AD-A045 996 AIR FORCE INST OF TECH WRIGHT-PATTERSON AFB OHIO SCH--ETC F/G 5/1
AN EXPERIMENTAL TEST FOR GOAL CONGRUENCE IN AN AIR FORCE MAJOR --ETC(U)
SEP 77 C G O'BERRY

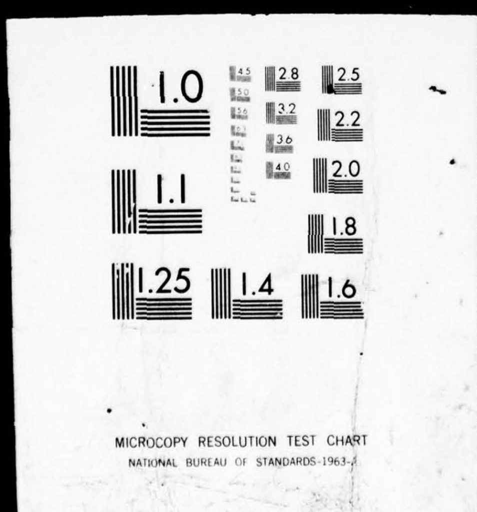
UNCLASSIFIED AFIT/GSM/SM/77S-13 NL

1 OF 2
AD
A045996

SIFIED

1 OF 2

AD A045996



UNITED STATES AIR FORCE

AIR UNIVERSITY

AIR FORCE INSTITUTE OF TECHNOLOGY

Wright-Patterson Air Force Base, Ohio

AN EXPERIMENTAL TEST FOR

GOAL CONGRUENCE

IN AN AIR FORCE MAJOR COMMAND

THESIS

GSM/SM/77S-13 Carl G. O'Berry
Lt Col USAF

GSM/SM/77S-13

AN EXPERIMENTAL TEST FOR GOAL CONGRUENCE IN AN AIR FORCE MAJOR COMMAND

THESIS

Presented to the Faculty of the School of Engineering
of the Air Force Institute of Technology
Air University
in Partial Fulfillment of the
Requirements for the Degree of
Master of Science

by

Carl G. O'Berry, B.S.
Lt Col USAF
Graduate Systems Management

September 1977

Approved for public release; distribution unlimited.

P R E F A C E

This study would not have been possible without the enthusiastic support received from many senior executives and project officers at several Air Force Communications Service agencies. I wish particularly to thank Colonel J.D. Caldwell, AFCS Assistant Deputy Chief of Staff/Personnel, for his timely support in providing rosters of AFCS managers from which to select experimental subjects. Special thanks are also due Captain Russ Zink of SACCA, Major John Pompei of NCA, and Major Frank Neely of TCA for their consideration and willing support as project officers at their respective units.

I wish also to gratefully acknowledge the invaluable help of two Air Force Institute of Technology professors: Lieutenant Colonel Adrian Harrell, for his unfailing encouragement and willingness to share his hard-gained knowledge, and Major Charles W. McNichols, ever enthusiastic and unmatched in his effortless dredging up of obscure statistical concepts and instantaneous computer programs.

Finally, but far from least important, I wish to thank the man who paid the bills: Mr. Thomas Yium, of the AFCS Office of Operations Research and Analysis.

Carl G. O'Berry

Wright-Patterson Air Force Base, Ohio
August 1977

CONTENTS

CONTENTS

LIST OF FIGURES

LIST OF TABLES

AFIT/GSM/SM/77S-13

A B S T R A C T

The policy-capturing model frequently used in psychological research was adapted in this study to test for goal congruence between managers at different levels of a large service organization of the U.S. Air Force. The data base was derived from a field experiment wherein 660 military officers and civilian managers were asked to make decisions based on identical information cues. The decisions were then grouped according to command level and a multivariate linear regression model was derived for each group. An F-test was used to compare these models for equality of regression coefficients as a determinant of the effectiveness of goal communication between organizational layers. The linear regression model proved readily adaptable as an analytical instrument for organizational study. The results appeared reasonably conclusive, with significant differences in decision-making behavior ~~being~~ indicated at different command levels. Finally, a comparison of the decisions of senior executives against those of various middle management groups was made as a test of the importance of goal congruence. It was found that the decisions of senior managers and subordinate middle management groups, made under identical conditions, differed significantly in some cases. These differences suggest that goal congruence within the Command might have considerable importance, and that it might be improved through a more effective management information system.

Chapter I

INTRODUCTION

It is widely held among organization theorists and management specialists that organizations are goal oriented. Several excerpts from the literature on organizations serve to illustrate the nearly universal appeal of this assumption. Organizations are said to be:

> "... [oriented] toward ends that are objects of common knowledge." (Simon, 1952, p. 1130)
>
> "... [aimed at] some kind of collective goal(s) or output(s)." (Leavitt, 1963, p. 23)
>
> "... devoted primarily to attainment of specific goals." (Etzioni, 1964, p. ix)
>
> "... [structured for] obtaining a set of objectives or goals." (Litterer, 1965, p. 5)
>
> "... [structured toward] achievement of some common explicit purpose or goal." (Schein, 1970, p. 9)

The assumption of goal orientation is restated so often in the literature that this assumption is accepted as axiomatic by most students of organization theory. Indeed, there seems to be little reason to doubt that <u>implicit</u> goals are inherent to any organization; but most authors, as shown above, assume that organizations are oriented toward goals that are both <u>explicit</u> and collectively understood by the organization membership. Furthermore, these explicit goals are assumed to be important motivators of individual behavior within the organization (Porter, Lawler & Hackman, 1975, p. 78).

The assumption of explicit goal orientation in organizations has been challenged in recent years by several authors. Monsen and Downs (1965) hypothesized that senior managers in large organizations are motivated not by organizational goals but by the pervasive desire to maximize their individual lifetime incomes ("income" being measured in terms of money, power, prestige, or other personal considerations). This theory is extended organizationally downward through an added precept which states that middle managers strive to please their superiors, rather than attempting to satisfy organizational goals. Although the Monsen and Downs theory was directed primarily at private-sector organizations thought to be profit-maximizing entities, there is evidence suggesting that the theory is applicable to large public-sector organizations as well (Harrell, 1977). Another researcher suggests that the process of identifying and communicating organizational goals, which should be most exacting and carefully done, is more often than not a rather haphazard activity, because organizations are not inclined to devote the necessary resources to this process or lack the objectivity to do the job well (Manley, 1972, p. 1).

Regardless of an author's particular persuasion regarding goals and the goal-setting process, it seems generally agreed that clear, unambiguous goals, properly communicated within the organization, can aid substantially in promoting understanding of the organizational mission and in developing standards upon which to judge the performance of both people and units of activity.

The Nature of Organizational Goals

Goals have been generally defined by organization theorists as desired future states of affairs (Porter, Lawler & Hackman, 1975, p. 78). While goals may not in some cases be attainable, organizations are viewed in general as intending to reach their established goals. Herbert Simon (1964, p. 2) classified organizational goals into two categories: official goals and operative goals. Official goals are viewed as the stated, sometimes cosmetic, acceptable goals of the organization, and they may be either very general or fairly specific. Some authors regard official goals as being primarily for external consumption (Manley, 1972, p. 3). Operative goals, on the other hand, are those goals which provide the bases for organizational policy formulation, operating decisions, development and application of information and control systems, and other management functions. Operative goals are considered to be in force whether or not there exists a conscious organizational goals-setting process, and they may be supportive of, indifferent to, or directly opposed to, the official goals of the organization (Manley, 1972, p. 3).

Communicating Organizational Goals

One persistent problem in large organizations is the difficulty of accurately communicating the goals of top management to those who must implement those goals. Such difficulty can stem from several sources. First, the communication process itself is subject to erroneous and misleading input/output. Second, biases, which are inherent to all groups of people, can limit accuracy in reception of managerial intent. Third, the views of groups, when continually reinforced by group members, can become virtually immune to change (Porter, Lawler & Hackman, 1975, p. 378). An example of the latter problem might be the continually reinforced view among civilians in a military organization that management goals will always favor military personnel. Finally, the accuracy of communicating top management goals can be adversely influenced by the "do as I say, not as I do" syndrome. This problem might develop when senior managers designate one set of goals, but make decisions inconsistent with those stated goals.

If the latter situation does occur, then subordinates are faced with the difficulty of correctly judging the operative goals of senior managers while more or less ignoring stated goals. In his Air Training Command experiment, Harrell (1975) sought to test the ability of middle-level managers to correctly interpret the desires of senior managers when those seniors acted at cross purposes to the stated goals of the organization. He found that subordinate managers readily ignored stated goals when feedback information revealed that their superiors had done so. Furthermore, Harrell's experiment indicated that middle managers would change their decisions, in opposition to stated policy, when they learned that their superiors' decisions were contrary to established goals. It thus became obvious that an admonition to behave in a specified fashion is insufficient to guarantee such behavior when a contrary example is set by superiors.

Since Harrell's experiment was conducted entirely within a single organizational level of the Air Training Command, it might be reasonable to conclude that it would be even more difficult to insure an accurate perception of top management goals in a widely dispersed organization. Similarly, the previously cited sources of difficulty in communicating organizational goals would be amplified by wide geographical separation of units within an organization.

Goal Congruence Between Organizational Levels

Goal congruence is defined by Horngren, a managerial accountant, in a systems sense. That author asserts that a managerial system must provide a global, or all-encompassing, emphasis, so that major goals are considered whenever managers act. The system must specify goals and subgoals to encourage behavior that blends with, and supports, top management goals (Horngren, 1972, p. 155). In consonance with this systems emphasis, goal congruence, as used here, is intended to imply general agreement between the decisions made by managers at all organizational levels, given the same specified set of goals upon which to base those decisions. Stated another way, goal congruence may be said to exist when different managers assign the same relative importance to stated goals in making a specified decision. This research effort was initiated to determine whether or not such goal congruence exists between managers at different organizational levels and units of the Air Force Communications Service (AFCS), a large and widely dispersed support command of the United States Air Force.

AFCS Command Structure

The Air Force Communications Service is organized essentially as shown in Figure 1-1. Excepting the Northern and Southern Communications Areas, the commanders of the AFCS Areas also serve as Deputy Chiefs of Staff (or Deputy Commanders) for Communications-Electronics for the major commands they support. Due to differences in the missions supported by the Areas, each Area has its own staff structure, as depicted by Figures 1-3 through 1-5. Figure 1-2 shows the basic staff structure of the AFCS command headquarters. Inasmuch as AFCS managers theoretically have an equal chance of being assigned to any of the Areas, differences in staff structure are not considered significant for purposes of this study except to help illustrate the diversity of the support provided by AFCS. The wide variety of combat missions supported by the Areas, however, is significant, as is the vast geographical dispersion of the Command. Figures 1-6 through 1-8 serve to illustrate both the geographical separation of the operating units under each Area and the considerable span of control of each Area commander. The operating units vary in personnel strength from less than 50 to several hundred. The total strength of the Command is nearly 46,000, making it one of the six largest commands in the Air Force.

Management Information Systems

There are several ways in which AFCS managers receive and dispatch information and guidance. In addition to interfaces between headquarters and subordinate unit counterparts, conferences are held at the Area level for various segments of the unit management staffs. There are also various reporting systems which assist the higher command echelons in maintaining visibility and control over field unit activities. These reporting systems tend to be one-way (upward) systems, and there is little immediate information feedback to the reporting units. Furthermore, there is an absence of lateral information transfer systems; hence, the operating groups and squadrons do not frequently exchange information.

