi-square, and Kendall's tau tests were performed. In addition, both the correlation matrix, used to analyze the correlations between the independent variables, and the Pearson's product-moment correlation, used to analyze the correlation between the independent and dependent variables, were calculated. In the latter Pearson's correlation, the specific characteristics were classified as either positive or negative influences on the promotion process to colonel.

The specific PhD characteristics were examined in multivariate fashion to test the second hypothesis. These specific PhD characteristics, categorized in Diagram E, were analyzed and each specific characteristic's contribution to the promotability of Academy graduates to colonel was determined.

To facilitate the understanding of the impact of the specific characteristics on the promotion process, the population of Academy graduates with PhDs was divided into two sets of criterion groups; those promoted below the zone, on

time, and passed over to colonel (BTZ-ONT-PDO), and those who were promoted and passed over to colonel (PRO-PDO).

In the concluding procedure for the multivariate analysis of the second hypothesis, the specific characteristics were included in a discriminant function analysis with an F default value of zero (0). This default value allowed all the specific characteristics to be included in the final discriminating equation. This final discriminant function provided the means to construct a continuum of specific characteristics according to their discriminating power. On the one extreme were depicted those characteristics with the most positive influences on the promotion to colonel, while on the opposite end were located the characteristics with the most negative influences on the graduate's promotion to colonel.

The Limitations

Sample Related

The study evaluated all officers who graduated from the first nine classes at the United States Air Force Academy, and were either selected below the zone, or considered in

the primary zone for promotion to colonel, less military lawyers and doctors. The latter two groups of officers were considered for promotions under different criteria and by means of promotion boards consisting of officers in the legal or medical professions.

Moreover, the small population size for testing the second hypothesis ($n = 37$) detracted from the generalizability of any conclusions. The analysis of the second hypothesis, therefore, provided only suggestive results. Hopefully, as the population size of Academy PhD officers increases, future studies will substantiate the findings reached by this study.

Data Related

In evaluating the officer effectiveness ratings of the officers concerned, only the last 10 effectiveness ratings were available from the official personnel data file. As the reports varied with regard to reporting period or interval, there was no standard length of time that was represented by each report. The rating periods ranged from 4 months to 15 months. However, a random spot check revealed that the last 10 ratings covered a period generally

of 10 years or less (each individual rating covered an evaluation period of approximately one year).

In addition, in recording the medals, decorations, and combat experience of the population, data from self-reported biographical sketches were added to the Academy ERDB data file by the Association of Graduates (AOG). The data because of their self reported nature, however, could have been incomplete or noncurrent. All the other variables extracted from official personnel data file of the Air Force required supporting documentation before submitting an entry into an individual's file.

Finally, the promotion process in the military has been a closely guarded procedure. The exact steps followed by each promotion board were subject to annual change and could only be hypothesized by the rest of the officer corps. Determining the sequence of events that enabled the promotion board members to draw the promotion/passed over line remained a yearly secret with the board members. The study, nonetheless, dealt with the objective aspects of the promotion process, and did not attempt to deal with the equally important subjective aspects that entered into this most important career progression process.

THE RESULTS OF THE ANALYSIS

Overview

Chapter 4 presents the findings of the analysis. The first part of the chapter deals with a preliminary analysis of the independent variables and proceeds with the testing of the first hypothesis. The first part concludes with a determination of the overall effect of the PhD variable in the military promotion process, and a rank order of all the variables used in this analysis. The second part of the chapter deals with a preliminary analysis of the specific characteristics related to the attainment of a PhD and proceeds to testing the second hypothesis. The second part concludes with the contributions of the specific characteristics to the overall effect of the PhD variable and a rank order of all the specific characteristics used in the analysis. All the tables dealing with the results of the analysis are presented in the text of the chapter.

The First Hypothesis

Restatement of H1

In Chapter 3, the first hypothesis stated that there was a positive discriminating effect of the doctoral degree variable in differentiating membership between three groups of Air Force Academy graduates; those promoted below the zone, those promoted on time, and those passed over for promotion to the rank of colonel. The literature supported the contention that the higher the academic credentials of the officers considered for promotion, the better his/her chances for being selected.

Analysis of the Independent Variables (H1)

Table 12 depicted the original 22 independent variables analyzed for a test of the first hypothesis. A simple F-test showed that the means of 11 of the variables proved significantly different among those promoted below the zone, those promoted on time, and those passed over to the rank of colonel. On a univariate basis, the average of the officer's OERS (EFF RTG) and the number of controlled OER 3-ratings (CTRL 3 RTG) were significant at $p < .001$.

Table 12

The Mean Scores, Standard Deviations, F-Ratios, and P Levels
For Three Criterion Groups of Academy Graduates
Considered for Promotion to Colonel

Postulated Variables	Promtd. BTZ		Promtd ONT		Passd Over		F-Ratio
	Mean	SD	Mean	SD	Mean	SD	
HI SCHOOL	573.67	105.62	579.29	103.84	565.42	101.73	00.68
ENGLISH	1136.19	126.58	1133.69	125.97	1116.49	146.03	00.83
MATH	1277.30	122.52	1277.83	121.88	1278.40	117.16	00.00
MIL SERV	.12	.33	.07	.26	.05	.23	2.52
ACAD MERIT	6.12	2.87	6.22	2.77	5.48	2.73	2.71
MIL MERIT	7.86	2.70	7.06	2.73	6.06	2.88	13.34***
GRAD MERIT	6.47	2.77	6.33	2.69	5.48	2.65	4.80**
NONRTD	.06	.25	.10	.30	.03	.19	2.48
NAVIG	.04	.21	.06	.24	.21	.41	13.45***
PILOT	.88	.31	.83	.37	.71	.45	6.23**
LANG	1.19	.58	1.15	.52	1.11	.44	.74
HI MIL EDUC	4.73	.47	4.79	.52	4.36	1.17	14.85***
TOT MIL EDUC	10.59	2.95	11.20	2.88	9.16	4.03	15.64***
HI ACAD EDUC	2.93	.88	2.95	.97	2.71	1.42	2.16
MASTERS	.93	.25	.92	.25	.81	.39	6.90***
PHD	.06	.23	.08	.22	.12	.32	1.52
COMBAT	2.78	.62	2.80	.54	2.80	.46	.08
MED DEC	83.75	45.32	71.15	46.29	65.71	62.61	4.77**
EFF RTG	9.92	.12	9.84	.15	9.62	.24	100.70***
CTRL 3 RTG	.06	.25	.08	.27	.57	.74	61.82***
CTRL EFF RTG	9.67	1.23	9.49	1.55	9.15	1.82	3.58*

Note: * = $p < .05$, ** = $p < .01$, *** = $p < .001$

Both variables dealing with the level and amount of professional military training an officer received (HI MIL EDUC, TOT MIL EDUC), the aeronautical rating of navigator (NAVIG), and the graduate's cadet military order of merit (MIL MERIT) represented the variables possessing the second order of significance. Finally, the master's degree

(MASTERS), the aeronautical rating of pilot (PILOT), the weighted combination of medals and decorations (MED DEC), the officer's graduation order of merit (GRAD MERIT), and the average of the controlled OERS received (CTRL EFF RTG) were classified together in the last group of significant discriminators. Moreover, as a further refinement Appendix F contained the results of the Scheffe test, and depicted which criterion groups among the postulated variables differed significantly.

Utilizing the crosstabs procedure of the SPSS computer program, the independent variables were further examined as to their frequency distribution and linearity with the three criterion groups of officers (dependent variable) considered in this study. The Chi-square tested for anomalies in the frequency distribution and Kendall's tau tested for linearity between the chosen independent variable and the discrete dependent variable. The independent variables were arranged by the variable subcategory as presented in Diagram A, Chapter 1, and listed in Table 13. In each case the independent variable was either dichotomized or trichotomized to provide better interpretability of results.

Table 13

The Frequency Distribution of the Postulated Variables
Among the Three Criterion Groups of Academy Graduates
Considered for Promotion to Colonel.

Variable Name	Code	BTZ		ONT		PDO		Chi-Square	Kendall's Tau
		N	%	N	%	N	%	p	p
HI SCHOOL	Lo	43	30	67	47	32	23	.151	.102
	Me	73	26	140	51	64	23		
	Hi	36	34	56	53	13	12		
ENGLISH	Lo	21	23	42	47	27	30	.167	.081
	Me	115	31	192	51	69	18		
	Hi	16	27	29	50	13	23		
MATH	Lo	0	0	2	100	0	0	.632	.424
	Me	88	30	145	48	65	22		
	Hi	64	29	116	52	44	19		
MIL SERV	Yes	19	43	19	43	6	14	.083	.016
	No	133	28	244	51	103	21		
ACAD MERIT	Lo	33	27	57	47	32	26	.079	.045
	Me	63	30	100	47	49	23		
	Hi	55	29	106	57	27	14		
MIL MERIT	Lo	17	21	38	48	25	31	.001	.001
	Me	31	19	90	54	45	27		
	Hi	103	37	135	49	39	14		
GRAD MERIT	Lo	29	27	51	47	28	26	.023	.012
	Me	60	28	99	46	54	25		
	Hi	63	31	112	56	27	13		
NONRTD	Yes	11	26	27	64	4	10	.094	.230
	No	141	29	236	49	105	22		
NAVIG	Yes	7	14	17	35	25	51	.001	.001
	No	145	31	246	52	84	18		
PILOT	Yes	134	31	219	51	77	18	.001	.001
	No	18	19	44	47	32	34		

Variable Name	Code	BTZ		ONT		PDO		Chi-Square	Kendall's Tau
		N	%	N	%	N	%	p	p
HI ACAD EDUC	Ba	10	20	19	38	21	42	.001	.145
	Ma	133	31	222	52	75	17		
	PhD	9	21	22	50	13	30		
MASTERS	Yes	142	30	244	52	88	18	.001	.001
	No	10	20	19	38	21	42		
PHD	Yes	9	20	22	50	13	30	.226	.045
	No	143	30	241	50	96	20		
HI MIL EDUC	SOS	2	9	5	22	16	70	.001	.052
	ISS	36	37	41	42	21	21		
	AWC	114	28	217	54	72	18		
TOT MIL EDUC	Lo	9	21	11	26	23	53	.001	.135
	Me	50	35	66	47	25	18		
	Hi	93	27	186	55	61	18		
LANG	Lo	137	29	239	50	101	21	.456	.229
	Me	1	11	5	56	3	33		
	Hi	14	37	19	50	5	13		
COMBAT	Yes	126	29	223	51	90	20	.681	.279
	No	20	28	34	47	18	25		
MED DEC	Lo	34	20	90	53	47	28	.002	.001
	Me	71	30	118	50	46	20		
	Hi	44	40	51	46	15	14		
EFF RTG	Lo	0	0	1	20	4	80	.001	.001
	Me	3	5	21	31	43	64		
	Hi	149	33	241	53	61	14		
CTRL 3 RTG	0	142	32	242	54	63	14	.001	.001
	1	10	16	21	34	30	50		
	2	0	0	0	0	16	100		
CTRL EFF RTG	Lo	17	12	60	43	64	45	.001	.001
	Me	24	19	77	62	24	19		
	Hi	100	50	91	45	10	5		

In the precommissioning subcategory, none of the variables investigated which measured pre-Academy training proved significant. The officer's prior academic record (HI SCHOOL), however, appeared to be the stronger of the four measures with regard to differentiating membership in the three criterion groups. Because this study was performed in part for the express benefit of the Air Force Academy, the variables which measured an officer's cadet performance, ie., academic (ACAD MERIT), military (MIL MERIT), and graduation (GRAD MERIT) orders of merit, all held special interest. Of the three, the variable promising to be a strong discriminator of the criterion groups was the military order of merit (MIL MERIT). Of the other two variables, the graduation order of merit (GRAD MERIT) also proved significant in the Chi-square test.