The Operating Unit Environment

AFCS operating units are tenant organizations on the bases they support. In effect, AFCS has contracts with the various mission elements of the Air Force to provide communications and air traffic control operating, maintenance, planning, programming, engineering, and installation services. These agreements, in general, require that AFCS provide trained personnel to engineer, install, operate, and maintain communications-electronics and air traffic control facilities which are the real property of the using command. The methods of providing these services are in many ways analogous to methods employed by service agencies in the private sector.

Rating of Operating Units and Managers

The AFCS field operating unit (group, squadron, or detachment) is essentially loaned or leased to the using base or agency, while AFCS retains the prerogative of managing the personnel resources of these highly technical units. An operating unit commander typically serves two masters: he is responsible directly to his next higher AFCS commander, but he is also directly responsible to the base, wing, or other commander whom his unit supports. His Officer Effectiveness Report, which is the primary instrument by which he is promoted in grade, is prepared by the person to whom his unit provides the specified services; that is, the non-AFCS base commander or wing commander whom the AFCS unit has been tasked to support. The Officer Effectiveness Report is then forwarded to the appropriate next higher AFCS headquarters for review and indorsement; thus, it is obviously in the best interest of the unit commander to optimize his relationships with both his local superior and his AFCS superiors. It seems reasonable to hypothesize that pressures external to AFCS might be expected to have an important role in the response of the field unit commanders to AFCS goals and policies.

Figure 1-9 shows the internal organization of a typical AFCS field unit serving a Strategic Air Command (SAC) base. This unit structure changes in both subtle and obvious ways in units supporting other commands, whose mission requirements may differ widely from those of SAC. These differences, along with the geographical separation of units and varying degrees of identification of AFCS units with the supported organizations, tend to create difficulty in comparing AFCS units in terms of performance. Also the standards against which the effectiveness and efficiency of AFCS units might be compared tend to vary as the policies, procedures, and requirements of the users of the services provided.

Objectives of the Study

This study was conducted under the sponsorship of Headquarters, Air Force Communications Service, Richards-Gebaur Air Force Base, Missouri. It was intended to test for goal congruence between various management levels of that Command. The specific objectives of the study were as follows:

a. To isolate and define a set of goals considered by the AFCS headquarters staff to be important to effective AFCS mission accomplishment, and to translate these goals into specific decision criteria.

b. To determine the relative importance placed on each of the above goals by the senior AFCS headquarters staff and by other managers throughout the Command.

c. To compare the values thus determined and to extract from this comparison, if possible, some measure of the degree of goal congruence between the various managers and managerial groups.

Scope and Limitations of the Study

Because a wide spectrum of AFCS management personnel was chosen to participate in the data collection effort associated with this study, it was hoped that the results of the research might be indicative of the decision behavior of managers throughout the Command. It is not expected, however, that these study results would be applicable to other Air Force commands or to other military service organizations. The AFCS mission is extremely complex and the Command employs a highly technical work force. Consequently, management of the Command demands skilled engineers, computer specialists, mathematicians, and other well educated and trained managers. Furthermore, the wide separation of AFCS units requires managers to operate with considerable independence and provides wide latitude for decision-making. These are factors not frequently found in the military management environment, particularly at the middle management level.

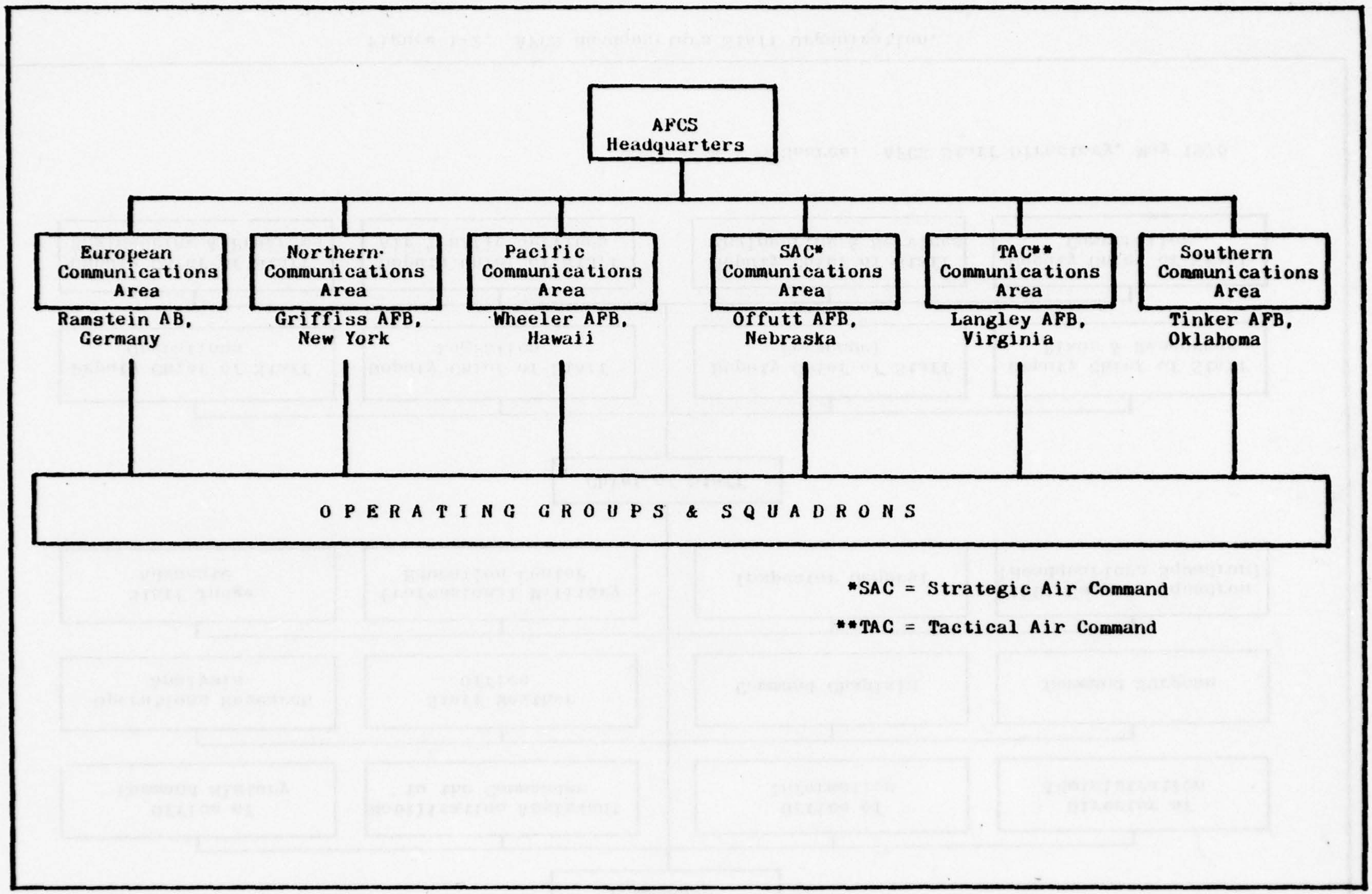
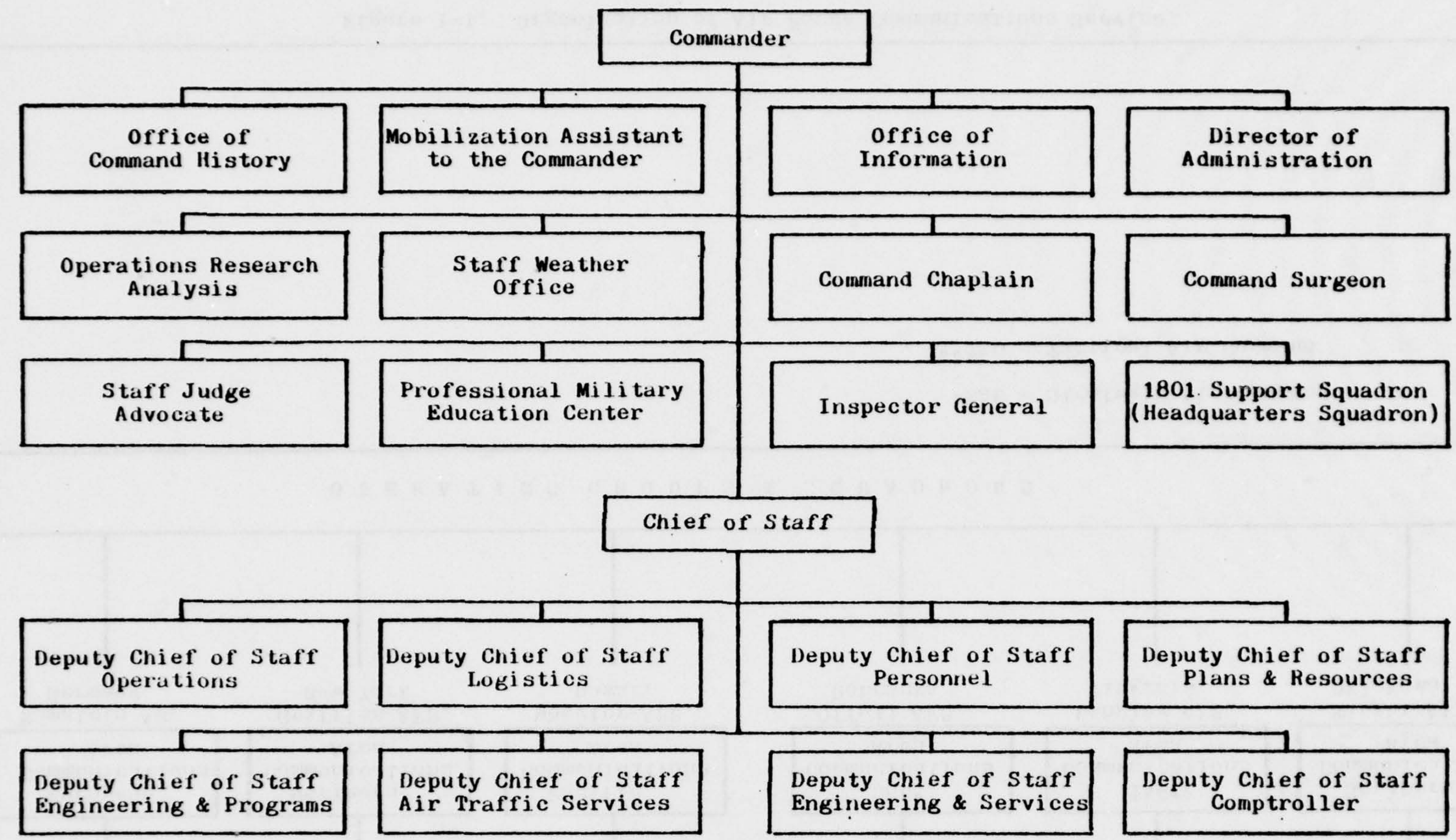
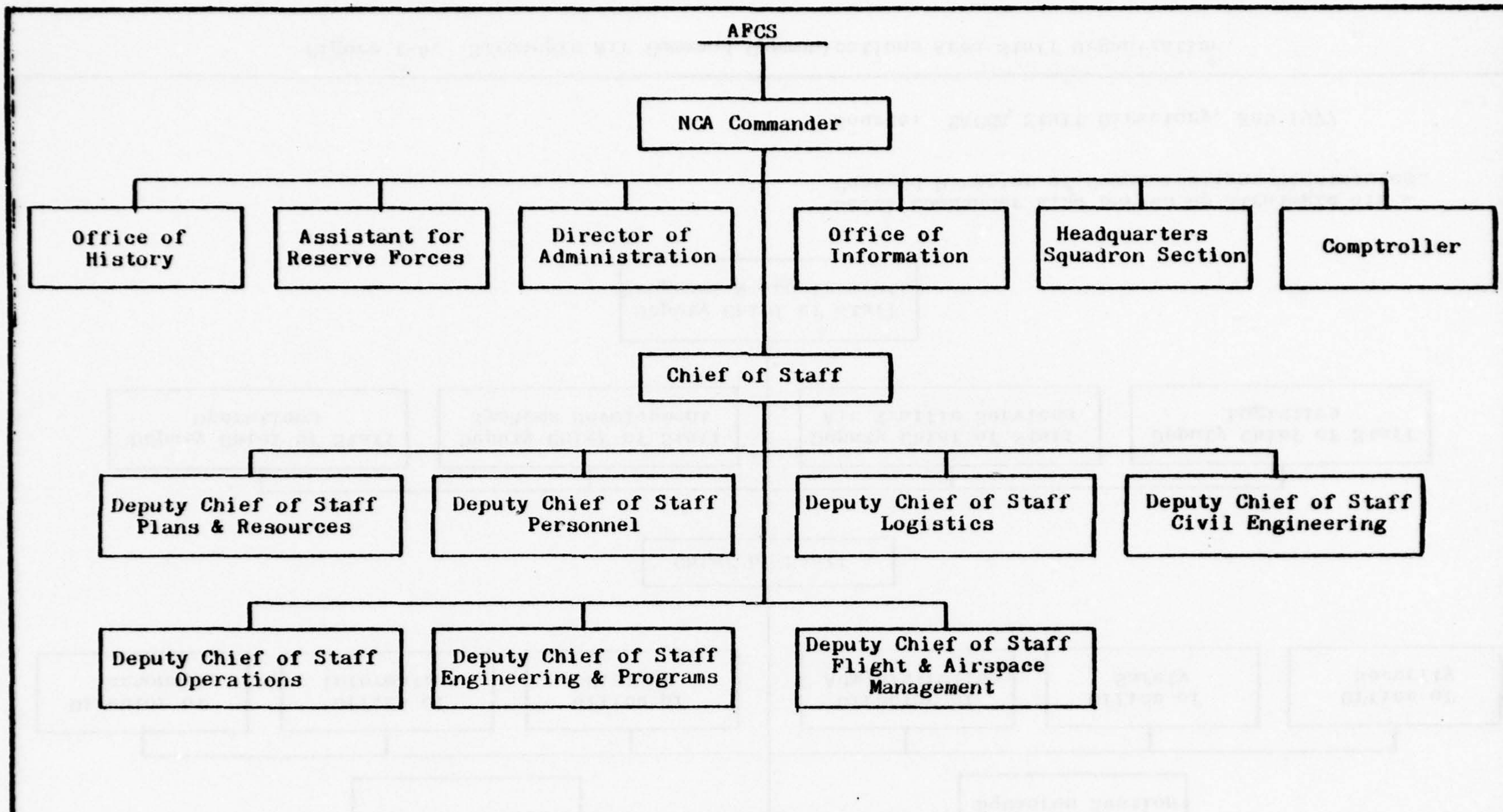


Figure 1-1. Organization of Air Force Communications Service.



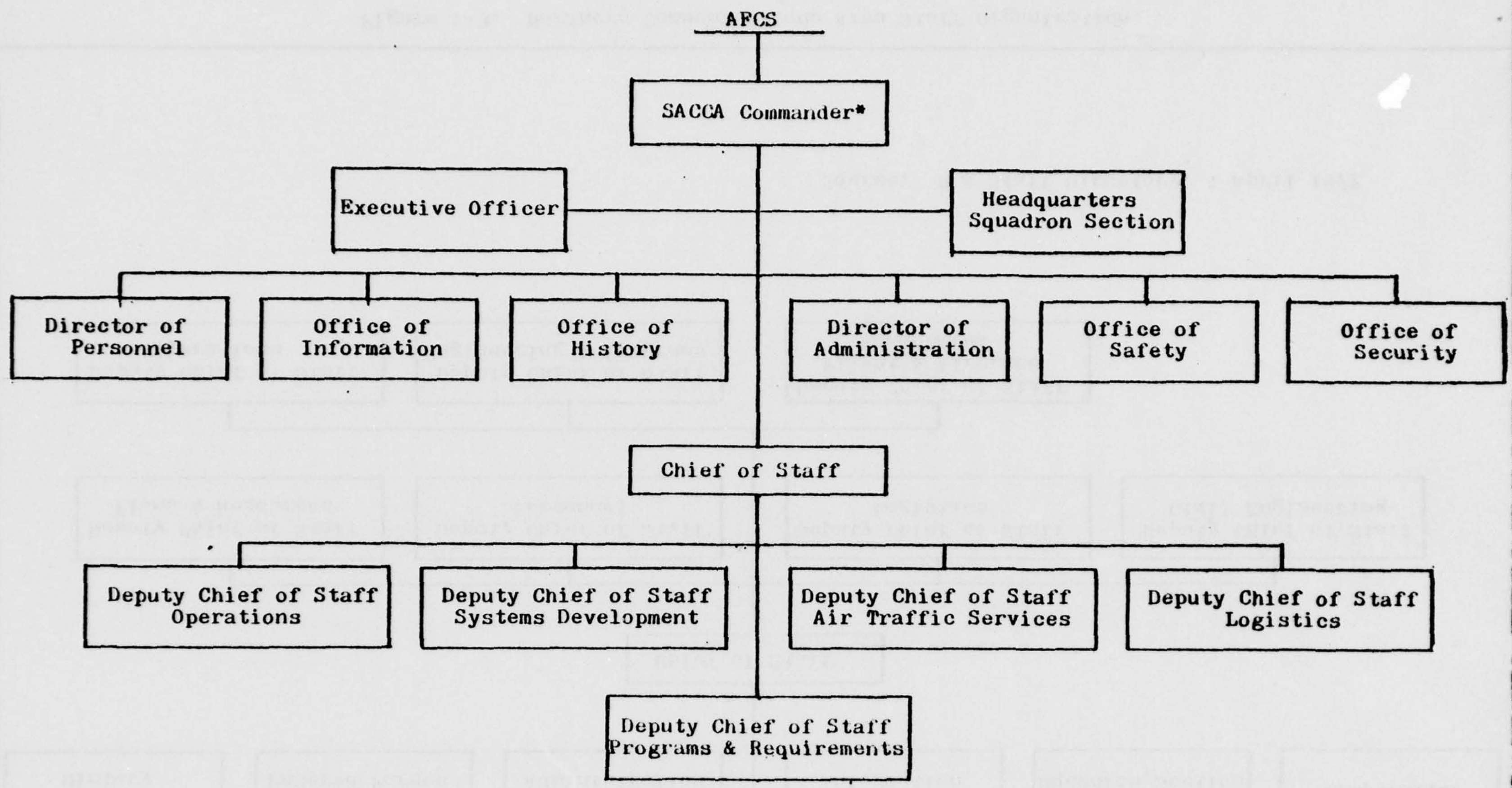
Source: AFCS Staff Directory, May 1976

Figure 1-2. AFCS Headquarters Staff Organization.



Source: NCA Staff Directory, 1 April 1977

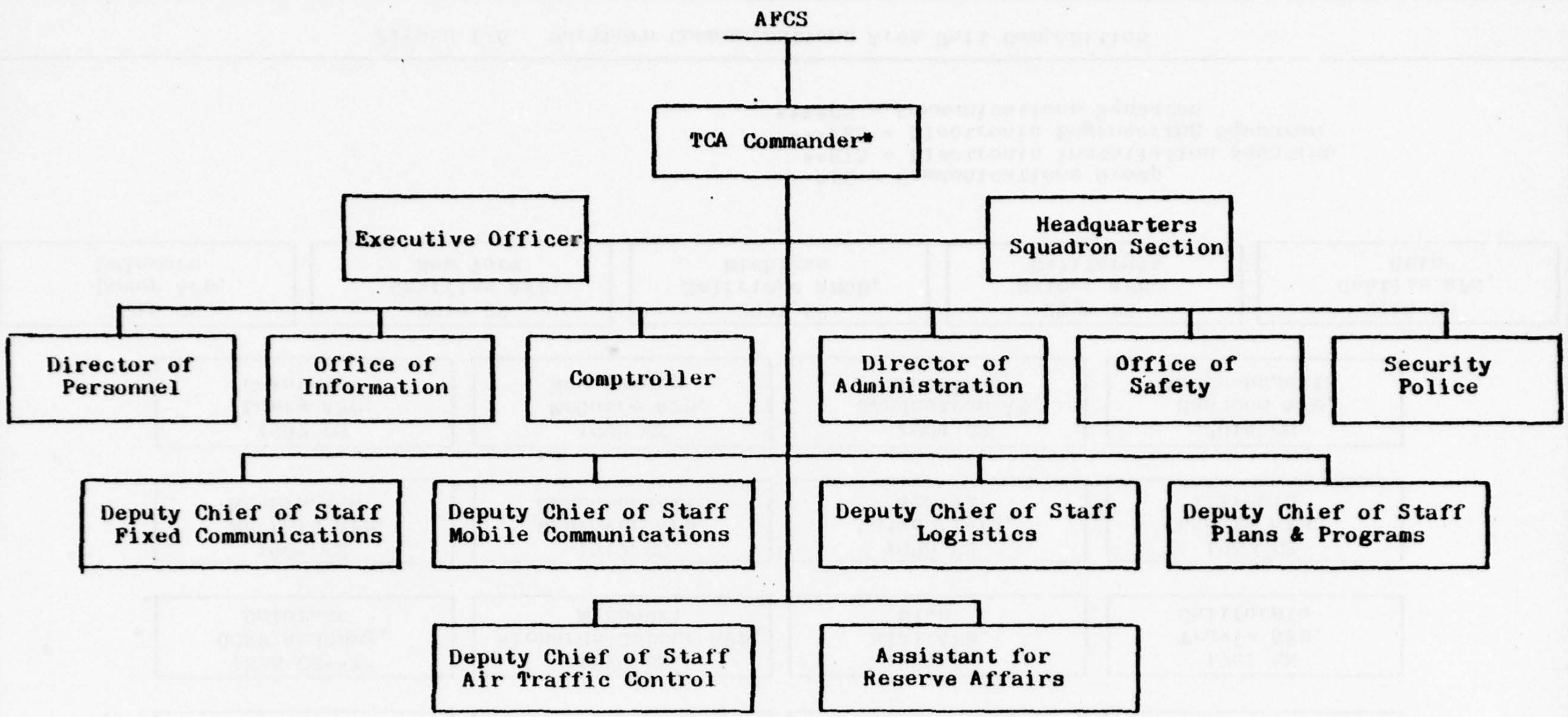
Figure 1-3. Northern Communications Area Staff Organization.



*SACCA Commander also serves as Strategic Air Command Director of Communications-Electronics.

Source: SACCA Staff Directory, Feb 1977

Figure 1-4. Strategic Air Command Communications Area Staff Organization.



*TCA Commander also serves as Tactical Air Command Deputy Chief of Staff/Communications-Electronics.

Source: TCA Staff Directory, 1 April 1977

Figure 1-5. Tactical Communications Area Staff Organization.