In the continuing training subcategory, which included the largest number of independent variables, the aeronautical statuses of pilot and navigator (PILOT, NAVIG) were significant. In the area of professional military training, both the highest level attained (HI MIL EDUC), and the total combination of courses completed (TOT MIL EDUC) were also statistically significant, as were the highest level attained of academic higher education (HI ACAD EDUC) and, specifically, the master's degree (MASTERS). The least sig-

nificant variable appeared to be foreign language proficiency (LANG).

The effectiveness and achievement subcategories were deemed to contain the most important discriminating variables, according to the literature. As was expected, most of the variables in these subcategories did test out to be significant. The average of both the officer's OERs and controlled OERs (EFF RTG, CTRL EFF RTG), the number of controlled 3-ratings (CTRL 3 RTG), and the weighted combination of medals and decorations received (MED DEC) were also significant. Expectedly, the combat duty (COMBAT) of the individual was not significant, indicating that all three criterion groups had a proportionate share of officers who served in Southeast Asia during the Vietnam era.

At this point in the analysis, the independent variables were compared in bivariate fashion. Table 14 showed a modified version of the pooled within groups correlation matrix on all 22 variables considered for the analysis. All the variables displayed in the matrix had a correlation of $r \geq .25$ or better with at least one other variable. This table was important in investigating the relationships between variables, and in eliminating some of the variables which did not provide any unique variance to the discriminant function.

Table 14

Modified Pooled Within Groups Correlation Matrix

Variables	ACAD MERIT	GRAD MERIT	COMBAT	PHD	MED DEC	CTRL 3 RTG
HI SCHOOL	.37	.38	-.03	.12	.03	-.06
MIL SERV	-.10	-.08	-.08	-.08	-.01	.00
ENGLISH	.37	.35	.01	.14	-.02	.00
MATH	.37	.34	-.07	.13	-.05	-.01
ACAD MERIT	1.00	.96	-.03	.28	-.01	.00
MIL MERIT	.07	.17	-.05	-.04	.02	-.06
GRAD MERIT	.96	1.00	.00	.27	.00	.00
NONRTD	.08	.08	-.27	.19	-.34	-.07
NAVIG	-.04	-.06	-.04	.08	-.15	-.03
PILOT	-.04	-.02	.25	-.25	.37	.09
ASTRO	--	--	--	--	--	--
LANG	-.03	.10	-.01	.06	.07	.03
HI MIL EDUC	-.04	-.07	.05	-.20	.02	.08
TOT MIL EDUC	.00	-.02	.00	-.14	-.04	.
HI ACAD EDUC	.35	.32	-.10	.61	-.16	-.06
MASTERS	.23	.21	-.02	.11	-.11	-.02
PHD	.28	.27	-.16	1.00	-.14	-.09
COMBAT	-.03	.00	1.00	.16	.25	.06
MED DEC	-.01	.00	.25	-.14	1.00	.00
EFF RTG	.07	.08	-.02	.07	-.05	-.62
CTRL 3 RTG	.00	.00	.06	-.09	.00	1.00
CTRL EFF RTG	-.06	-.05	.00	.03	.00	-.11

The relationships between variables were, in most cases, predictable. For example, the individual's prior academic record (HI SCHOOL) had a noticeable correlation with both cadet academic and graduation order of merit ($r=.37$, $r=.38$). Those students who did well academically in high school also did well academically at the Academy. Looking at the other precommissioning variables, academic order of merit (ACAD

MERIT) had a near perfect correlation with graduation order of merit (GRAD MERIT) at $r=.96$, and a moderate correlation with academic higher education (HI ACAD EDUC) at $r=.35$. Graduation order of merit (GRAD MERIT) at the Academy was computed, predominantly, from the cadet's academic standing in his class. Also, those individuals who excelled academically at the Academy were the ones who pursued academic higher education in the service.

The variables in the continuing training subcategory also displayed anticipated results. The non-rated members (NONRTD) of the study showed a substantial negative correlation with medals and decorations (MED DEC) at $r=-.34$ and combat duty (COMBAT) at $r=-.27$. On the other hand, pilots (PILOT) had a high correlation with medals and decorations (MED DEC) at $r=.37$, with combat duty (COMBAT) at $r=.25$, and a negative correlation with the PhD variable (PHD) at $r=-.25$.

In the effectiveness and achievement subcategory, combat duty (COMBAT) was correlated with medals and decorations (MED DEC) at $r=.25$. In addition, the officer's OER average (EFF RTG) was negatively correlated with the number of controlled 3 ratings (CTRL 3 RTG) at $r=-.62$. With such a high correlation one could surmise that the controlled 3-ratings (the lowest rating awarded) accounted for much of the

discriminating power of the OER, and would be difficult to overcome.

An analysis of the correlation matrix led to the elimination of three variables from the discriminant function analysis. First, the aeronautical variable of astronaut (ASTRO) was eliminated due to an absence of data. No one in the population data bank was designated as an astronaut. Second, the graduation order of merit (GRAD MERIT) was similarly eliminated due to the high correlation this variable had with academic order of merit (ACAD MERIT). Moreover, since GRAD MERIT was a weighted composite of both ACAD MERIT (80%) and MIL MERIT (20%), its inclusion in the discriminant analysis might obscure the issue of deciding the relative importance of academic or military training at the Academy in predicting long-term promotability among graduates.

Lastly, the variable which measured the highest academic degree attained (HI ACAD EDUC) was eliminated due to the duplication of information with the master's and doctoral degree variables (MASTERS, PHD). The study was primarily concerned with the delineation between the two graduate degrees and not merely with the pursuit of higher education. With the three variables eliminated, a Pearson's product-moment was computed on the 19 postulated variables to determine the direction, positive or negative, of each variable

on the promotability of Academy graduates to the rank of colonel.

Table 15 calculated a Pearson's correlation for all the postulated variables and two sets of criterion groups; those promoted below the zone, on time, and passed over (BTZ-ONT-PDO), and those promoted and passed over (PRO-PDO) to colonel. As illustrated, in both cases the correlations between attaining a PhD (PHD) and promotability were negative. Moreover, the PhD variable was significant at $p < .05$ when analyzed with all three criterion groups (BTZ-ONT-PDO), and significant at $p=.068$ with the criterion groups of those promoted and passed over to colonel (PRO-PDO).

The Cross Validation Procedure (H1)

The initial step in conducting a multivariate analysis was cross validating the discriminant function procedure. The entire population was divided into two random groups. The first, called the developmental group, consisted of 328 individuals, or 60% of the total population. The second, called the cross-validation group, consisted of 196 individuals, or 40% of the total population. To demonstrate the similarity of the two randomly selected groups, Table 16 presented the corresponding F-ratios and significance levels

Table 15

Pearson's Correlation Coefficients Between
the Independent Variables and Two Sets
of Criterion Groups Tested

Variables	BTZ-ONT-PDO (r)	PRO-PDO (r)
HI SCHOOL	.0255	.0493
ENGLISH	.0494	.0576
MATH	.0048	.0074
ACAD MERIT	.0747*	.1050**
MIL MERIT	.2169***	.1841***
MIL SERV	.0922*	.0534
NONRTD	.0356	.0820*
NAVIG	-.2059***	-.2391***
PILOT	.1541***	.1525***
COMBAT	-.0208	-.0107
LANG	.0464	.0415
HI MIL EDUC	.1578***	.2264***
TOT MIL EDUC	.1244**	.2203***
MASTERS	.1400***	.1696***
PHD	-.0747*	-.0652
MED DEC	.1226**	.0773*
EFF RTG	.5074***	.5021***
CTRL 3 RTG	-.3568***	-.4407***
CTRL EFF RTG	.1168**	.1043**

Note: * = $p < .05$; ** = $p < .01$; *** = $p < .001$

of the same variables in both groups. Table 16 graphically showed that in only two variables (PILOT, NAVIG) were the F-ratios significantly different. A discriminant function analysis was conducted on the developmental group to arrive at a discriminant function which could be used to classify unknown cases into the three criterion groups.

Table 16

Wilks' Lambda and F-Ratio for Variables in the Developmental
and Cross-Validation Groups

Variable	Wilks' Lambda	F	Significance
HI SCHOOL	.99877	.6357	.425
ENGLISH	.99996	.0194	.889
MATH	.99878	.6295	.427
ACAD MERIT	.99996	.0184	.892
MIL MERIT	.99893	.5543	.456
MIL SERV	.99945	.2842	.594
NONRTD	.99890	.5707	.450
NAVIG	.99190	4.2210	.040
PILOT	.99141	4.4790	.034
COMBAT	.99933	.3458	.556
LANG	.99999	.0076	.930
HI MIL EDUC	.99998	.0092	.923
TOT MIL EDUC	.99980	.1020	.749
MASTERS	.99856	.7430	.389
PHD	.99945	.2842	.594
MED DEC	.99920	.4127	.520
EFF RTG	.99987	.0657	.797
CTRL 3 RTG	.99792	1.0780	.299
CTRL EFF RTG	.99960	.2048	.651

Table 17 illustrated the summary results of the stepwise procedure which selected 10 discriminating variables from the original 19 considered. Only eight of the variables, however, were statistically significant. Table 18 contained the unstandardized canonical discriminant function coefficients that were derived from the developmental group's selected variables.

Table 17

Summary Table of Developmental Group's
Discriminating Variables

Variable	Step	Wilks' Lambda	Rao's V	Ch in V	Significance
EFF RTG	1	.6585	167.5	167.50	.001
TOT MIL EDUC	2	.6133	197.5	30.02	.001
NAVIG	3	.5833	223.1	25.61	.001
CTRL 3 RTG	4	.5453	249.4	26.25	.001
HI MIL EDUC	5	.5329	260.4	10.99	.004
MED DEC	6	.5216	269.1	8.75	.012
MASTERS	7	.5141	277.0	7.91	.019
PILOT	8	.5104	280.2	3.20	.201
NONRTD	9	.4965	295.9	15.65	.001
MIL MERIT	10	.4928	298.9	3.03	.219

Table 18

The Developmental Group's
Unstandardized Canonical Discriminant
Function Coefficients

Variables	First Function
MIL MERIT	.020
NONRTD	3.408
NAVIG	2.397
PILOT	3.564
HI MIL EDUC	.355
TOT MIL EDUC	.034
MASTERS	.697
MED DEC	.001
EFF RTG	.043
CTRL 3 RTG	-.429
(Constant)	-49.336

Finally, Table 19 displayed the "hit-rate" percentages of the cases in the developmental group which were properly classified into the three criterion groups by the discriminating function classification procedure.

Table 19

Developmental Group's Classification Results

Act. Gp	No. of Cases	Pred. BTZ	Pred. ONT	Pred. PDO
BTZ	91	42(46.2%)	48(52.7%)	1(1.1%)
ONT	160	22(13.8%)	128(80.0%)	10(6.3%)
PDO	76	3(3.9%)	27(35.5%)	46(60.5%)

Note: Percent of grouped cases correctly classified was 66.06%

According to Hair (1982), the chance model used for an evaluation of the "hit-rate" percentage could be calculated by summing the squares of the criterion group ratios to the total population. An acceptance level then could be determined by adding 25% of the chance model to itself and comparing this figure with the "hit-rate" percentage. Any "hit-rate" percentage above the acceptance level should be considered as an improvement on chance.