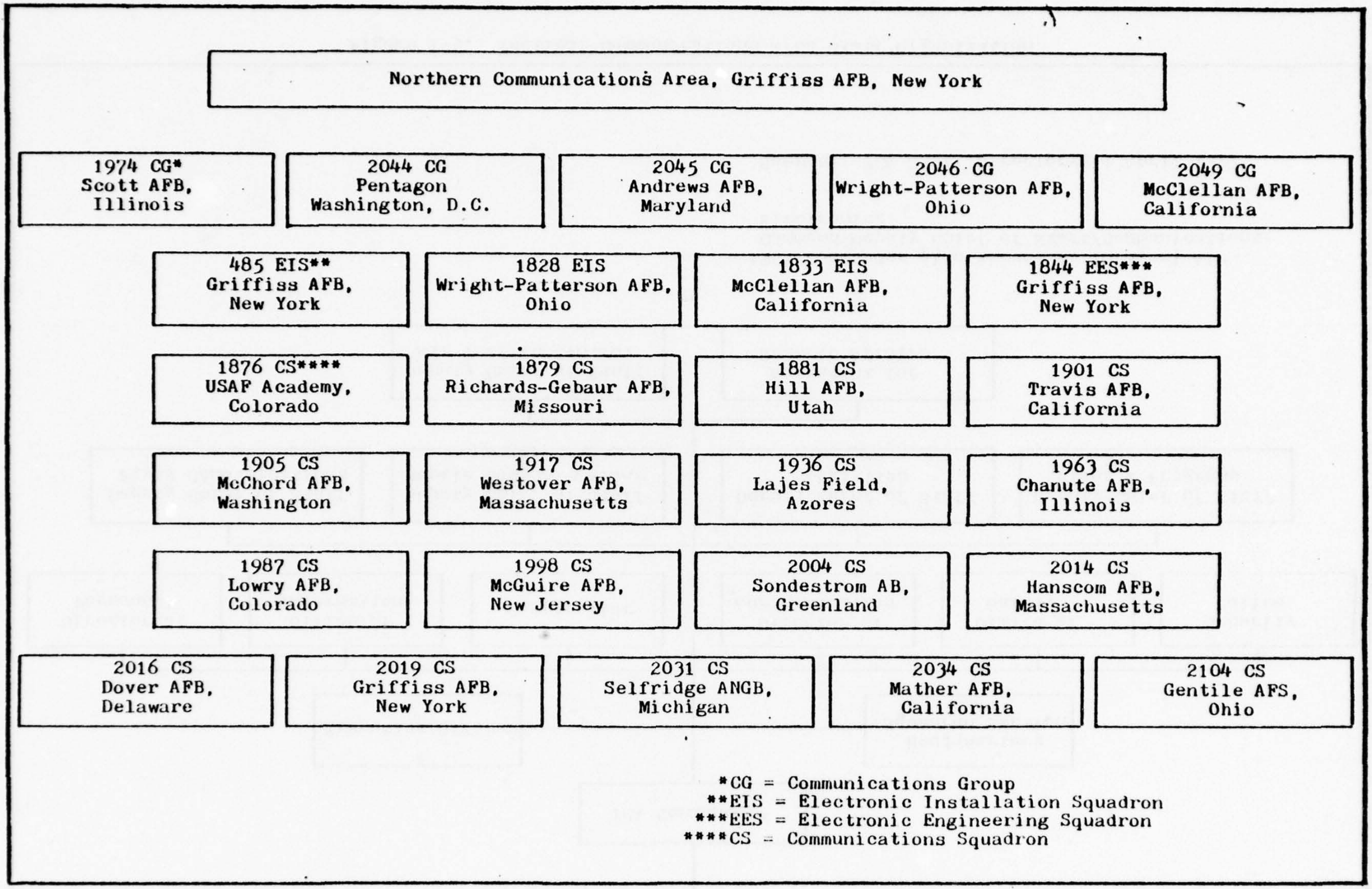


Figure 1-6. Northern Communications Area Unit Composition.

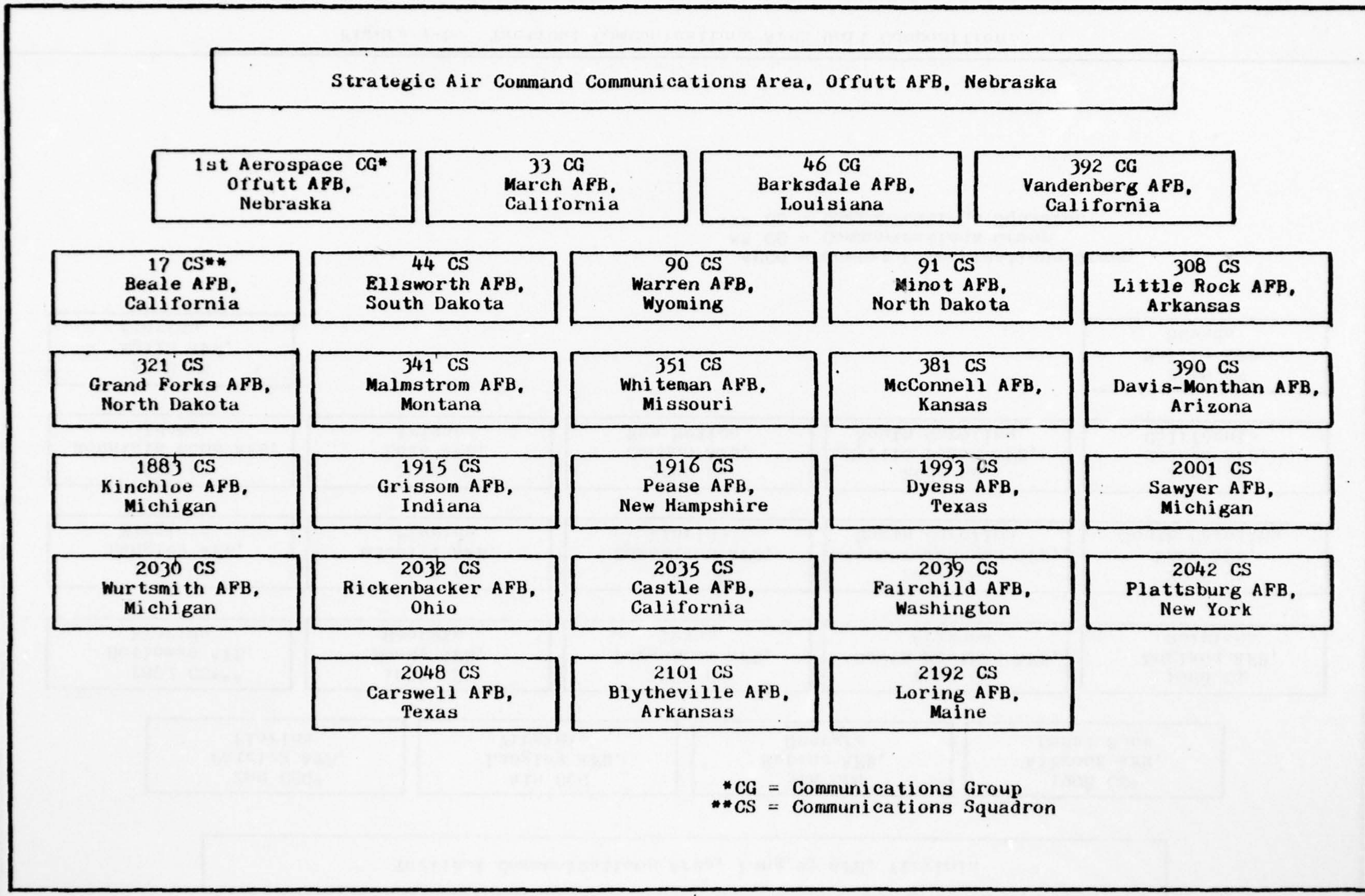


Figure 1-7. Strategic Air Command Communications Area Unit Composition.

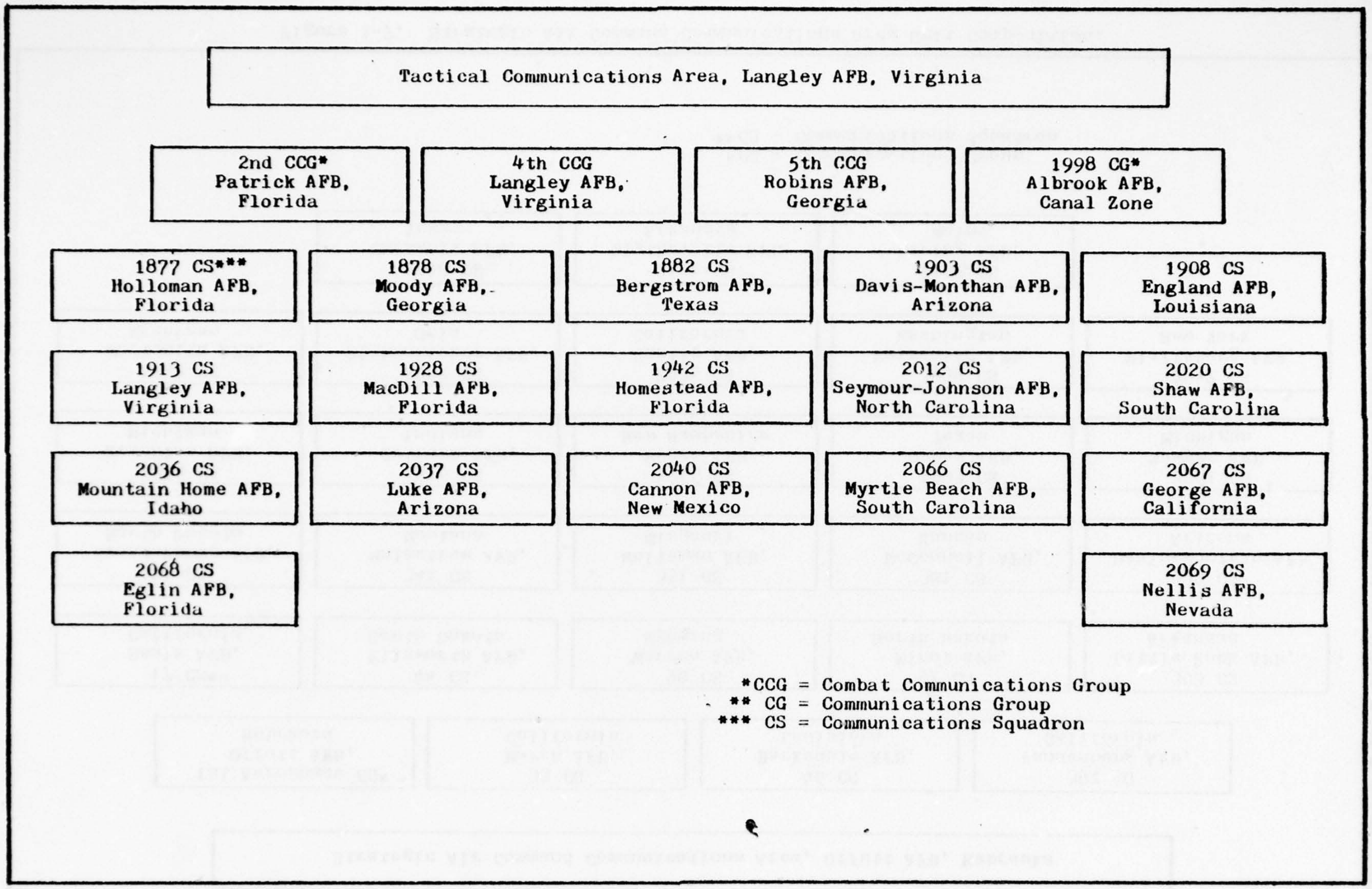


Figure 1-8. Tactical Communications Area Unit Composition.

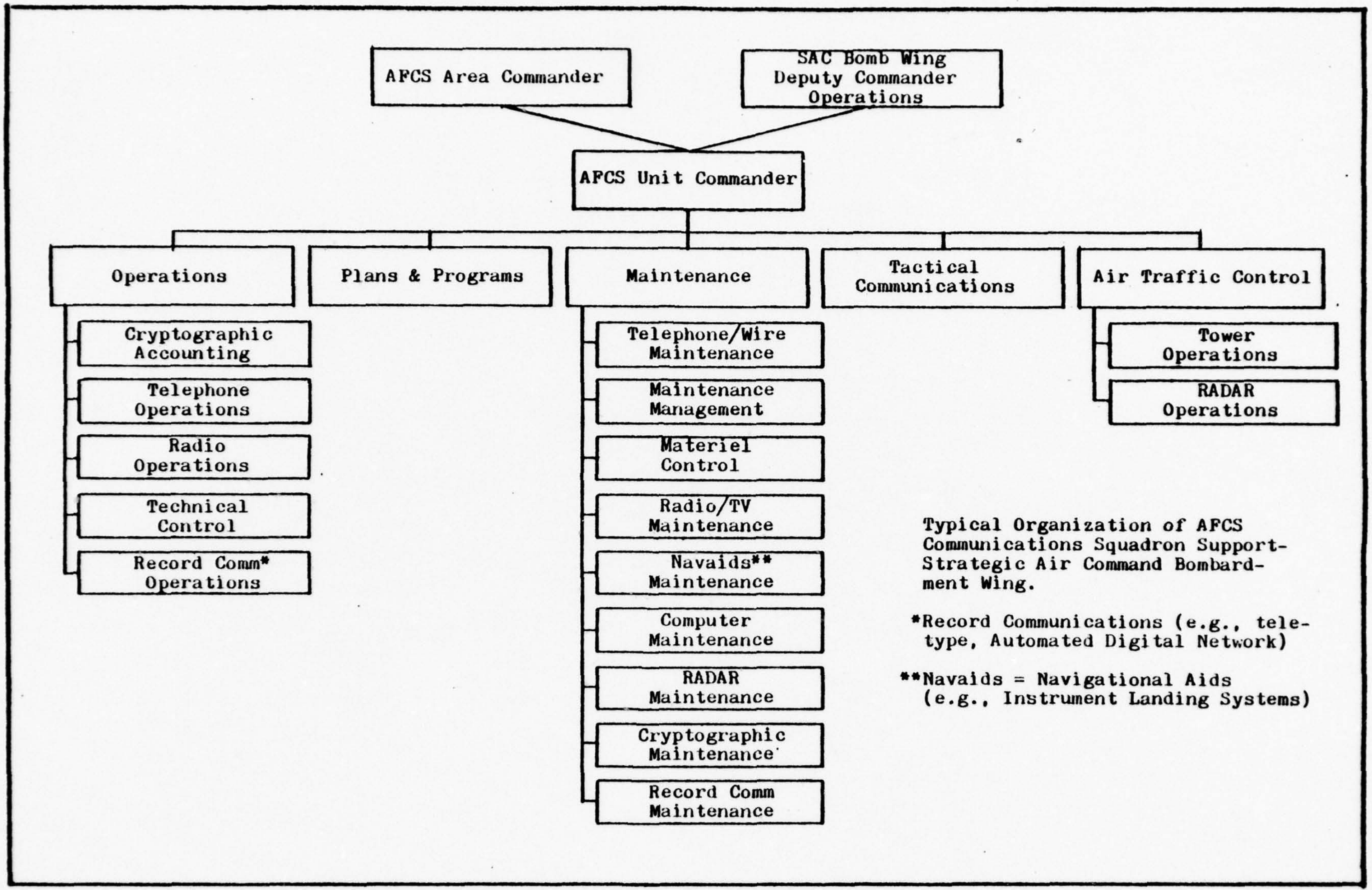


Figure 1-9. AFCS Squadron Organization.

Chapter II

MODELING HUMAN JUDGEMENT

It has been argued frequently and vehemently that human judgement is too complicated to predict with any real accuracy, and this might well prove true if one attempted to build a model for predicting the response of a particilar individual to non-specific external stimuli. Arguments citing the complexity of the human decision process appear to stem from several factors. First, the utilization of external stimuli, or cues, to arrive at decisions seems to be dependent upon numerous environmental, educational, and experiential behavior elements learned over time by every individual. Second, the process of decision-making, or judgement, is apparently not a purely intellectual one, or even an intellectual/emotional process alone. Judgement also seems to involve physiological dynamics, such as the individual's state of physical health, his diet, and a plethora of chemical/hormonal balances and imbalances. Finally, the human judgement process appears to incorporate varying degrees of intuition, ranging from nearly logical inferences to insights that are hardly short of incredible.

Despite the arguments against attempting to simulate or model the human judgement process, there are numerous authors who believe that this problem does not involve modeling the complex decision process itself, but only the manner in which humans use available information in making decisions. Consequently, the attention of many specialists (social scientists, in particular) has begun to focus on the process of integrating information for the purpose of predicting human judgement. In the opinion of some experts the real issues in simulating human judgement are the questions of what the individual does with available information and what he should be doing with that information. The first question involves the psychology of how individuals use information while the second question seems to be more practical, involving the attempt to make the decision process more efficient (Slovic & Lichtenstein, 1971, p. 652).

A number of mathematical models have been proposed for capturing human judgement policies. The model used in this study was the linear model suggested by Hoffman (1960), which is based, in turn, upon the lens model presented by Brunswick (1952). Without reiterating the details of the work of Hoffman and Brunswick, whose efforts are well-known in the field of psychology, let it suffice to say that the linear model is founded upon the notion that a judge's decisions represent linear combinations of the available stimuli, or cues.

Linear Regression Models

The work of Brunswick, Hoffman, and many others interested in modeling human judgement is based upon the process of fitting data to a linear equation through the method of least squares regression. The resulting equation is referred to as a regression model. It contains a criterion variable and one or more predictor variables in a linear combination described mathematically by coefficients which are derived through the least squares procedure. Given specified information cues, the criterion can be predicted from linear combinations of these cues by the following general regression equation:

$$Y = \beta_o + \beta_1 X_1 + \beta_2 X_2 + \beta_i X_i + \epsilon$$

where the coefficients (β_o, β_i, i = 1, 2, ..., k) are the parameters of the model and ϵ is an error term which accounts for any variance in Y not explained by the predictors (X_i) in the least squares regression. It should be noted that the term "linear" refers to linearity in the parameters of the regression model and not to the predictors; hence, a regression equation such as

$$Y = \beta_o + \beta_1 X_1 + \beta_2 X_2^2 + \epsilon$$

is a second-order (in X) linear (in the β's) regression model (Draper & Smith, 1966, p. 9).

In practice, it is not usually feasible to examine all possible occurrences of Y and X; therefore, statistical sampling is used to derive estimates of the actual parameters of the regression model. When judgement is represented by the linear regression model the estimates of the parameters thus derived, usually denoted as b_o, b_1, ..., b_k, are used to represent the relative importance given to each cue by the judge in arriving at his decision (Y) (Slovic & Lichtenstein, 1971, p. 659). Hoffman (1960) proposed an alternative index, which he called "relative weight", designed to better represent the importance placed on each cue by the judge. Relative weights are calculated from the parameters of the regression model and the squared multiple correlation coefficient (R^2) derived from the regression, as follows:

$$RW_{iY} = \frac{b_{iY} r_{iY}}{R_Y^2}$$

where RW_{iY} is the relative weight of the predictor X_i with respect to the decision Y (the regression model criterion variable), b_{iY} is the standardized regression coefficient (usually called the beta-weight) yielded by the least squares regression of Y with the predictor X_i, and r_{iY} is the intercorrelation coefficient between the predictor variable X_i and the decision Y. R_Y^2 is, as indicated above, the squared multiple correlation coefficient for the regression. This latter coefficient indicates the proportion of variance in the decision Y which is explained by the regression.

As will be seen later, the policy-capturing technique employed for this study involves the use of orthogonal (independent) predictors in the regression equation. In this special case, the intercorrelation coefficients and the beta-weights resulting from the regression are identical. The formula for calculating the relative weights of the predictors, therefore, reduces to:

$$RW_{iY} = \frac{(b_{iY})^2}{R_Y^2}$$

Examples of Linear Modeling Applications

There is considerable justification in the literature for use of the linear model as a predictor of decisions by human judges. Slovic and Lichtenstein (1971, p. 679) cite more than 30 studies where researchers have very successfully represented various judges' idiosyncratic weighting policies with linear models. Such studies are tremendously diverse in the judgemental tasks to which the linear model has been applied. The tasks include judgements about personality characteristics, performance in school or on the job, physical and mental pathology, legal decisions, and various gambles, such as attractiveness of common stocks. In some cases the cues supplied were artificial and the judges were unfamiliar with the task. An example of this is a study where college students were asked to judge the intelligence of their peers on the basis of grade point average, aptitude test scores, and other such cues (Knox & Hoffman, 1962). In other cases, studies were made of judgements in complex but familiar situations by skilled decision-makers who, in addition to the cues included in the prediction equation, had other information available to them. The following excerpt provides examples of such cases:

> "... Kort (1968) modeled judicial decisions in workmen's compensation cases using various facts from the cases as cues. Brown (1970) modeled caseworkers' suicide probability estimates for persons phoning a metropolitan suicide prevention center; the

cues were variables such as sex, age, suicide plan, etc., obtained from the telephone interview. And Dawes (1970) used a linear model to predict the ratings given applicants for graduate school by members of the admissions committee." (Slovic & Lichtenstein, 1971, p. 679)

Further Rationale for Use of Linear Decision Models

Information processing by humans in the face of uncertainty has long been a concern of psychologists and other social scientists. Many studies have been conducted which used various aspects of statistics as normative models in the investigation of human behavior. The philosophical basis for such studies is that man must often resort to use of equivocal or probabilistic information in making decisions about real world situations (Beach, 1967, p. 276). In other words, man must frequently make judgements regarding situations about which he has incomplete information.

In decisions involving uncertainty, man may not always be as good a judge as the model of man. For example, one study involved capturing the diagnostic policies of 29 clinical psychologists and forming a composite linear model of those policies. It was found that the composite model was nearly always more accurate than the individual human judges in drawing clinical inferences because of the elimination of a significant amount of the random error to which the individual clinicians were prone (Goldberg, 1970, p. 476). In another study, linear models were constructed of 80 university judges' policies for predicting graduate student grade point averages based on undergraduate grades, Graduate Record Examination scores, and other cues. These linear models were then used to forecast actual graduate grade point averages and the results were compared against first-hand predictions by the judges. In every case, the model proved superior to the judge from whom it was derived (Wiggins & Kohen, 1971, p. 105).

The results of the above studies and numerous others show clearly that the linear model is a powerful device for predicting quantitative judgements arrived at on the basis of specific cues; so much so, in fact, that many researchers seem to have concluded that the model is better at making decisions than the man being modeled. It seems reasonable to conclude, on the basis of this evidence, that the linear regression model might also be used as an effective analytical instrument for purposes such as the type of study described here.

Chapter III

RESEARCH METHODOLOGY

Identification of AFCS Goals

Since the objective of this study was to test for goal congruence it was necessary at the outset to identify a set of organizational goals which met several criteria, as follows: (1) the goals must be realistic, operative goals of the Command, (2) the goals must be unambiguous and reasonably independent of one another, and (3) the accomplishment of the goals must be measurable.

Four AFCS goals which met the above requirements were identified. First, AFCS strives to provide personnel support programs to maximize retention of its skilled technical personnel, to maintain high morale and esprit de corps, to minimize disciplinary and complaint rates, and to provide adequately for the welfare of the AFCS work force. Second, the Command seeks to maximize the quality of the service it provides to its customers. Third, compliance with AFCS directives is sought in this Command whose field units are widely separated and often far removed from supervising staffs. Finally, the Command seeks maximum effectiveness and efficiency in repair and preventative maintenance of the facilities for which it has responsibility.