The chance model and acceptance level for the developmental group were calculated as follows:

Developmental Group Calculations.

$$(91/328)^2 \times (160/328)^2 \times (76/328)^2 = .3685$$

Chance Model = 36.85%

+ 25% of Chance Model = 9.21%

Acceptance Level = 46.06%

In this particular case, the "hit-rate" percentage of 66.06%, compared to an acceptance level of 46.06%, represented a substantial improvement over chance.

In the next step, the developmental group's unstandardized coefficients were multiplied to the raw scores of the 10 discriminating variables of the cross validation group. These recomputed variables were designated with an X- prefix to distinguish them from the same variables of the developmental group. A second discriminant function was then performed on the cross validation group utilizing only the X-prefixed variables. A summary of the stepwise procedure was provided in Table 20. The five selected discriminating

variables were able to correctly classify all the cases of the cross-validation group at a "hit-rate" percentage of 60.71% (see Table 21). The cross validation "hit-rate" percentage, being only slightly reduced from the developmental "hit-rate" percentage, indicated that the error effects of the discriminant function procedure were minimal. The calculations for the chance model and acceptance level were as follows:

Cross-Validation Group's Calculations.

$$(60/196)^2 + (103/196)^2 + (33/196)^2 = .3982$$

$$\text{Chance Model} = 39.82\%$$

$$+ 25\% \text{ of Chance Model} = 9.96\%$$

$$\text{Acceptance Level} = 49.78\%$$

Table 20

**Summary Table of Cross-Validation Group's
Discriminating Variables**

Variable	Step	Wilks' Lambda	Rao's V	Ch in V	Significance
XEFF RTG	1	.8267	39.82	39.82	.001
XMIL MERIT	2	.7568	60.94	21.13	.001
XHI MIL EDUC	3	.7170	73.46	12.51	.002
XCTRL 3 RTG	4	.6919	80.95	7.48	.023
XNAVIG	5	.6818	84.77	3.82	.147

Table 21

Cross-Validation Group's Classification Results

Act. Group	No. of Cases	Pred. BTZ	Pred. ONT	Pred. PDO
BTZ	60	23 (38.3%)	35 (58.3%)	2 (3.3%)
ONT	103	14 (13.6%)	82 (79.6%)	7 (6.8%)
PDO	33	1 (3.0%)	18 (54.5%)	14 (42.4%)

Note: Percent of grouped cases correctly classified was 60.71%

Multivariate Analysis of the First Hypothesis (H1)

Once the discriminant function procedure was validated, the PhD variable was investigated as a discriminating variable by means of two different approaches. First, a discriminant analysis was conducted on the three criterion groups of officers; those promoted below the zone, on time, and passed over to colonel (BTZ-ONT-PDO). Second, a discriminant analysis was conducted on the two criterion groups of those officers promoted, and those officers passed over to colonel (PRO-PDO). Table 22 and 23 depicted the summary tables of the discriminating variables selected with each approach. In no case was the PhD variable (PHD) selected as a discriminating variable.

Table 22 showed that twelve discriminating variables were selected for the three criterion groups of officers. The most important variable appeared to be the officer effectiveness ratings (EFF RTG) which was consistent with the readings in the literature review. The second variable selected was the highest level of professional military education attained (HI MIL EDUC). This selection was of practical importance in that professional military education was one of the few variables over which a military member has some degree of control. The next two variables selected

Table 22

Discriminating Variables for Three
Criterion Groups of Officers; Those
Promoted Below the Zone, Those Promoted On Time,
and Those Passed Over to the Rank of Colonel

Variables	Step	Wilks' Lambda	Rao's V	Ch in V	Significance
EFF RTG	1	.7193	201.3	201.3	.001
HI MIL EDUC	2	.6815	238.4	37.05	.001
NAVIG(-)	3	.6479	276.6	38.18	.001
CTRL 3 RTG(-)	4	.6158	307.2	30.64	.001
MIL MERIT	5	.6055	319.0	11.84	.003
MED DEC	6	.5962	328.7	9.70	.008
MASTERS	7	.5901	336.9	8.17	.016
TOT MIL EDUC	8	.5833	343.6	6.65	.036
MIL SERV	9	.5775	349.9	6.34	.042
PILOT	10	.5741	353.9	3.97	.137
NONRTD	11	.5635	369.2	15.29	.001
COMBAT	12	.5612	371.8	2.60	.272

were both highly negative factors in the promotion process to colonel. Being a navigator (NAVIG-) was to be avoided, as was receiving a controlled 3-rating (CTRL 3 RTG-) on one's record. Those four variables were significant at $p < .001$ in discriminating between the three criterion groups tested.

The remaining variables were all fairly well distributed among the precommissioning training, continuing training, and performance subcategories of this study's conceptual model. Synthesizing the information presented in the table, one could conclude that the following chronological order of

events played an important role in the promotion of graduates to the rank of colonel. First, an early military orientation (MIL MERIT,MIL SERV) was beneficial. Becoming either a pilot (PILOT) or being non-rated (NONRTD) were better than becoming a navigator (NAVIG-). Attaining the highest level of professional military education (HI MIL EDUC), having a high combined total of professional military courses (TOT MIL EDUC), and completing a master's degree (MASTERS) prior to one's consideration for colonel were all seen as career enhancing variables. Finally, the superior performance of one's military duties as evidenced by outstanding officer effectiveness ratings (EFF RTG), and the absence of any controlled 3-ratings (CTRL 3 RTG-) were crucial to promotion success.

Because it was difficult to conceptualize how the selected variables could differentiate between three criterion groups, a second discriminant function analysis was conducted on only two criterion groups of officers; those promoted and those passed over to colonel. Table 23 depicted the discriminating variables selected. Contending with only two groups of officers, the results were easier to interpret and more meaningful in that most officers were concerned primarily with being promoted, and not necessarily with accelerated promotion.

Table 23

Discriminating Variables for Two Criterion Groups
Officers; Those Promoted and Those Passed Over to Colonel

Variables	Step	Wilks' Lambda	Rao's V	Ch in V	Significance
EFF RTG	1	.7521	170.4	170.4	.001
HI MIL EDUC	2	.7131	208.0	37.61	.001
NAVIG(-)	3	.6783	245.1	37.14	.001
CTRL 3 RTG(-)	4	.6600	266.3	21.23	.001
MASTERS	5	.6538	273.8	7.43	.006
MIL MERIT	6	.6496	278.8	5.00	.025
TOT MIL EDUC	7	.6480	280.8	2.03	.154
MED DEC	8	.6463	282.9	2.09	.148

Interestingly, the first four variables selected were identical to the variables selected for three criterion groups of officers: effectiveness ratings (EFF RTG), highest level of professional military education (HI MIL EDUC), not being a navigator (NAVIG-), and not having controlled 3-ratings (CTRL 3 RTG-) on one's record. The next variable selected was attaining a master's degree (MASTERS), followed by the officer's military order of merit as a cadet (MIL MERIT). The last two variables of the combined total of professional military courses completed (TOT MIL EDUC), and the weighted total of medals and decorations (MED DEC) added discriminating power to the previously selected variables but neither variable was significant at $p < .05$. Again, the PHD variable (PHD) was not selected as a discriminator.

Chronologically, the table again confirmed that an early military orientation (MIL MERIT) was important in predicting long term military success. In the continuing training subcategory, not being a navigator (NAVIG-), attaining the highest level of professional military education (HI MIL EDUC), and completing a master's degree (MASTERS) were all significant influences in the promotion process to colonel. Finally, and most importantly, the manner in which an officer performed his military duties, represented by outstanding effectiveness ratings (EFF RTG), and an absence of any controlled 3-ratings (CTRL 3 RTG-) were highly predictive factors in determining those officers who were promoted from those officers who were passed over to colonel.

On the basis of the most powerful discriminators selected in the multivariate procedure, the picture began to form that overall military performance was paramount in promoting officers to high rank. The desired military performance was characterized by consistently outstanding effectiveness ratings with an absence of controlled 3-ratings on one's record. In addition, the military seemed to be placing great emphasis on professional military education as a catalyst for outstanding military performance, as well as a master's degree to raise the officer's academic qualifications.

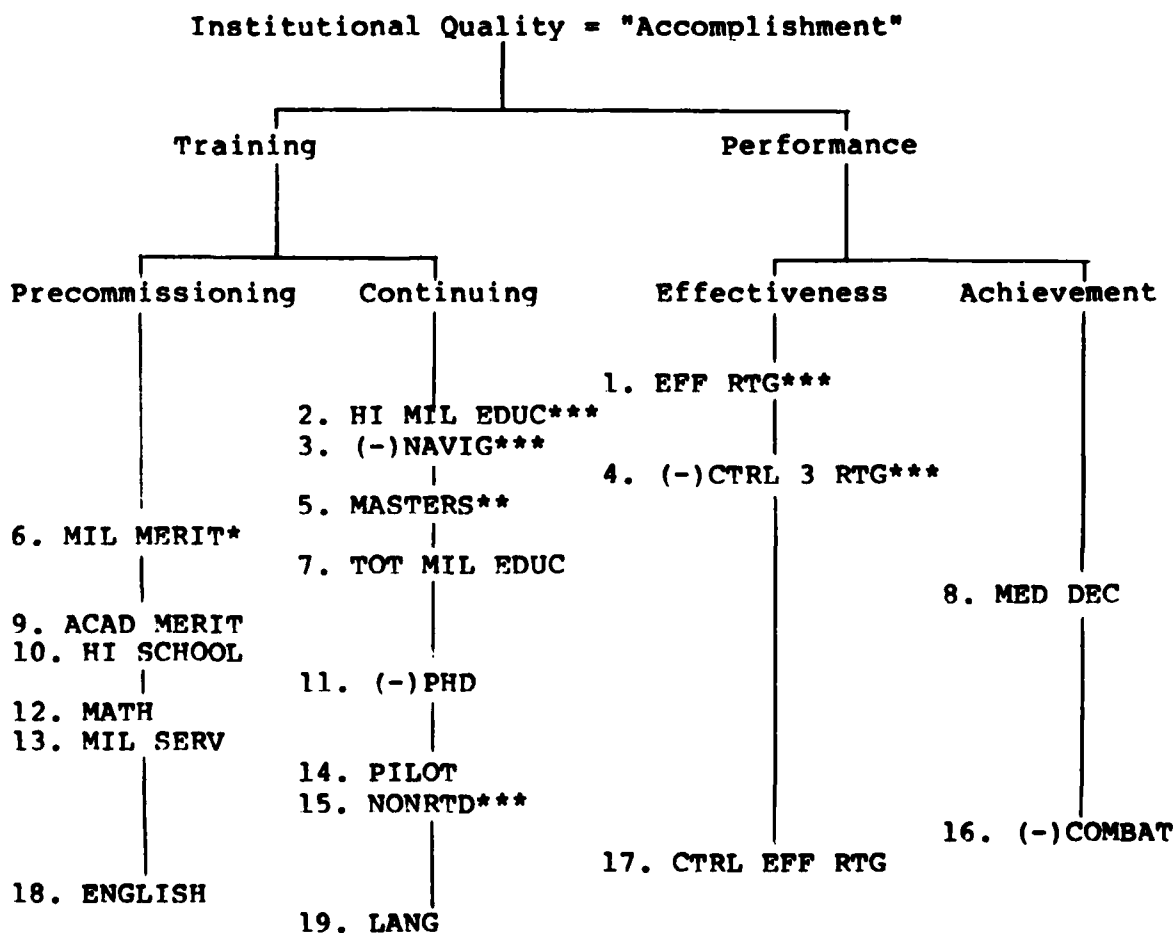
The Rank Order of the Postulated Variables (H1)

To rank order the variables, one final discriminant function analysis was conducted on the entire population. The stepwise method with an F default value of zero (0) was employed to select all the variables according to their ability to discriminate between criterion groups. Because it was difficult to conceptualize how the selected variables could discriminate between three criterion groups, the rank order of the independent variables utilized two criterion groups of officers; those promoted and those passed over to the rank of colonel. This division of the dependent variable was of greater interest to the majority of officers who strive to achieve the rank of colonel on time.