Design of the Experimental Task

It was proposed in this study to employ a policy-capturing technique similar to that suggested by Christal

(1968b) and used by Harrell (1975) in his Air Training Command experiment. Accordingly, the above listed goals were translated into four predictor criteria for an experimental judgement task from which a linear model could be derived for each managerial entity to be tested.

Recalling the form of the basic linear regression model, and dealing henceforth only with the model applicable to the AFCS sample population, it would be well to address at this point the effect of independence in predictor criteria. The appropriate linear model for this study is

$$Y = b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + \epsilon$$

where X_1 through X_4 are the predictor variables translated from the selected AFCS goals, as follows:

X_1 = *Personnel Programs*

X_2 = Quality of Service

X_3 = Compliance

X_4 = Maintenance Quality

The intention, following Harrell's 1975 example, was to devise an experimental task where AFCS judges are asked to evaluate, on an eight point scale, the performance of hypothetical operating squadrons. Each decision case contains information about whether each predictor variable is rated satisfactory or unsatisfactory. Since there are four predictors (which may be referred to as unit performance criteria) and only two states for each criterion (satisfactory or unsatisfactory), there are $2^4 = 16$ possible combinations to consider; hence, each selected AFCS judge was asked to rate the performance of 16 hypothetical squadrons.

The use of satisfactory/unsatisfactory values for the judgement cues consigns the researcher's model to special status, since the sixteen decision tasks can each be represented by a mathematically orthogonal vector. This assures that the predictors themselves will be uncorrelated in the regression, which in turn provides that the "usefulness" of the performance criteria in arriving at the performance evaluation is strictly measured by the intercorrelation between each performance criterion and the decision (Darlington, 1968, p. 162). In other words, each of the sixteen evaluations made by the experimental subject is strictly characterized by the numerical value (1, 2, ..., 8) of his evaluation and one of sixteen orthogonal predictor vectors, each of which represents a unique performance state. It is thus quite simple to determine the importance the subject places on each of the four performance criteria.

Figure 3-1 clearly illustrates the orthogonality of the sixteen decision cases represented by assignment of ratings of S or U to a set of four decision criteria. Each of the digital equivalents of the sixteen cases can be read directly into the regression algorithm as a unique predictor vector.

The data collection instrument used for this study is

Case Number	Criterion Ratings	Predictor Vectors
1	U U U U	0 0 0 0
2	S U U U	1 0 0 0
3	U S U U	0 1 0 0
4	S S U U	1 1 0 0
5	U U S U	0 0 1 0
6	S U S U	1 0 1 0
7	U S S U	0 1 1 0
8	S S S U	1 1 1 0
9	U U U S	0 0 0 1
10	S U U S	1 0 0 1
11	U S U S	0 1 0 1
12	S S U S	1 1 0 1
13	U U S S	0 0 1 1
14	S U S S	1 0 1 1
15	U S S S	0 1 1 1
16	S S S S	1 1 1 1

Figure 3-1. Orthogonal Predictor Vectors Associated With Ratings of S or U for a Set of Four Decision Criteria.

presented in Appendix B. The sixteen cases were randomly arranged in the exercise booklet by assigning an arbitrarily selected random number from a random number table to each case, with the cases listed as shown in Figure 3-1, then sequentially listing the random numbers and the cases associated with each number.

Collection of the Experimental Data

In agreement with AFCS, the researcher chose middle management personnel at the Command headquarters, Northern Communications Area (NCA), Strategic Air Command Communications Area (SACCA), Tactical Communications Area (TCA), and the operating units under each Area for participation in this experiment. Middle managers were defined as Air Force officers in the grades of lieutenant through lieutenant colonel and civilian managers in the grades GS-9 through GS-13. It is this management segment which is largest in number and which has the greatest responsibility for insuring that AFCS organizational goals are met.

A sample of 80 managers was selected at each headquarters except TCA, where the entire population of 63 middle managers was asked to participate. The experimental exercises were delivered personally by the author to each of the Areas and to the Command headquarters. A project officer was designated at each of these agencies to collect the completed instruments and return them by mail to the author.

A total of 360 operating unit personnel was selected to participate in the exercise. These subjects received the experimental exercise by mail and were asked to return the completed instruments in self-addressed envelops provided for that purpose. A lower response rate was anticipated for the operating units because of the requirement to mail the data collection instruments; hence, a slightly higher proportion of potential subjects was selected from each of these populations than from those of the headquarters staffs.

The randomness of subject selection from each population was assured by the following process:

a. The AFCS Deputy Chief of Staff/Personnel prepared computer listings of middle managers assigned to the Command headquarters and each of the three Areas. Similarly, lists were generated which contained the names of management personnel assigned to the operating units, grouped by Area. Thus, a total of seven separate listings was created.

b. For each of the seven listings provided a random number was chosen from a random number table by arbitrary prior selection of a line and column number (e.g., line 54, column 12). This yielded a 5-digit random number from which, also by prior arbitrary choice, a two-digit number was selected (e.g., first two digits, last two digits, middle two digits). The two-digit number thus selected was used as the starting point on the personnel listing and from that point every nth person was selected, n being equal to the total number on the list divided by the desired sample size.

Selections were continued by counting on through the top of the list as necessary.

Coding of Collected Data

When the completed data collection instruments were returned, the information from each one was coded onto a standard IBM card. Figure 3-2 shows the card format and variable names used for the data base. The demographic data for each judge were collected for use in a separate but related research effort being conducted simultaneously with this study. The name of the subject was recorded in the data base only if he requested an analysis of his performance in the exercise, which was offered as an incentive to increase the return rate. An example of the feedback provided to those requesting it is presented in Appendix C.

Restructuring the Data for Regression Analysis

Each coded data card contained the numerical values (1, 2, ..., 8) for every unit evaluation made by the subject, but did not contain the predictor vector associated with each of the 16 decisions. Also, the 16 evaluations were coded on the cards in a horizontal format, and the CDC 6600 computer regression algorithm available to the researcher requires that the regression variables be read in line by line. Therefore, it was necessary to restructure the data for regression analysis. To accomplish this, a FORTRAN program was prepared which reads the numerical values for the 16 decisions coded on each card and creates

Card Columns

1	2	3 4	5 6	7	8 9 10 11	12 13 14	15 16	17 18	19	20	21	22	23	24	25
STATUS	GRADE	DØRYR	DØRMØ	HDQ	UNIT	ØFFSYM	ASGNYR	ASGNMØ	PME	CESTAFF	PRMAJCØM	PRLVL	EDLVL	EDFLD	ANRQ

Card Columns

26 thru 41	42	43 44	45 thru 70
EVAL	UNDES	BØØKNR	NAME

Figure 3-2. Key to Coding of Exercise Data on Data Cards. Alpha or numeric values for each variable were entered exactly as coded by the experimental subject. The variable EVAL in columns 26-41 is the numerical value (1, 2, 3, ..., 8) of the 16 unit performance evaluations provided by the subject. Subject's name was entered only when he had requested an analysis of his performance in the experiment.

an n x 5 matrix for storage of each decision and its respective predictor vector, n being 16 times the number of subjects responding. The program adds the appropriate predictor vector to each evaluation, then stores the entire matrix thus created, along with all the demographic data for each subject, in a computer disk file. This disk file is then attached by the regression program as required. The FORTRAN program was prepared by Major C.W. McNichols, a professor in the AFIT Systems Management Department, and has general application possibilities for other studies of this nature.

Additional Data Collected

In addition to the 663 data collection instruments distributed to AFCS middle managers, the senior managers of the Command were also requested to provide an input to this study. The AFCS Chief of Staff and each of seven deputy chiefs of staff was requested to provide the researcher with the weight he felt should be given to each of the four performance criteria in evaluating AFCS units. This was accomplished by asking each senior manager to divide 100 points between the four criteria. Then, each of these senior executives was asked to complete the performance evaluation task in the same manner as all other subjects. The objective of this request was to provide a means for comparing the perceived and actual importance assigned to the performance criteria by the most senior managers of the Command with like data calculated from the responses of the middle managers. An example of the explanatory letter sent to each senior manager is contained in Appendix B. Precautions were taken to protect the privacy of the senior respondents to this request, as shown in the sample explanatory letter.

Analysis of the Experimental Data

The analysis medium used for this study was the Aeronautical Systems Division (ASD) CDC 6600 computer, employing the Statistical Package for the Social Sciences (SPSS) multivariate regression algorithm (Nie, et al., 1975). Also, a number of FORTRAN programs were written by the author to facilitate use of the data output from the SPSS regression runs. A program was written to calculate the relative weights of the predictors in every regression and to compute the F-test value for comparing the regression models in each composite run. Another program was written to select data from the disk file and prepare the individual analyses for subjects requesting such analysis. Finally, the author modified another program, written by Major C. W. McNichols, to calculate the relative weights and multiple correlation coefficient for every respondent to the experimental exercise.

The SPSS regression algorithm is extremely flexible, providing several types of regression, tests for significance, and various statistics. The data for this study were subjected to step-wise regression in every case, and in every regression the evaluation variable (the subject's evaluation of unit performance) was regressed on X_1 through

X_4 (the unit performance criteria, listed in the order presented earlier). Appendix D contains examples of the SPSS regression program used and typical outputs from the regression runs completed for this study. A total of 28 separate regression models was generated in analyzing the data for this study, but this was easily accomplished with the useful selection features of the SPSS algorithm.

To assure generation of all the models required to address the basic research question, the matrix shown in Figure 3-3 was developed. The numbers along the horizontal and vertical sides of the matrix represent the 9 different regression groups listed at the bottom of the figure. A regression model was generated for every non-zero element in the matrix. Where a non-zero element appears at the intersection of like-numbered rows and columns, the associated regression run included only members of that one group. All other non-zero elements indicate composite groups included in the regression run. It is necessary to regress two groups together only once; therefore, there are no reversals indicated in the matrix (i.e., all elements below the diagonal are zero).

Testing for Statistical Differences Between Models

Each of the 28 regressions indicated above produced a model which was used to determine whether a statistically significant difference exists between two or more groups of AFCS managers. A statistically significant difference would indicate that the regression coefficients represent different

	1	2	3	4	5	6	7	8	9
1	x	0	0	0	0	0	0	0	0
2	0	x	x	x	x	x	x	x	x
3	0	0	x	x	x	x	x	0	0
4	0	0	0	x	x	x	0	x	0
5	0	0	0	0	x	x	0	0	x
6	0	0	0	0	0	x	0	0	0
7	0	0	0	0	0	0	x	x	x
8	0	0	0	0	0	0	0	x	x
9	0	0	0	0	0	0	0	0	x

Regression Group	Unit
1	All Respondents
2	AFCS Headquarters
3	NCA Headquarters
4	SACCA Headquarters
5	TCA Headquarters
6	Combined Operating Units
7	NCA Units
8	SACCA Units
9	TCA Units

Figure 3-3. Regression Run Plan. All non-zero entries indicate requirements for an SPSS regression run involving the groups identified by the row/column intersection.

populations and, therefore, that the importance given to the performance criteria by at least one group in the comparison is significantly different from the others. The F-test used for comparisons in this study is described by G. C. Chow (1960, p. 599). The null hypothesis tested in each comparison is that there is no significant difference in the regression coefficients of the models being compared. The alternate hypothesis is that there is at least one model among those being compared whose regression coefficients are significantly different from the others. In other words, statistically different populations are involved. Rejection of the null hypothesis, for purposes of this study, is tantamount to stating that there are significant differences in the goals of the groups being compared. The level of significance used for all F-tests applied for this study was 0.05. The method of calculating the observation F value for testing the null hypothesis is shown in Appendix E.

Significance of R^2 in Orthogonal Predictor Models

One further aspect of models having orthogonal predictors is important to this study, and that is the significance of R^2, the squared multiple correlation coefficient for the regression. If a regression equation is generated for each individual judge making the same decision, using the same information cues, such an equation expresses completely the policy of that judge (Christal, 1968a, p. 26). Computation of the R^2 for each such model is then an effective measure of the prediction efficiency of the judge, since variations about the predicted value of the decision variable are largely due to inconsistencies in application of the judge's policy.

When the predictors are uncorrelated, as in the case of the models used for this study, the value of R^2 can actually be viewed as a measure of the judge's consistency in applying his established weights to the predictors in making his 16 evaluations. This notion can be extended to models representing larger groups also, but it becomes relatively more obscure as judges are clustered together, for the following two reasons: (1) a greater number of random errors is introduced in larger groups of judges, and (2) each judge may be very consistent in applying his own policy, but the composite group may not reflect the same degree of consistency as the individual judges (will not, in fact).

The notion of using R^2 as a measure of rater consistency was important for evaluating the AFCS senior manager contributions to this study, and to providing feedback to those experimental subjects who requested it.

Chapter IV

RESULTS OF THE EXPERIMENT

AFCS Response to the Experiment

As shown in Table 4-1, of a total of 671 experimental exercises distributed to AFCS managers 520 usable completed exercises were returned for analysis, resulting in an overall response rate of 77.5%. As anticipated, the response rates among the operating units was somewhat lower than in the several headquarters agencies, where managers were concentrated in larger numbers and could be reached directly rather than requiring mail distribution of the exercise.

Managers contacted directly during this experiment almost invariably expressed keen interest in the research. There were also numerous expressions of interest in the form of written comments and suggestions which were returned with the exercises. The high interest of the Command is most notably reflected, however, in the 349 requests for analyses of individual performance in the exercise, a total which constitutes 68% of the exercise respondents.

Senior Manager Results

The seven returns from AFCS senior managers were subjected to separate step-wise regressions, then grouped together in a composite regression run. The results are displayed in Table 4-2.

The senior managers were extremely consistent in applying their individual evaluation policies, as evidenced

Table 4-1. Experimental Exercise Distribution and Response Rates.

Management Group	Number of Exercises Distributed	Number of Usable Returns	Response Rate
Senior Staff	8	7	87.5%
Hq AFCS	80	70	87.5%
Hq NCA	80	62	77.5%
Hq SACCA	80	69	86.25%
Hq TCA	63	58	92.06%
NCA Units	134	102	76.12%
SACCA Units	119	85	71.43%
TCA Units	107	67	62.62%
Total	671	520	77.5%

by the mean R^2 of 0.91366; however, it is apparent that there are some significant differences in the policies of these senior executives. One senior manager (Number 1) placed 42% of his evaluation emphasis on the Compliance factor. Another (Number 5) weighted the Quality of Service factor at only 21%. These two findings are unusual, for AFCS managers who participated in the experiment generally rated the Quality of Service factor far higher than any other, while the Compliance factor was generally rated quite low (10-14%)

Another interesting aspect of the senior manager analysis is the comparison of the weights each manager indicated he believed <u>should</u> be applied to the predictors versus the weights he actually used in his unit evaluations. Of the five senior managers who submitted their perceived weights for the predictors, only one (Number 2) actually came close to applying those indicated weights. In most cases, the Quality of Service motive received significantly higher consideration in the exercise than the executives indicated they felt this factor should receive. This, of course, resulted in compensating differences in the weights given to the remaining predictors. This tendency to apply different weights than those specified seems to indicate that a valid comparison has been made between the stated and operative goals of senior AFCS executives, serving to demonstrate how the "do as I say, not as I do" syndrome can arise. There appears to be little question that the goals used by senior AFCS executives to formulate Command policy can represent

Table 4-2. Senior Manager Analysis Results.

Senior Manager	Predictor	Beta Weight	Relative Weight	Perceived Weight	R^2
1	Personnel	.3077935	.10	--	.90526
	Service	.5129892	.29	--	
	Compliance	.6155870	.42	--	
	Maintenance	.4103913	.19	--	
2	Personnel	.5013947	.25	.25	.98771
	Service	.5682473	.33	.30	
	Compliance	.3008368	.09	.15	
	Maintenance	.5682473	.33	.30	
3	Personnel	.2961898	.09	.20	.97228
	Service	.7290826	.55	.35	
	Compliance	.3189736	.10	.20	
	Maintenance	.5012443	.26	.25	
4	Personnel	.4708236	.25	.20	.87094
	Service	.6591531	.50	.35	
	Compliance	.2197177	.06	.10	
	Maintenance	.4080471	.19	.35	
5	Personnel	.5178575	.28	.25	.95828
	Service	.4488098	.21	.25	
	Compliance	.3797622	.15	.20	
	Maintenance	.5869052	.36	.30	
6	Personnel	.1627577	.03	--	.82781
	Service	.7324096	.65	--	
	Compliance	.1627577	.03	--	
	Maintenance	.4882731	.29	--	
7	Personnel	.4160030	.20	.25	.87335
	Service	.7334790	.62	.28	
	Compliance	.2408438	.06	.22	
	Maintenance	.3229497	.12	.25	
All	Personnel	.3823280	.18	N/A	.82683
	Service	.6111227	.45	N/A	
	Compliance	.3006694	.11	N/A	
	Maintenance	.4656031	.26	N/A	

Consistency Index (Average R^2): 0.91366 a significant departure from the stated goals of such managers. The next question which comes to mind is: How well are the actual (operative) goals of these executives understood and supported by their subordinates and by units subordinate to the Command headquarters?

Results of the Main Data Base Analysis

The answer to the above question lies in the analysis of responses from the AFCS middle managers. The main body of the computation results is contained in Appendix F. This Appendix shows the relative weights computed for each group of AFCS managers, the beta-weights for each regression, the regression R^2 and residual sum of squares and, finally, the observed F value for testing goal congruence between the groups in each regression. Table 4-3 presents a summary of analytical results for middle managers similar to that provided earlier for senior manager results. All managerial groups in Table 4-3 and subsequent tables have been referred to by numerical designators. Identification of the groups is considered proprietary information and is not considered necessary to understanding of this report. Should the reader deem it essential to know such details, he should contact AFCS/OA, Richards-Gebaur AFB, Missouri 64030.

A superficial perusal of the middle management analysis results reveals what could be taken as striking similarities between the seven groups of managers. For example, four of the seven groups weighted the Quality of Service factor at exactly the same value (0.49). Similarly, the

Table 4-3. Middle Manager Analysis Results.

Management Group	Predictor	Beta Weight	Relative Weight	R^2
1	Personnel	.3534649	.16	.76104
	Service	.6076846	.49	
	Compliance	.2792534	.10	
	Maintenance	.4346199	.25	
2	Personnel	.3576236	.18	.72728
	Service	.5643008	.44	
	Compliance	.3332323	.15	
	Maintenance	.4121910	.23	
3	Personnel	.3302284	.14	.77875
	Service	.6301606	.51	
	Compliance	.3140704	.13	
	Maintenance	.4170775	.22	
4	Personnel	.3616129	.17	.77501
	Service	.6173115	.49	
	Compliance	.3252636	.14	
	Maintenance	.3967088	.22	
5	Personnel	.3221150	.14	.74185
	Service	.6039127	.49	
	Compliance	.3106724	.13	
	Maintenance	.4205441	.24	
6	Personnel	.2904820	.11	.77785
	Service	.6180874	.49	
	Compliance	.3445501	.15	
	Maintenance	.4390004	.25	
7	Personnel	.3044796	.12	.76711
	Service	.6241570	.51	
	Compliance	.3474526	.16	
	Maintenance	.4040994	.21	
All Subjects	Personnel	.3282215	.14	.75832
	Service	.6095076	.49	
	Compliance	.3212979	.14	
	Maintenance	.4193588	.23	

Consistency Index (Average R^2): 0.89016 rank ordering of the four performance criteria is the same for six of the seven groups, the single exception being Group 6 managers, who placed relatively more weight on the Compliance factor than did the other groups. The rank ordering in all groups except Group 6 was as follows:

X2 (Quality of Service)
X4 (Maintenance Quality)
X1 (Personnel Programs)
X3 (Compliance)

For the Group 6 managers, the Compliance and Personnel criteria were interchanged.

The relatively lower R^2 value for these groups compared with the individual R^2 of each of the senior managers is readily explainable. Each manager applies his own evaluation policy with a fairly high degree of consistency; however, when a number of individuals is taken as a composite group, the apparent decision consistency is decreased due to differences in individual evaluation policies. This is proven by averaging the individual consistencies of all respondents and comparing this averaged R^2 with the R^2 of the combined regression runs. As shown in Table 4-3, the consistency index for all 513 middle manager respondents was 0.89016. The R^2 of the respondents combined as a group was 0.75832. These findings are consistent with those from the senior managers, whose group R^2 was 0.82683 while the individual averaged R^2, or consistency index, was 0.91366.

This first, rather cursory glance at the analysis findings seems to suggest a rather marked, Command-wide homogeneity in the decision behavior of AFCS managers; however, the real test of this apparent agreement lies in a more rigorous comparison of the managerial groups.

F-Test Results

Employing the test detailed in Appendix E, appropriate groups of middle management unit evaluations were compared to determine whether any such groups represented decisions by statistically different populations. As Appendix E shows, the F-Test value is calculated using the residual sums of squares of all regression models in the comparison. The observed F value thus calculated is compared against the appropriate value for a standard F distribution, at the chosen level of significance, to decide whether or not to reject the null hypothesis that all compared models have statistically similar regression coefficients. Table 4-4 shows the AFCS management groups thus compared, the number of decisions (N) made by each composite group, the appropriate F values, and an indication of whether or not the null hypothesis was rejected in each case. Figure 4-1 is a more graphic portrayal of the F-Test results. The solid lines in this figure are intended to indicate connections between statistically similar populations, whereas the broken lines between groups suggest differences in the goals of the groups thus connected.

Although there are more rejections of the null hypothesis than there are acceptances, it was considered possible that each group might simply be optimizing its own

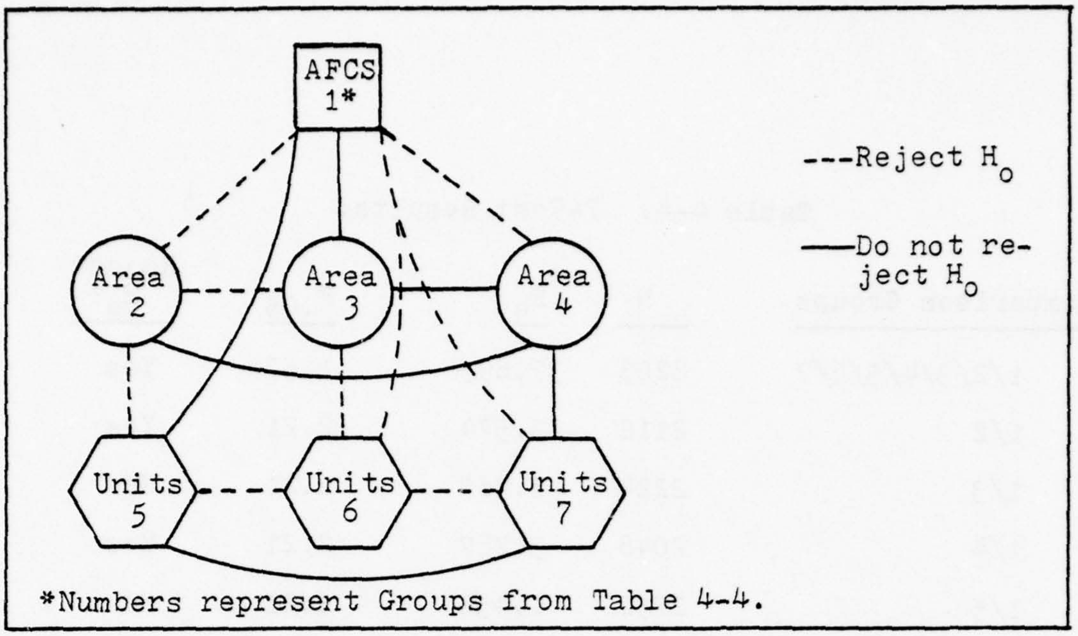


Figure 4-1. Graphic Depiction of F-Test Results.

slightly different goals to the same general effect. That is, while the goals being considered in the managerial decision process might be somewhat different for each group, the decisions reached might still reflect the general policy of the Command as a whole. To test this hypothesis, it was necessary to establish a Command standard for evaluating individual groups. Accordingly, it was reasoned that the average weights used by the senior executives of the Command in making identical decisions could be used as comparative bases for determining whether the decisions of AFCS middle managers represent the interests of the Command. This seems natural and defensible, since the senior staff officers in the Command headquarters are the de jure policy-setters for AFCS.