The F default value of zero was used to insure that all 19 variables would be included in the final discriminant function without fear of rejection. Diagram F demonstrated the variables' rank order based on their selection in the stepwise method of the discriminant procedure. As illustrated in the table, the PhD variable had an overall ranking of eleventh. Because the PhD variable had shown itself to be a negative factor, and not statistically significant in discriminating between two sets of criterion groups tested, the first hypothesis was rejected.

Diagram F

Final Rank Order of All 19 Discriminating Variables for
Those Officers Promoted and Passed Over to Colonel



Note: * = $p < .05$; ** = $p < .01$; *** = $p < .001$

The Second Hypothesis

Restatement of H2

The second hypothesis stated that there were differences in the specific characteristics related to the attainment of a PhD for three groups of United States Air Force Academy graduates; those promoted below the zone (BTZ), those promoted on time (ONT), and those passed over (PDO) to the rank of colonel. Although the literature did not provide any guidance with regard to the directionality of the second hypothesis, idiographic data suggested that the specific characteristics related to time (refer to Diagram E, chapter 3) would significantly discriminate between the criterion groups. Specifically, the study tested the proposition that the longer a military member spent in academic endeavors, the more negative the influence of the PhD on promotability.

Analysis of the Specific Characteristics (H2)

Because the data base at the Air Force Academy did not provide sufficient information on how the individuals attained their doctoral degrees, a questionnaire was devised which reflected the desired data for testing the second

hypothesis. Of the total 51 PhD officers who were eligible for promotion to colonel, 10 retired from active duty prior to their primary zone consideration, and were eliminated from the analysis. Three others were eliminated because they were selected as permanent professors at the Academy and were awarded the rank of colonel through congressional legislation. In only one case was the questionnaire returned because of an unknown address. Of the remaining 37 cases, 33 responded for a response rate of 89%.

Before entering the 22 specific characteristics into a discriminant function analysis, univariate and bivariate analyses were conducted to understand the individual impact and interrelation between the specific characteristics themselves and between the specific characteristics and the criterion variables tested. Tables 24 and 25 illustrated the respective F-ratio and Chi-square tests performed on the specific characteristics. Interestingly, the same two characteristics, being stationed at the Academy before pursuing a PhD (CMD BEF AFA), and being stationed in an operational unit before pursuing a PhD (CMD BEF OPS), were significant at $p < .05$ level for both tests. In the F-ratio test completion of all PhD requirements (COMPLETE) was significant at $p < .05$, as was total academic time as an instructor (INSTR TIME) for the Chi-square test.

Table 24

The Mean Scores, Standard Deviations, F-Ratios, and P Levels
For Three Criterion Groups of Academy Graduates With PhDs
Considered for Promotion to Colonel

Specific Charact.	Promoted BTZ		Promoted ONT		Passed Over		
Name	Mean	SD	Mean	SD	Mean	SD	F-Ratio
AGE	32.06	3.09	35.18	3.28	33.83	3.06	2.653
COMM TIME	9.70	2.98	13.27	3.49	11.66	3.14	3.191
ACAD TIME	26.20	6.32	27.90	3.26	29.83	5.07	1.014
TOTAL TIME	3.20	.91	3.90	1.70	3.66	.81	.806
STUD TIME	3.40	.96	3.81	.40	3.83	.40	1.248
INSTR TIME	2.40	2.01	4.81	3.06	4.83	2.04	2.942
CONSEC	3.60	1.17	4.36	2.06	5.50	1.51	2.448
DISCHUM	.20	.42	.09	.30	.33	.51	.723
DISCSOC	.30	.48	.36	.50	.33	.51	.042
DISCENG	.30	.48	.36	.50	.33	.51	.042
DISCSCI	.10	.31	.09	.30	.00	.00	.283
DISCOTH	.10	.31	.09	.30	.00	.00	.283
AFIT	.90	.31	1.00	.00	1.00	.00	.839
AFA	.60	.51	.72	.46	.83	.40	.475
COMPLETE	.50	.52	.63	.50	.00	.00	3.856*
CMD BEF AFA	.10	.31	.63	.50	.00	.00	7.607**
CMD BEF OPS	.90	.31	.36	.50	1.00	.00	7.607**
CMD AFT AFA	.60	.51	.45	.52	.66	.51	.382
CMD AFT OPS	.40	.51	.55	.52	.33	.51	.382
PHD AFA	.70	.48	.45	.52	.50	.54	.643
PHD OPS	.20	.42	.54	.52	.50	.54	1.423
ATTIT	2.50	.70	2.36	.92	1.8	.98	1.175

Note 1: * = $p < .05$; ** = $p < .01$.

Note 2: The results of the Scheffe test were that no two criterion groups among any of the characteristics were significantly different at $p < .05$.

Table 25

The Frequency Distribution of the Specific Characteristics
Among the Three Criterion Groups of Academy Graduates
Considered for Promotion to Colonel

Specific Variable	Code	BTZ		ONT		PDO		Chi-Square	Kendall's Tau
		N	%	N	%	N	%	p	p
AGE	0-34	09	56	04	25	03	19	.239	.081
	35-50	04	27	07	46	04	27		
COMM TIME	0-11	09	56	04	25	03	19	.239	.081
	12-20	04	27	07	46	04	27		
ACAD TIME	0-27	05	42	05	42	02	16	.880	.325
	28-50	06	35	09	41	04	24		
TOTAL TIME	0-3	07	39	08	44	03	17	.782	.340
	4-8	04	36	04	36	03	28		
STUD TIME	0-4	10	36	12	43	06	21	.428	.124
	5-8	01	100	00	00	00	00		
INSTR TIME	0-4	10	56	05	28	03	16	.041	.018
	5-8	01	09	07	64	03	27		
CONSEC	0-4	08	42	09	47	02	11	.175	.095
	5-8	03	30	03	30	04	40		
DISCHUM	NO	11	41	11	41	05	18	.499	.480
	YES	03	50	01	17	02	33		
DISCSOC	NO	10	44	08	35	05	21	.959	.466
	YES	04	40	04	40	02	20		
DISCENG	NO	09	43	08	38	04	19	.915	.412
	YES	05	42	04	33	03	25		

Specific Variable	Code	BTZ		ONT		PDO		Chi-Square	Kendall's Tau
		N	%	N	%	N	%	p	p
DISCSCI	NO	13	42	11	36	07	22	.744	.313
	YES	01	50	01	50	00	00		
AFIT	NO	04	80	00	00	01	20	.128	.088
	YES	10	36	12	43	06	21		
AFA	NO	04	50	03	38	01	12	.662	.186
	YES	07	33	09	43	05	24		
COMPLETE	NO	06	35	05	29	06	35	.056	.095
	YES	05	42	07	58	00	00		
CMD BEF AFA	NO	10	48	05	24	06	28	.007	.328
	YES	01	13	07	87	00	00		
CMD BEF OPS	NO	01	13	07	88	00	00	.007	.328
	YES	10	48	05	24	06	28		
CMD AFT AFA	NO	04	33	06	50	02	17	.725	.462
	YES	07	41	06	35	04	24		
CMD AFT OPS	NO	07	41	06	35	04	24	.725	.462
	YES	04	33	06	50	02	17		
PHD AFA	NO	07	39	07	39	04	22	.902	.348
	YES	07	47	05	33	03	20		
PHD OPS	NO	11	58	05	26	03	16	.111	.030
	YES	03	21	07	50	04	29		
ATTIT	MINUS	01	14	03	43	03	43	.340	.047
	NEUT	04	50	02	25	02	25		
	PLUS	09	50	07	38	02	12		

Table 26 displayed the modified correlation matrix between the specific characteristics (independent variables) in the analysis. The matrix was modified to highlight the characteristics that would generally pertain to an Air Force

Academy graduate. A specific sequence of events, starting with Air Force Academy sponsorship (AFA), being stationed at the Air Force Academy before pursuing a PhD (CMD BEF AFA), completing all PhD requirements during the AFIT tour (COMPLETE), being stationed at the Air Force Academy after completing the PhD (CMD APT AFA), and the officer's attitude toward the effect of the PhD on promotability (ATTIT) were all reflected in the modified correlation matrix table.

Of particular interest to the United States Air Force Academy were the negative correlations between Academy sponsorship (AFA) and the completion of the PhD (COMPLETE) at an $r = -.400$, and between Academy sponsorship and the individual's attitude of the PhD toward promotion to colonel (ATTIT) at $r = -.414$. These strong negative correlations indicated that the individuals who were being sent for their PhDs from the Academy did not complete their degrees during the AFIT graduate tour, and generally, felt that the doctoral degree was detrimental to their careers. On the euphemistic "positive" side, the Academy sent more senior officers (AGE) for their PhDs, $r = .509$, with more total commissioned time (COMM TIME) at $r = .522$.

The correlation between the command before the PhD assignment at the Academy (CMD BEF AFA) and the age (AGE) of the individual was an $r = .685$, and an $r = .658$ for total

commissioned time (COMM TIME). This relationship indicated that older officers with more commissioned time were the ones generally sent for their PhDs from the Academy assignment. Moreover, CMD BEF AFA's high correlation with AFA at $r=.534$, and with INSTR TIME at $r=.564$ inferred that those individuals sent for their PhDs from the Academy, were logically sponsored by the Academy, and, generally, accumulated the longer periods of academic instructor time on their records.

Investigating the completion characteristic (COMPLETE) revealed negative correlations at $r=-.448$ with the total time in pursuit of a PhD (TOTAL TIME), an $r=-.516$ with total commissioned time (COMM TIME), an $r=-.554$ with the Social Science PhDs, and a positive $r=.311$ with the attitude variable (ATTIT). The data indicated that the individuals who completed their degree requirements during their graduate tours were the junior officers who were sent early in their careers, and who spent the shorter time in pursuit of the PhD. In addition, those individuals were the ones with a positive attitude toward integrating the PhD with their military careers. Moreover, the officers who sought a doctoral degree in the Social Sciences were not completing their requirements during their graduate tours.

The characteristic of being stationed at the Academy after completing the PhD (CMD AFT AFA) had strong positive correlations with total instructor time (INSTR TIME) and consecutive academic time (CONSEC) at $r=.486$, and $r=.462$, respectively. There was also a high positive correlation with having a PhD related assignment only at the Air Force Academy (PHD AFA) at $r=.395$. These last two correlations showed that Air Force Academy sponsorship (AFA) generally meant that the officer was being assigned back to the Academy immediately following the attainment of the PhD, and that the Academy would probably be the only Air Force assignment requiring the officer to work in the PhD capacity.

The last characteristic of the individual's attitude of the PhD toward promotion to colonel (ATTIT), showed a strong negative correlation with the Humanities PhD (DISCHUM) at $r=-.365$, and with a PhD related assignment at the Academy (PHD AFA) at $r=-.358$. This appeared to mean that Academy graduates who pursued their PhDs in the Humanities had a more negative attitude toward the influence of their doctoral degree on their promotion opportunities to colonel. Moreover, if their PhD related assignment was only at the Academy, the chances were greater that they also perceived their degree as a negative factor on promotability.

Table 26

Modified Pooled Within Groups Correlation Matrix

SpChar	AFA	CMD BEF AFA	COMPLETE	CMD AFT AFA	ATTIT
AGE	.509	.685	-.438	.095	-.089
COMM TIME	.522	.658	-.516	.093	-.103
ACAD TIME	-.116	.053	.285	-.227	-.069
TOTAL TIME	.217	.207	-.448	-.212	.076
STUD TIME	-.275	.142	.036	-.217	-.040
INSTR TIME	.450	.564	-.046	.486	-.316
CONSEC	.315	.320	.029	.462	-.259
DISCHUM	.308	-.229	.082	.203	-.365
DISCSOC	.461	.254	-.554	.007	-.060
DISCENG	-.417	-.034	.355	.168	.133
DISCSCI	-.104	.105	.285	-.308	.199
DISCOTH	-.424	-.294	-.045	-.308	.199
AFIT	.271	.056	-.234	.248	-.124
AFA	1.000	.534	-.400	.410	-.414
COMPLETE	-.400	-.228	1.000	-.031	.311
CMD BEF AFA	.534	1.000	-.228	.258	-.260
CMD BEF OPS	-.534	-1.000	.228	-.258	.260
CMD AFT AFA	.410	.258	-.031	1.000	-.293
CMD AFT OPS	-.410	-.258	.031	-1.000	.293
PHD AFA	.455	.239	-.056	.395	-.358
PHD OPS	-.367	-.227	.033	-.314	.325
ATTIT	-.414	-.260	.311	-.293	1.000

Table 27 showed the results of the bivariate analysis between the specific characteristics and the two sets of criterion groups tested. The second column displayed the correlation coefficients of the specific characteristics and the promotion groups of officers promoted below the zone, on time, and passed over to colonel (BTZ-ONT-PDO). As indicated six of the characteristics proved significant at $p <$

Table 27

Pearson's Product-Moment Correlation
Coefficients Between the Specific
Characteristics and Two Sets
of Criterion Groups

SPEC/CHAR	BTZ-ONT-PDO	PRO-PDO
AGE	-.304*	-.088
COMM TIME	-.347*	-.105
ACAD TIME	-.255	-.234
TPP	-.149	-.033
STUD TIME	-.300	-.138
INSTR TIME	-.377*	-.165
CONSEC	-.312*	-.327*
DISCHUM	-.024	-.139
DISCSOC	-.010	+.019
DISCENG	+.044	-.070
DISCSCI	+.095	+.131
DISCOTH	+.049	+.164
AFIT	-.213	-.012
AFA	-.167	-.124
COMPLETE	+.275	+.429**
CMD BEF AFA	-.039	+.315*
CMD BEF OPS	+.039	-.315*
CMD AFT AFA	+.006	-.083
CMD AFT OPS	-.006	+.083
PHD AFA	+.064	-.027
PHD OPS	-.316*	+.154
ATTIT	+.326*	+.307*

Note: * = $p < .05$; ** = $p < .01$

.05. Considering the criterion groups of simply promoted and passed over to colonel (PRO-PDO), five characteristics proved significant at $p < .05$.

To recap the preliminary analysis, the specific characteristics when compared to the postulated variables did not

appear to offer as many strong discriminators of criterion groups. Both the number and significance levels of the characteristics in the F-ratio and chi-square tests were lower than for the postulated variables. In contrast, however, the correlation matrix of the specific characteristics displayed much higher correlations than the correlation matrix for the postulated variables. Simply analyzing the characteristics for two criterion groups of officers; those promoted and passed over to colonel, the characteristics could be divided into positive and negative groups. The characteristics which, by themselves, enhanced promotion opportunities to colonel were: completing the PhD during the AFIT tour (COMPLETE), being stationed at the Air Force Academy before pursuing the PhD (CMD BEF AFA), and having a positive attitude that the PhD would be beneficial in the promotion process to colonel (ATTIT). The corresponding negative characteristics were: consecutive academic time as either a student or instructor (CONSEC), and being stationed in an operational unit before pursuing a PhD (CMD BEF OPS).

Multivariate Analysis of the Second Hypothesis (H2)

During the next phase of the research, the multivariate analysis proved to be highly interesting and relevant. Table 28 depicted the summary results of the discriminant function analysis for all 22 specific characteristics and the three criterion groups of officers promoted below the zone, on time, and passed over to colonel. Two general comments concerning this analysis were in order. First, all seven of the characteristics selected in the discriminant function process were significant, and second, the majority of the characteristics selected were negative factors in the promotion process.

Table 28 provided some insight into which characteristics were important when considered collectively. Interestingly, on the positive side, being stationed at the Academy immediately before pursuing a PhD (CMD BEF AFA), and completing the PhD during the AFIT tour (COMPLETE) were significant at $p < .001$. On the negative side, spending too much time as an instructor (INSTR TIME), or in a schooling assignment in pursuit of a PhD (ACAD TIME), or prolonging the completion of the PhD requirements (TOTAL TIME), all proved to detract significantly from promotion opportunities to colonel. The other significantly negative characteristic

was having a PhD related assignment in operations (PHD OPS). The selection of this characteristic indicated that the Air Force would seemingly rather that the PhD officer not work operationally in his PhD specialty, or that working in one's PhD specialty was too restrictive in demonstrating promotion potential for colonel. Finally, the last positive characteristic selected was obtaining one's PhD in a discipline other than the ones classified by the Academy's academic divisions (DISCOTH). This indicated that officers who pursued their PhDs in Business Administration, for example, were very successful in attaining the rank of colonel.

Table 28

Discriminating Characteristics for Those Officers Promoted Below the Zone, On Time, and Passed Over to Colonel.

SpecChar	Step	Wilks' Lambda	Rao's V	Ch in V	Significance
CMD BEF AFA	1	.6120	15.21	15.21	.001
COMPLETE	2	.4412	28.09	12.87	.002
INSTR TIME(-)	3	.3258	40.38	12.29	.002
ACAD TIME(-)	4	.2470	55.19	14.81	.001
PHD OPS(-)	5	.1664	73.48	18.29	.001
TOTAL TIME(-)	6	.1453	80.63	7.15	.028
DISCOTH	7	.1216	90.66	10.03	.007

The three criterion group analysis was difficult to interpret because one was not certain upon which criterion groups the characteristics were acting. For that reason

Table 29 illustrated the specific characteristics which were selected as discriminators for only two criterion groups of officers; those promoted and those passed over to colonel. Again, the significance levels of the characteristics selected and the number of negative characteristics were noteworthy. In this final analysis the positive discriminators were deemed to be; completing one's PhD during the AFIT schooling tour (COMPLETE), and being stationed at the Academy before pursuing the PhD (CMD BEF AFA). The negative characteristics were analyzed to be; excessive academic time as an instructor (INSTR TIME), too much academic time in pursuit of the PhD (ACAD TIME), a PhD related assignment in operations (PHD OPS), and a long period of consecutive time as either a student or an instructor (CONSEC).

Table 29

Discriminating Characteristics for
Two Criterion Groups of PhD Officers; Those
Promoted and Those Passed Over to Colonel

SpecChar	Step	Wilks' Lambda	Rao's V	Ch in V	Significance
COMPLETE	1	.7714	7.40	7.40	.007
CMD BEF AFA	2	.6734	12.12	4.71	.030
INSTR TIME (-)	3	.4976	25.24	13.12	.001
ACAD TIME (-)	4	.3778	41.17	15.93	.001
PHD OPS (-)	5	.3167	53.92	12.76	.001
CONSEC (-)	6	.3016	57.87	3.95	.047

In analyzing these results even further, one could postulate a rationale for each of the characteristics selected by the discriminant function procedure. Completing one's PhD during the AFIT tour could be critical to a military member in allowing him/her to return to operational duties as soon as possible. Conversely, not completing the PhD during the AFIT tour could have the disastrous effect of causing the individual to dilute their professional output by dividing their energies between completing the PhD and primary military responsibilities. Being stationed at the Academy prior to pursuing a PhD could have a highly positive impact on promotion in that the Academy as an academic institution would only consider sending its most qualified officers for their doctoral degrees. Being designated a PhD candidate while stationed at the Air Force Academy would constitute recognition that the officer so selected was part of the Academy's elite corps of officers. The effectiveness ratings of these officers or the administrative positions assigned to them might favorably reflect this elite status.

In all the time related characteristics, such as, total academic time as an instructor (INSTR TIME), academic time in pursuit of the PhD (ACAD TIME), and consecutive academic time (CONSEC), one thread was common to all--the longer the individual spent away from military activities, the less

chance the person had to be promoted to colonel. If the Air Force promoted individuals based on their military performance, it would stand to reason that the longer they stayed away from operational (military) assignments, the less opportunity they would have to display their military talents.

Finally, having a PhD related assignment in operations (PHD OPS) also had a negative effect on promotion to colonel. The selection of this characteristic indicated that the Air Force was not interested in the "specialist" as a consideration for high rank, but rather favored the "generalist." In other words, instead of utilizing the specific knowledge gained by the PhD in an operational capacity, it would be better for the officer to demonstrate that the PhD was of benefit in allowing him to become a more effective military officer. Converting the PhD knowledge to general military effectiveness was more important than utilizing the PhD knowledge for the specific PhD related tasks.

The Rank Order of the Specific Characteristics (H2)

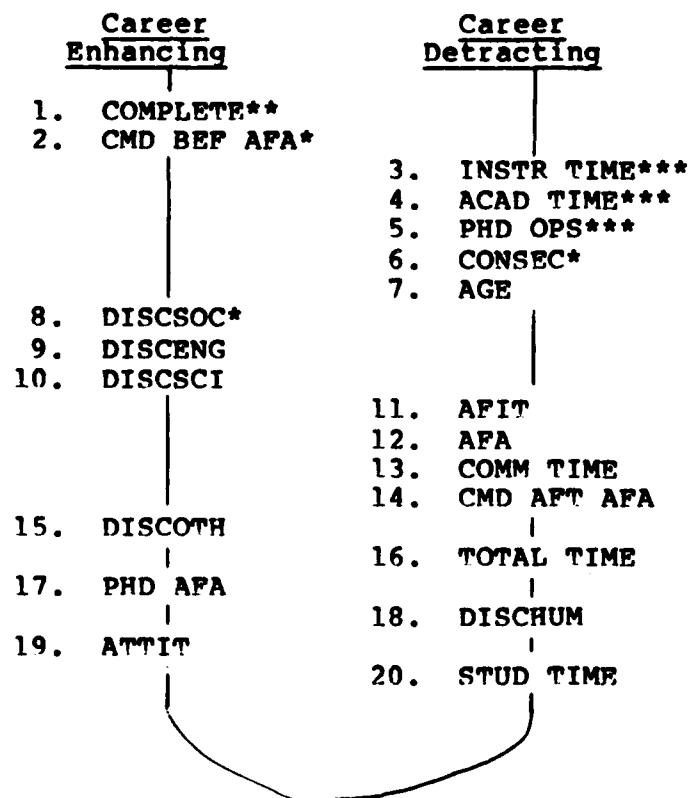
In the final step, similar to the procedure followed in testing the first hypothesis, a discriminant function analysis was performed on all the specific characteristics

with a default value of zero. This allowed all the characteristics to be included in the final discriminant function without fear of rejection. Diagram G divided the characteristics into positive and negative categories, and rank ordered them according to their selection in the stepwise method. The criterion groups considered for this last analysis were those promoted and those passed over to colonel. Diagram G was constructed as a "horseshoe" continuum to demonstrate more graphically which characteristics related to the attainment of the PhD were career enhancing, and which were career detracting. In addition, the asterisks indicated the various significance levels associated with each characteristic's ability to add discriminating power to the previously selected characteristics. Diagram G was the extension of Table 29 with all the characteristics rank ordered. On the positive side in decreasing discriminating power, the characteristics varied from completing the PhD during the AFIT tour (COMPLETE) as the most positive, to the least positive characteristic of having the attitude that the PhD would enhance promotion opportunities to colonel (ATTIT).

Crossing to the other side of the continuum, the least negative characteristic was total academic time as a student (STUD TIME). At the top of the list as the most powerful

Diagram G

Final Rank Order of All Specific Characteristics For Those Officers Promoted and Passed Over to Colonel



Note: * = $p < .05$; ** = $p < .01$; *** = $p < .001$

negative characteristic was total academic time as an instructor (INSTR TIME). The added information provided by this diagram was that almost any PhD other than a humanities degree would be a positive influence on the military promotion process to colonel. Moreover, returning to the Academy immediately after the PhD, and being older with more

commissioned time in the service were also career detracting. On a final note, it also appeared that the independent pursuit of the PhD was a positive factor in the promotion process to colonel. Officers would be better off attaining their doctorates on their own rather than being sponsored by the Air Force Academy or by having AFIT fund their graduate tours. Again, it must be reiterated that these findings of positive and negative characteristics related only to the small number of United States Air Force Academy graduates who attained their doctoral degrees in the military.

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

A review of the related literature led to the conclusion that there would be a positive influence between the PhD variable and the promotion to colonel for Academy graduate officers. The perception by Academy faculty officers that a doctoral degree had a negative impact on promotability was dismissed as either idiosyncratic to the Academy environment, or unfounded based on actual data.

The results of this study tended to support that in the military where academic degrees were not credentials, the PhD variable was not a significant discriminating variable. For those officers promoted and passed over to colonel, the six variables found to be discriminators were: the officer's effectiveness ratings (EFF RTG), the highest level attained in professional military education (HI MIL EDUC), the navigator aeronautical rating (NAVIG-), the number of 3

ratings during the controlled OER period (CTRL 3 RTG-), the master's degree (MASTERS), and the officer's military order of merit as a cadet (MIL MERIT). These variables were all significant at $p = .05$ or less.

In the bivariate analysis, utilizing Pearson's product-moment correlation coefficients, the PhD variable showed itself to be a significantly negative factor in the promotability of Academy officers to colonel, specifically, between criterion groups of those promoted below the zone, on time, and passed over. As the PhD variable did not, however, discriminate between any criterion groups in the multivariate analysis, and was determined to be a negative factor rather than a positive factor in the military promotion process, the first hypothesis was rejected.

By isolating the PhD officers from the rest of the total population, the specific characteristics related to the attainment of the PhD were analyzed to ascertain if any were significant discriminators of the criterion groups tested in the first hypothesis. For those officers promoted and passed over to colonel, the positive discriminators were revealed to be; completing one's PhD during the AFIT schooling tour (COMPLETE), and being sent for the PhD from the Air Force Academy (CMD BEF AFA). The corresponding negative discriminators were; total academic time as an instructor

(INSTR TIME), spending excessive academic time in pursuit of the PhD (ACAD TIME), a PhD related assignment in operations (PHD OPS), and a long consecutive time as either an instructor or student (CONSEC). Because the specific characteristics related to the attainment of the PhD which dealt with time did significantly discriminate between criterion groups as negative influences, the second hypothesis was accepted.

In reviewing the discriminating variables selected in the multivariate analysis, the underlying principle appeared to state that military performance of duty was the standard by which officers were either promoted or passed over to colonel. The officer's effectiveness ratings (EFF RTG) and controlled 3-ratings (CTRL 3 RTG) were deemed extremely important discriminators in the promotion process, probably because these variables validated outstanding military performance. Professional military education (HI MIL EDUC), and the master's degree (MASTERS) were significant in providing the educational foundation upon which to become a more effective officer. Finally, the officer's military order of merit as a cadet (MIL MERIT) was possibly indicative of an early military orientation that taught officers that superior performance of duty correlated highly with military advancement. Unfortunately, the navigator rating remained an enigma. As a purely military endeavor, it

should have been a positive discriminator of criterion groups. The revealed negative impact of being a navigator on the promotion process to colonel, however, was consistent with the more recent articles published in the Air Force Times and quoted in the literature review.

In reviewing the specific characteristics related to the attainment of the PhD, the underlying principle seemed to state that excessive time spent away from primary military duties was detrimental to promotion to colonel. The completion of the PhD during the AFIT tour (COMPLETE), along with all the other time related characteristics of total instructor time (INSTR TIME), academic time in pursuit of the PhD (ACAD TIME), and consecutive academic time as either a student or an instructor (CONSEC), all indicated that the officer who was interested in promotion to colonel, probably should not spend too much time in pursuit of a doctoral degree or in an academic environment like the Air Force Academy. In addition, officers would likely have a better chance of being promoted to colonel if they were stationed at the Air Force Academy immediately before starting their PhD tour (CMD BEF AFA), and if they did not specialize in their PhD area of study at an operational assignment (PHD OPS).

Conclusions

The most fundamental concept to emerge from this study was that the "military seemed to reward military behavior." This military behavior could extend from the time an individual left secondary school until that person was eligible or was selected for colonel. The positive aspects of this military orientation were reflected in the promotion success of those graduates who, early in their lives, gained a solid military foundation either through prior military service (MIL SERV), or as evidenced by their high class standing in military order of merit at the Academy (MIL MERIT). This positive military orientation continued throughout a graduate's career with the "on time" completion of professional military education (HI MIL EDUC, TOT MIL EDUC), consistent outstanding performance of duty (EFF RTG), and the frequent recognition of their professionalism in the form of awards, medals and decorations (MED DEC). Simply stated the Air Force appeared to promote those individuals who devoted their energies to military endeavors.

The second major conclusion was that the officer effectiveness ratings (EFF RTG) possibly exerted the most powerful influence on the promotability of Academy graduates to colonel. Unquestionably, the entire promotion process was

heavily dependent upon an accurate evaluation of the officer effectiveness ratings. As such, the OERs did reflect many of the other variables postulated as having an effect on the promotion process. This most probably accounted for its inordinate discriminating power with both sets of criterion groups tested. Interestingly, however, the correlation matrix inferred that the OER's discriminating power was due, primarily, to the controlled OER period ($r=.62$). This would further lead one to conclude that in the event promotion boards were no longer able to differentiate between individuals due to the "inflated" ratings being awarded to officers today, a second controlled OER period could become a reality. Another possibility could be that situational factors, such as OER endorsements, and personal sponsorship would become the significant promotion discriminators if the OER were to lose its ability to discriminate.

Finally, in addressing the PhD controversy, one could conclude that in non-academic professions, the PhD loses its positive impact on professional advancement. In the Air Force, the PhD showed itself to be a negative factor on the promotability of Academy graduates to the rank of colonel ($r=-.074, p=.04$). However, considered with all the other postulated variables, the PhD variable looked to be a weak non-significant discriminator of the criterion groups

tested, and, consequently, of little practical significance as a predictive variable to colonel. However, because this study inferred that the PhD variable probably was divisible into specific characteristics related to the attainment of a PhD, certain strategies appeared from the findings which could alter the negative effect of the PhD variable on promotability to colonel.

Timing, tradeoffs, and attitude in pursuing a PhD were seen as the general characteristics which could alter the PhD's negative impact on the promotion of graduates to colonel. The results yielded by this study suggested that attaining a PhD early in one's career and in the shortest possible time in order to devote the remaining service time to more "visible" military endeavors would be career enhancing. Moreover, if the officers attaining their PhDs were also rated as pilots, completed all required professional military education, and were appropriately recognized in their professional work as evidenced by ample awards and decorations, the effects of a PhD would also be of greater positive value to a long term military career.

As an interesting aside, there almost appeared to be a "self-fulfilling prophesy" syndrome attached to the attitude characteristic (ATTIT). Individuals who believed the PhD to be career enhancing seemingly were promoted in greater

numbers than those individuals who believed the PhD to be career detracting. Considering the criterion set of three groups (BTZ-ONT-PDO) and the attitude characteristic (ATTIT), there was a significant positive correlation at $r=.326$ ($p=.03$). For the criterion set of two groups (PRO-PDO) and the attitude characteristic (ATTIT), the correlation was also significantly positive at $r=.307$ ($p=.04$). Moreover, in the modified correlation matrix presented in Chapter 4 the attitude characteristic (ATTIT) correlated negatively with total time as an instructor (INSTR TIME) at $r=-.316$, consecutive academic time (CONSEC) at $r=-.257$, and Air Force Academy sponsorship (AFA) at $r=-.414$. These correlations tended to support that the longer individuals stayed in an academic environment, the more pessimistic they felt about the PhD's influence on their opportunities to colonel. Conversely, the officers, who shortened their career academic time and were able to return to operational assignments, probably had an optimistic attitude about the PhD's impact on their promotion to colonel.

Based on studies in the literature review, a plausible reason could be that the positively oriented individuals viewed the PhD as merely one more stepping stone in enhancing their careers. In other words, the emphasis was placed on "careers" and not on "PhD." This type of individual was

more inclined to insure that all other requirements for promotion were met, and, generally, valued the attainment of a PhD as added insurance for promotion rather than as a personal goal to be achieved for its own intrinsic merit.

Recommendations

The study has revealed the negative effect attaining a PhD has on the promotability of Academy graduates to colonel. The recommendations made in this chapter were designed to offset the negative impact of the PhD and to allow officers to know what to expect when pursuing a PhD in the military. The basic premise to all the recommendations offered was that "promotability" under the existing military promotion system was the "bottom line" for modifying educational policies in the Air Force. Quite naturally, another series of recommendations could be formulated based on changing the existing promotion system to better recognize academic achievement as a criterion for military advancement. After thoughtful consideration, however, it was decided that the existing promotion system could only be changed if it were no longer effective or if the highest level of military command desired it changed. Both possibilities seemed remote. Therefore, a more feasible approach

was to assume that the military promotion system would continue unchanged, and to make recommendations accordingly.

The following recommendations were directed, principally, to the United States Air Force Academy as the prime beneficiary of this research study. First, concerning the predominant academic orientation experienced by the cadets during their four years at the Academy, more emphasis might be placed on the military aspects of cadet training. Toward this end, faculty officers should reinforce the importance of military training by insuring that they themselves were models of a professional military officer in both comportment and appearance. Second, faculty officers could insist upon basic military courtesies and good manners from their cadets at all times. Promptness, neatness, and respect were all traditional values greatly admired in military life, and all these attributes could be enhanced in the classroom environment. Also, faculty officers should become instrumental in cultivating a sense of patriotism, commitment, and personal integrity by their personal examples.

If the promotion to colonel was the primary consideration for a successful career, very clear guidelines have surfaced in selecting officers for a doctoral program. First, the initial screening process should include only officers with outstanding military records. That is to say,

individuals should have excellent effectiveness reports and have completed the suggested professional military courses appropriate for their rank before being considered seriously for a doctoral degree. Moreover, the individual departments on the faculty should insure that the persons considered for a PhD program possess a positive attitude concerning the impact of the PhD on their careers. Again, the emphasis should be on their careers and not solely on the PhD. The Academy should consider individuals relatively early during their Academy assignment, and preferably should select junior officers with four to five years of operational experience. Finally, a concerted effort should be made to send faculty officers for their PhDs from the Academy assignment.

Once in graduate school, the Academy should bring pressure to bear on the officers to finish all their degree requirements in the shortest possible time, and certainly, to complete their dissertation during their AFIT schooling tour. That being impossible, the Academy should continue to assist the PhD candidates by insuring that they complete their dissertation as soon as possible after returning to the Academy. The importance of an expeditious completion of all requirements is in having the military members devote their full energies to the more "operational" tasks.

The Academy should also reinforce its support of returning all faculty officers to operational assignments. A stronger effort should be made to insure that faculty officers do not accumulate an excessive amount of instructor time. Although this concept runs counter to the administration of the current PhD tenured officer's program, there exist some potentially effective prospects for merging these two points of view. If, for example, the tenured pool of officers at the Academy were rotated between operational and Academy assignments, each department would effectively double its membership of tenured officers. At any given time, half of the tenured officers would be away in operational assignments, while the other half would be stationed at the Academy. At the end of the three year rotational period a one-for-one transfer would occur. The plan has the dual advantages of retaining a full complement of PhD officers in the departments at all times, while allowing the PhD officers to gain valuable operational experience on a recurring basis. It would appear that the key to the survival of the tenured officer program at the Academy is in the discovery of a compatible way of obtaining operational experience for Academy PhD officers.

Another recommendation would be for the faculty departments to closely monitor the military careers of all the PhD

officers assigned to their organizations, especially, the non-tenured PhD officers. Important feedback could be obtained from these PhD officers in the field as to the effectiveness of a doctoral degree in meeting general and specific job requirements in operational units throughout the Air Force. In addition, with current and effective liaison between these PhD officers and the Academy departments, the situation exists for personal sponsorship of younger officers stationed at the Air Force Academy by more senior PhD officers out in the field which could prove of great mutual benefit.

As the study dealt specifically with Academy graduates, a follow-up study might be considered to analyze the same postulated variables and specific characteristics with the promotion of non-Academy officers to colonel. In addition, another study might compare Academy PhD officers with PhD officers from other commissioning sources (ROTC) to determine any differences in their respective career profiles, and promotion rate to colonel.

Another sensitive issue that bears more detailed investigation, was the negative impact the navigator rating had on the promotability of Academy officers to colonel. Speculation would be that the promotion statistics were even worse for non-Academy navigators. If the Air Force requires

a navigational specialty for the accomplishment of its flying mission, then this type of professional discrimination should not exist. A study, therefore, should be conducted which would probe into the navigator-promotion dilemma in the Air Force. In fairness, the Air Force must determine what factors are responsible for the negative influence being a navigator has on the promotion process to colonel, and must quickly correct this career "pitfall."

Finally, the small number of Academy PhD officers on active duty detracted somewhat from the generalizability of the results of the analysis. With the pool of PhD officers, however, increasing each year, another analysis of the total PhD officer population in three to four years would provide a better statistical foundation upon which to draw valid conclusions. Moreover, future studies might also reveal any shifts in the discriminating power of the PhD variable, and could further reflect the positive or negative approaches advanced by the Academy in sponsoring faculty officers for their PhDs.

On a final note, the Air Force appears to be fairly pragmatic in its approach toward graduate PhD education for its officer corps, ie., the Air Force supports higher education so long as it equates to increased officer effectiveness or productivity. In the final analysis, however, an

officer's effectiveness will be determined by how well s/he can apply their academic training to military tasks. Certainly, logic would dictate that the higher the academic qualifications of the military officer, the greater his/her potential for military effectiveness. The only constraint seems to be that the officer must be able to convert that knowledge to professional expertise. In that regard, it would seem that the more education, the better. One could conceive of a continuum, consisting of varying degrees of intellectual knowledge which form the educational foundation of the military officer. On the extreme positive side--the PhD officer, we are describing the "scholar-soldier" ideal in its best form. On the extreme negative side--the illiterate soldier, we are dealing with the warrior-robot stereotype in its worst form. Education, in this perspective, can be seen as one of the critical ingredients that adds a humanizing quality to the military profession. The absence of this "quality" ingredient, education, to a military career is underscored by the following anonymous quotation:

"When a country draws a broad line of demarcation between its soldiers and its intellectuals, it runs the grave risk of having its fighting done by fools and its thinking done by cowards."

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APPENDIX A

ABBREVIATIONS

<u>Abbreviations</u>	<u>Meaning</u>
ACAD EDUC	Academic higher education
Acdmcs	Academic training
ACAD MERIT	Academic order of merit
ACAD TIME	Academic time in pursuit of PhD
Adv rated crs	Advanced rated courses
AERO RTG	Aeronautical rating
AFA	Air Force Academy sponsorship
AFIT	AFIT Funding for PhD
AGE	Age at PhD completion
AOG	Association of Graduates
AOT	Advanced operational training
ASTRO	Astronaut qualified individual
Astro tng	Astronaut training
ATTIT	Officer's attitude toward PhD and promotion
AWC	Air War College
BTZ	Below the zone (promotion)
Cmd	Command
CMD AFT AFA	Command assignment after PhD at Academy
CMD AFT OPS	Command assignment after PhD in operations
CMD BEF AFA	Command assignment before PhD at Academy
CMD BEF OPS	Command assignment before PhD in operations
COMBAT	Combat duty
COMM TIME	Total commission time at PhD completion
Comp Bd	Composition of (promotion) board
COMPLETE	Completion of all PhD requirements
CONSEC	Consecutive academic time
CTRL EFF RTG	Controlled officer effectiveness rating
CTRL 3 RTG	Controlled 3-rating (lowest)
DISC-	Discipline of PhD
Eff OER Sup	Effectiveness (writing) of OER supervisor
EFF RTG	Officer effectiveness rating/average
ERDB	Educational Research Data Base
GRAD MERIT	Graduation order of merit
HI SCHOOL	Prior academic record (high school)
INSTR TIME	Total academic time as an instructor

AbbreviationsMeaning

ISS	Intermediate Service School
LANG	Foreign language proficiency
Ldrshp	Leadership training
MED DEC	Medals and decorations
MIL EDUC	Professional military education
MIL MERIT	Military order of merit
MIL SERV	Previous military service
NONRTD	Non-rated individual
ONT	On time (promotion)
OOR	Office of the Registrar
PDO	Passed over (for promotion)
PHD AFA	PhD related assignment at Academy
PHD OPS	PhD related assignment in operations
PILOT	Pilot qualified individual
Pol Or	Policy orientation of Air Force
SEPAR	Date of separation
SOS	Squadron Officer School
Spec crs	Specialty courses
STUD TIME	Total academic time as student
TOTAL TIME	Total time in pursuit of PhD
UOR	Uniform officer records

APPENDIX B

DEFINITION OF TERMS

Below the Zone Promotions. Below the zone promotions are a limited number of accelerated promotions for officers who are promoted to their next rank 1 to 3 years prior to their entry into the primary zone. Although, theoretically, all officers are considered, each major command within the Air Force must screen all "below the zone" candidates for a particular rank and can only forward 5-7% of their most qualified officers for "accelerated promotion" consideration.

Colonel. The rank of colonel is the highest field grade rank attainable prior to a military member's promotion to the grade of brigadier general. The normal sequence of ranks leading to colonel are; second lieutenant, first lieutenant, captain, major, and lieutenant colonel.

Field Grade Ranks. The field grade ranks are the ranks of major, lieutenant colonel, and colonel. The field grade grouping of ranks is of a higher order than the company grade grouping of second lieutenant, first lieutenant, and captain, and of a lesser order than any of the general officer ranks. The established order is based on greater responsibilities and privileges.

On Time Promotions. On time promotions is a term used when officers in the Air Force are promoted to the next higher rank the first time they become eligible in the primary zone. The bulk of the officers promoted to a particular rank are promoted in the primary zone.

Passed Over. The term passed over is used to denote officers who were not promoted during their first time eligibility in the primary zone. For successive years, the passed over officers are considered for promotion for the next higher rank but with new first time eligible officers in the primary zone. Thereafter, the passed over officers become second, or third time eligibles for promotion in the

primary zone. Only a minute percentage of officers are promoted the second time eligible and beyond.

Postulated Variables. The postulated variables are the characteristics or factors which are expected to have an effect on the United States Air Force's promotion process to the rank of colonel.

Primary Promotion Zone. The primary promotion zone is an eligibility period of normally one year in which officers with principally the same time-in-grade are grouped together by Headquarters Air Force to compete for promotion to the next higher rank. During the primary zone officers are afforded their best opportunity of being promoted.

Promotion Board. A promotion board is a group of officers who are selected by the Military Personnel Center from all the officers of the Air Force. The board convenes annually at the Center and recommends officers of a particular rank for promotion to the next higher rank. As a general rule the promotion board members are of the rank being considered with the president of the promotion board being two ranks above.

APPENDIX C

OFFICER EFFECTIVENESS REPORT

I. RATEE IDENTIFICATION DATA (Read AFR 35-10 carefully before filling in any item)						
1. NAME (Last, First, Middle Initial)		2. SSAN (Include Suffix)	3. GRADE	4. DAFC		
5. ORGANIZATION, COMMAND, LOCATION				6. PAB CODE		
7. PERIOD OF REPORT FROM: _____ THRU: _____		8. NO. DAYS OF SUPERVISION		9. REASON FOR REPORT		
II. JOB DESCRIPTION 1. DUTY TITLE: 2. KEY DUTIES, TASKS AND RESPONSIBILITIES:						
III. PERFORMANCE FACTORS <i>Specific example of performance required</i>						
1. JOB KNOWLEDGE (Depth, current, breadth)	NOT OBSERVED	0	FAR/BELOW STANDARD	BELOW STANDARD	MEETS STANDARD	ABOVE STANDARD
2. JUDGMENT AND DECISIONS (Consistent, accurate, effective)	0					
3. PLAN AND ORGANIZE WORK (Timely, creative)	0					
4. MANAGEMENT OF RESOURCES (Manpower and material)	0					
5. LEADERSHIP (Initiative, accept responsibility)	0					
6. ADAPTABILITY TO STRESS (Stable, flexible, dependable)	0					
7. ORAL COMMUNICATION (Clear, concise, confident)	0					
8. WRITTEN COMMUNICATION (Clear, concise, organized)	0					
9. PROFESSIONAL QUALITIES (Attitude, dress, cooperation, bearing)	0					
10. HUMAN RELATIONS (Equal opportunity participation, sensitivity)						

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PREVIOUS EDITION WILL BE USED

OFFICER EFFECTIVENESS REPORT

IV. ASSIGNMENT RECOMMENDATION:		1. STRONGEST QUALIFICATION:																																					
2. SUGGESTED JOB (Include AFSC):																																							
3. ORGANIZATION LEVEL:		4. TIMES:																																					
V. EVALUATION OF POTENTIAL: Compare the ratee's capability to assume increased responsibility with that of other officers whom you know in the same grade. Indicate your rating by placing an "X" in the designated portion of the most appropriate block. <table border="1" style="border-collapse: collapse;"> <tr><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td></tr> <tr><td style="font-size: x-small;">RATER</td><td style="font-size: x-small;">ADJN</td><td style="font-size: x-small;">WDOOR</td></tr> <tr><td style="font-size: x-small;">RATER</td><td style="font-size: x-small;">RATER</td><td style="font-size: x-small;">SR</td></tr> </table> Lowest ← <table border="1" style="border-collapse: collapse;"> <tr><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td></tr> <tr><td style="font-size: x-small;">RATER</td><td style="font-size: x-small;">ADJN</td><td style="font-size: x-small;">WDOOR</td></tr> <tr><td style="font-size: x-small;">RATER</td><td style="font-size: x-small;">RATER</td><td style="font-size: x-small;">SR</td></tr> </table> <table border="1" style="border-collapse: collapse;"> <tr><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td></tr> <tr><td style="font-size: x-small;">RATER</td><td style="font-size: x-small;">ADJN</td><td style="font-size: x-small;">WDOOR</td></tr> <tr><td style="font-size: x-small;">RATER</td><td style="font-size: x-small;">RATER</td><td style="font-size: x-small;">SR</td></tr> </table> <table border="1" style="border-collapse: collapse;"> <tr><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td></tr> <tr><td style="font-size: x-small;">RATER</td><td style="font-size: x-small;">ADJN</td><td style="font-size: x-small;">WDOOR</td></tr> <tr><td style="font-size: x-small;">RATER</td><td style="font-size: x-small;">RATER</td><td style="font-size: x-small;">SR</td></tr> </table> ↑ Highest							RATER	ADJN	WDOOR	RATER	RATER	SR				RATER	ADJN	WDOOR	RATER	RATER	SR				RATER	ADJN	WDOOR	RATER	RATER	SR				RATER	ADJN	WDOOR	RATER	RATER	SR
RATER	ADJN	WDOOR																																					
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APPENDIX D

NUMERICAL CONVERSION TABLES

Table 1

The Numerical Conversion of Academic, Military,
and Graduation Orders of Merit
(ACAD MERIT, MIL MERIT, GRAD MERIT)

Percentile	Numerical Conversion
.00 - .09	1
.10 - .19	2
.20 - .29	3
.30 - .39	4
.40 - .49	5
.50 - .59	6
.60 - .69	7
.70 - .79	8
.80 - .89	9
.90 - 1.0	10

Table 2

The Numerical Conversion of the Highest Level
Attained in Professional Military Education
(HI MIL EDUC)

Level of Schooling	Numerical Conversion
Squadron Officer's School (SOS)	3
Air Command and Staff or any equivalent school; Joint or Foreign Staff College (ISS)	4
Air War College or any equivalent school; National or Foreign War College (AWC)	5

Table 3

The Numerical Conversion of Total Combined
Schooling in Professional Military Education
(TOT MIL EDUC)

Combination of Schools	Numerical Conversion
SOS	3
ISS	4
AWC	5
SOS + ISS	7
AWC + SOS	8
AWC + ISS	9
AWC + ISS + SOS	12

Table 4

The Numerical Conversion of Highest Level
Attained in Academic Higher Education
(HI ACAD EDUC)

Level of Education	Numerical Conversion
Bachelor's Degree	1
Bachelor's Degree + Graduate work undertaken	2
Master's Degree	3
Master's Degree + Graduate work undertaken	4
Doctoral Degree	5

Table 5

The Numerical Conversion of Foreign
Language Proficiency
(LANG)

Level of Proficiency	Numerical Conversion
0-0	1
Up to 3-3	2
3-3 and beyond	3

Table 6

The Numerical Conversion of Aeronautical Rating
(AERO RTG)

Aeronautical Rating	Numerical Conversion
Non-Rated (NONRTD)	1-0
Navigator (NAVIG)	1-0
Pilot (PILOT)	1-0
Astronaut (ASTRO)	1-0

Table 7

The Numerical Conversion of the Officer
Effectiveness Ratings
(EFF RTG)

EFF RTG	Numerical Conversion
3	8
2	9
1	10

Table 8

The Numerical Conversion of Medals and Decorations
(MED DEC)

Awards/Decorations	Numerical Conversion
Navy/Coast Guard Achievement Medals	1
Purple Heart	2
Air Force Commendation Medal*	3
Joint Service Commendation Medal	4
Air Medal	5
Meritorious Service Medal	6
Bronze Star	7
Airman's Medal*	8
Distinguished Flying Cross	9
Legion of Merit	10
Silver Star	11
Distinguished Service Medal	12
Air Force Cross*	13
Medal of Honor	14

Note: * = Also awarded by the other services.

Table 9

The Numerical Conversion of the Command Before
and After the PhD Schooling Tour
(CMD BEF, CMD AFT)

Assignment Category/-Suffix	Numerical Conversion
USAF Academy Instructor Duty (-AFA)	1-0
USAF Operational Assignment (-OPS)	1-0

Table 10

The Numerical Conversion of the Discipline of PhD
(DISC-)

Academic Division/-Suffix	Numerical Conversion
Humanities (eg., English, Philosophy, History, etc.,) (-HUM)	1-0
Social Science (eg., Physiology, Law Political Science, etc.,) (-SOC)	1-0
Engineering Science (eg., Mechanical Civil, Electrical, etc.,) (-ENG)	1-0
Basic Science (eg., Computer Science, Physics, Chemistry, etc.,) (-SCI)	1-0
Other (-OTH)	1-0

Table 11

The Numerical Conversion of the Officer's Attitude
(ATTIT)

Response to Question	Numerical Conversion
A	3
B	2
C	1

APPENDIX E

QUESTIONNAIRE

5 March 1983

Dear ,

I need your assistance in filling out the enclosed questionnaire. You are one of 50 Academy graduates with a PhD or equivalent degree. I am conducting a research study that will attempt to relate a number of variables that are believed to have an effect on the long-term promotability of Academy officers. Of focal importance is the effect and discriminating power of a PhD or equivalent degree in the promotion process to the rank of colonel.

The results of the study will be of interest to those officers who aspire to continued intellectual growth, to the United States Air Force Academy administrators who routinely assign officers to AFIT PhD tours and, finally, to the United States Air Force hierarchy that sets educational policy for all military members and is responsible for the cost-effective management of all graduate programs.

Your responses to the following questions are critical to the study. Please take the 15 minutes required to carefully fill out the attached questionnaire. Accuracy is of prime importance. Also, please send the completed survey to me in the envelope provided. I appreciate your time in this study effort. The results of the study will be published in Checkpoints during the latter part of this year. However, if you desire a personal copy I would be more than happy to insure that you receive one.

Regards,

Ruben A. Cubero, '61

PRIVACY ACT STATEMENT

In accordance with paragraph 8, AFR 12-35, Air Force Privacy Act Program, the following information is provided.

1. Authority: 5 U.S.C., 301, Departmental Regulations; 10 U.S.C., 8012, Secretary of the Air Force: Powers and Duties, Delegation By.
2. The principal purpose for which this survey will be used is to determine if there are significant differences in the characteristics related to the attainment of a doctoral degree and the promotability of Academy officers to the rank of colonel.
3. The analysis of this questionnaire will be accomplished at the United States Air Force Academy. Individual questionnaires will not be available to anyone in your organization.
4. Participation in this survey is entirely voluntary.
5. No adverse action of any kind may be taken against any individual who elects not to participate in any part or all of this survey.

EDUCATIONAL STATUS SURVEY-NO. ____

PLEASE ANSWER THE FOLLOWING QUESTIONS.

1. My doctoral degree is in:

- A. ☐ The Humanities.
 - B. ☐ The Social Sciences.
 - C. ☐ The Engineering Sciences.
 - D. ☐ The Natural Sciences.
 - E. ☐ Other, please specify, _____
-

2. Course work for my doctoral program was predominantly completed through:

- A. ☐ AFIT (civilian institution).
 - B. ☐ AFIT (resident institution).
 - C. ☐ Scholarship (no Air Force funding).
 - D. ☐ Tuition assistance.
 - E. ☐ Personal expense.
 - F. ☐ Commander's option.
 - G. ☐ Other, please specify, _____
-

NOTE: In question 2 if you checked either A or B continue with question 3; if you checked response C through G continue with question 12.

3. My AFIT doctoral tour was sponsored by the USAF Academy:

- A. ☐ Yes
- B. ☐ No

4. The total time in number of months that I was assigned to my AFIT PhD tour was:

- A. ☐ Less than 24 months
- B. ☐ 24 to 27 months

- C. ☐ 28 to 30 months
- D. ☐ 31 to 33 months
- E. ☐ 34 to 36 months
- F. ☐ 37 to 40 months
- G. ☐ 41 months or more

5. When I terminated my AFIT PhD tour, I had:

- A. ☐ Completed all requirements for the PhD.
- B. ☐ Completed everything but my oral defense (dissertation was submitted).
- C. ☐ Completed everything but my dissertation and oral defense.
- D. ☐ Not completed the course requirements for the PhD.

6. The total time in number of years from the start of my AFIT PhD tour until the degree was awarded was:

- A. ☐ Less than 2 years
- B. ☐ 2 years
- C. ☐ 3 years
- D. ☐ 4 years
- E. ☐ 5 years
- F. ☐ 6 years
- G. ☐ 7 years
- H. ☐ Over 7 years

7. The total time in number of years officially assigned to an academic institution(s) as a student was: (Consider only the time spent in pursuit of graduate degrees through AFIT, or any other USAF approved "full-time" student programs)

- A. ☐ Less than 1 year
- B. ☐ 1 year
- C. ☐ 2 years
- D. ☐ 3 years
- E. ☐ 4 years
- F. ☐ 5 years
- G. ☐ 6 years
- H. ☐ 7 years
- I. ☐ Over 7 years

8. The total time in number of years officially assigned to an academic institution(s) as an instructor was:

- A. ☐ Less than 1 year
- B. ☐ 1 year
- C. ☐ 2 years
- D. ☐ 3 years
- E. ☐ 4 years
- F. ☐ 5 years
- G. ☐ 6 years
- H. ☐ 7 years
- I. ☐ Over 7 years

9. The longest consecutive time in number of years officially assigned to an academic institution(s) as either student or instructor was:

- A. ☐ Less than 1 year
- B. ☐ 1 year
- C. ☐ 2 years
- D. ☐ 3 years
- E. ☐ 4 years
- F. ☐ 5 years
- G. ☐ 6 years
- H. ☐ 7 years
- I. ☐ Over 7 years

10. My MAJCOM/duty assignment before entering my AFIT PhD program was:

11. My MAJCOM/duty assignment after terminating my AFIT PhD program was:

12. After attaining my doctoral degree and before being considered in the primary zone for colonel, I was assigned to an operational Air Force position which directly utilized my PhD specialty:

- A. ☐ Yes, at the U.S. Air Force Academy.
- B. ☐ Yes, at AFIT or the Air University.
- C. ☐ Yes, at some other MAJCOM.
- D. ☐ No, my PhD specialty was never utilized.

13. The reason I decided to pursue a PhD in the military was:

- A. ☐ To enhance my professional skills in an attempt to improve my career potential.
 - B. ☐ To enhance my professional skills in an attempt to improve my retirement potential.
 - C. ☐ Other, please specify _____
-

14. In retrospect I estimate that the PhD attained in the military:

- A. ☐ Enhanced my opportunities for promotion to O-6.
- B. ☐ Hindered my opportunities for promotion to O-6.
- C. ☐ Had no effect on my promotion opportunities to O-6.

15. When the proposed research project is completed I would prefer:

- A. ☐ My own personal copy of the results.
- B. ☐ To read about the results in Checkpoints.
- C. ☐ To never hear about it again.

Additional Comments: (Please reference a question number with your remarks)

APPENDIX F

SCHEFFE TEST

Significance Levels for Differences Between the
Criterion Groups of Each Postulated Variable

Variables	Criterion Gps	BTZ	ONT	PDO
MIL MERIT	BTZ ONT		*	*** **
GRAD MERIT	BTZ ONT			* *
NAVIG	PDO	***	***	
PILOT	BTZ ONT			** *
HI MIL EDUC	BTZ ONT			*** ***
TOT MIL EDUC	BTZ ONT			** ***
MASTERS	BTZ ONT			** **
MED DEC	BTZ			*

Variables	Criterion Gps	BTZ	ONT	PDO
EFF RTG	BTZ		***	***
	ONT			***
CTRL EFF RTG	BTZ			*
CTRL 3 RTG	PDO	***	***	

Note: * = $p < .05$; ** = $p < .01$; *** = $p < .001$