Table 4-4. F-Test Results.

Comparison Groups	N	F_o	$F_{.05}$	Reject H_o?
1/2/3/4/5/6/7	8208	37.895	1.57	Yes
1/2	2112	3.574	2.21	Yes
1/3	2224	1.387	2.21	No
1/4	2048	3.287	2.21	Yes
1/5	2752	1.452	2.21	No
1/6	2480	4.658	2.21	Yes
1/7	2192	4.826	2.21	Yes
2/3	2096	3.439	2.21	Yes
2/4	1920	1.819	2.21	No
2/5	2624	3.138	2.21	Yes
3/4	2032	1.712	2.21	No
3/6	2464	2.682	2.21	Yes
4/7	2000	1.947	2.21	No
5/6	2992	2.762	2.21	Yes
5/7	2704	1.323	2.21	No
6/7	2432	3.518	2.21	Yes

Further Decision Comparisons

The Student t-Test described by Speigel (1975, p. 215) and by Freund (1971, pp. 317-318) was used to test the null hypothesis that the 16 evaluations made by each of the various AFCS management groups represented the same decisions as like evaluations made by the senior AFCS staff. This hypothesis, of course, was tested against the alternate hypothesis that the 16 decisions of each group were not the same as those made by the senior staff; thus, a two-tailed test was indicated, and a 0.05 level of significance was used. The formula for calculating the observed t value for each decision is as follows:

$$t_o = \frac{\overline{X}_i - c_i}{s_i/(n)^{\frac{1}{2}}}$$

where $\overline{X}_i$ is the mean of hypothetical unit evaluation i (i = 1,2,...,16) calculated for all members of a given group, c_i is the mean of the same evaluation calculated from the seven senior manager responses, s_i is the standard deviation of the group evaluation being tested, and n is the number of respondents in the group sample.

It was realized that there are philosophical arguments against this approach, since obviously all seven senior managers did not precisely agree as to the goals of AFCS. This means, of course, that there is a statistical distribution involved in the senior manager decisions. Nonetheless, it was reasoned that these seven senior executives constitute a substantial majority of the policy-setting body of the Command; therefore, the mean of each of their 16 evaluations was viewed as a population parameter, rather than an estimate, against which to compare the means of like decisions by any given subordinate group.

Appendix G contains the actual t-Test scores calculated for each middle management group; however, the comparison results have been summarized in Table 4-5. This Table shows that the Command senior executives and various middle management groups agree on as few as 8 to as many as 12 of the 16 evaluations.

Table 4-5. t-Test Results

Middle Management Group	Number of Decisions Agreeing With Senior Staff	Percentage Of Agreement
1	12	75%
2	11	68.75%
3	12	75%
4	8	50%
5	12	75%
6	10	62.5%
7	11	68.5%

Sensitivity of the Regression Model

As a final note on the experimental results, the sensitivity of the linear regression model was tested by varying the values of a single evaluation in one model through several regression runs. It was found that this resulted in extreme differences in the multiple correlation coefficient. For example, the regression intially produced an R^2 value of 0.82781 with decision number 12 being valued at 1.0. When this decision value was changed full range to 8.0, the regression R^2 was reduced to 0.21579. Intermediate values in the range of the same decision resulted in corresponding R^2 variances; hence, the model is extremely sensitive to changes in the rating policy of the evaluator.

Chapter V

SUMMARY AND CONCLUSIONS

Summary

The Air Force Communications Service is a large, widely dispersed Air Force support organization with complex intracommand managerial interfaces. Such an organization inevitably has the potential for difficulty in communicating the goals and policies of its highest executives through its several managerial echelons to those who do the work of the Command. This research effort was initiated as an attempt to determine how successful the communication of Command goals is within AFCS. In other words, the research was intended to address the specific question of whether or not goal congruence exists among the various AFCS management levels.

The study methodology is a logical follow-on to the work of many contemporary social scientists who have used linear regression models to capture individual policy and predict human judgement. In this study, however, the linear model is used as an analytical instrument rather than a predictive one, in a manner similar to that used by Harrell (1975). The technique involves the use of controlled predictor variables as information cues for the experimental subject to employ in making decisions. In this study the predictors were cues related to four familiar operative goals of AFCS, as perceived by the researcher and agreed upon by the AFCS headquarters staff (See Appendix A). Each participant in the field experiment was asked to use the cues provided him to evaluate the performance of 16 hypothetical AFCS squadrons. The evaluations thus provided by 513 AFCS middle managers, along with responses from seven of eight senior AFCS staff officers, were subjected to step-wise multivariate regression analysis, the data being grouped by management level and by unit within each level.

The results of the regression analysis, which provided eight separate linear regression models, were then compared to determine whether or not the unit evaluations of the various management groups were statistically different. It was found that goal congruence existed in five of the fifteen comparisons made. In comparisons between command levels, agreement was found between one of the three Areas and the Command headquarters and between the operating units of another Area and AFCS headquarters. Similarly, the operating units of only one Area were found to be in agreement with the Area headquarters.

To analyze the significance of these differences between command levels, a further test was made to determine whether the various management groups might be emphasizing different goals, but still making decisions compatible with those of the senior executives of the Command. It was found that the decisions of the subordinate groups of managers were compatible with those of the Command's senior managers in 50% to 75% of the decisions made.

A rather surprising outcome of the analysis was the relatively greater importance placed on Compliance by the operating units vis-a-vis the Command headquarters. The intermediate headquarters staffs (Areas) also emphasized Compliance more than the Command headquarters, but less than the operating units.

One analytical result which AFCS should find very satisfying is the pervasiveness of the Service goal among its managers. While it is one thing to dictate the goals of an organization, it is quite another thing to find a single goal to be as powerfully operative throughout an organization as is the goal of service to the customer among AFCS middle managers. In every group studied the Service goal was by far the most important consideration in the management decisions made.

Conclusions

The following conclusions were arrived at after analysis of the experimental data:

a. There are significant differences in the goals emphasized by AFCS middle managers at different levels of that segment of the Command which participated in this study. As a result of these differences, it appears that the various groups of AFCS middle managers would make decisions that were different from those reached by the senior managers of the Command about 25% to 50% of the time.

b. The linear regression model is an effective analytical device for organizational studies involving goals and decision making. It is believed, on the basis of the author's literature review, that this is the first research effort where the techniques of linear modeling have been used to capture the decision policies of a multilevel organization, or to test for goal congruence between organizational levels. It appears that this useful research technique might have wide application in many types of organizational analysis.

Further Implications of the Results

It seems likely that the degree of goal congruence between AFCS units participating in this study could be improved by the initiation of a management information system designed to provide a more efficient downward flow of policy information. AFCSR 100-17 (1975), AFCSR 124-1 (1974), AFM 65-110 (1975), and AFM 65-265(1973), among others, all specify information to be reported by the operating units to their respective Areas, and likewise by the Areas to AFCS headquarters, on a rather immediate basis; however, no references were found concerning similarly rapid downward or lateral information flow. Interviews with AFCS managers indicated that avenues for communicating new command policy appear to be limited to inspection reports, staff visit reports, infrequent conferences, and occasional visits by Area/AFCS headquarters commanders. The dissemination of command policy in general, of course, is done through the media of regulations, manuals, and other written guidance. It seems likely that some more immediate form of two-way management information exchange would improve goal congruence between command levels.

The importance of Compliance at the lower levels of the command suggests that either there is a belief at the operating units that compliance is extremely important to higher AFCS levels or there is a perceivedneed to rely heavily upon higher command directives for guidance. Past experience of the researcher and discussion with others having AFCS command experience tends to negate the latter reasoning. With regard to the former rationale, discussions with the AFCS Inspector General have led to repeated assurances that Command emphasis on Compliance has dramatically decreased in the past two years. Experimental findings from among respondents at the Command headquarters tend to support this philosophy, yet the operating units apparently do not perceive a de-emphasis of Compliance by the various headquarters staffs. This paradox seems to suggest once again that the operative goals of the higher echelons are not being adequately communicated to the operating units.

Despite the apparent lack of goal congruence within the tested AFCS population, there is a high degree of consistency in the decisions of AFCS managers. This implies that AFCS managers are generally capable of incorporating their individual policies into the decision process in an unambiguous way, suggesting in turn a high degree of discipline and dedication. This tends to support once more the earlier implication that greater goal congruence within the Command is possible.

Finally, the hierarchical order in which the four performance criteria were entered into the step-wise regressions was generally consistent throughout the study. This order being directly associated with the relative importance placed upon the criteria by the decision makers, it seems probable that, while different relative weights are assigned to the criteria by the various groups, there is general agreement on the viability of the goals chosen for this study. That is, there is little doubt that the four selected goals are operative within the Command.

Suggestions for Further Research

It would be interesting to extend this study into other AFCS units to determine whether or not the results could be generalized to the entire Command. In particular, since some of the greatest differences in operative goals appear to occur between the Command headquarters and units having some direct affiliation with other commands, it would probably be fruitful to analyze the remaining three Areas to determine if this apparent trend might be real.

Another interesting possibility for further research exists in the extension of Harrell's (1975) techniques to AFCS to test for the effects of policy cues and feedback in the experiment. These factors can provide much meaningful data on the probable effectiveness of management information systems, and might suggest a form of information system best suited to the Command.

Other Comments

There are several important points to be made relative to the above conclusions and implications, as follows:

a. No attempt has been made in this study to state just how important goal congruence might be to AFCS. The literature tends to presume that goal congruence is a desirable state to be maintained within an organization. If the organization supports this assertion, then the lack of goal congruence would probably be considered a state which some attempt might be made to correct.

b. So little work has been done in the area of testing organizations for goal congruence that it would not be possible or desirable at this point to imply in any way that there is more or less goal congruence in AFCS than in any other organization.

c. No attempt was made in this study to say what goals of AFCS should be emphasized. In fact, no attempt has been made to say which of the four operative goals chosen for the study itself should by emphasized by AFCS managers.

<u>Related Study</u>

Another study is presently being conducted to determine whether or not some of the differences in goals found in this research effort might be related to the demographics collected with the experimental exercise. This second study will rely heavily on the Automatic Interaction Detection (AID) algorithm to compare the unit evaluations against such factors as the subject's grade, time in assignment, previous assignment, military/civilian status, education, etc. It is possible that some improvement in the predictive power of the linear models can be brought about by such demographic groupings; however, it should be understood that the models derived in this study have been demostrated to be both very sensitive and quite powerful for the applications described here.

APPENDICES

APPENDIX A

RESEARCH PROPOSAL/APPROVAL

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS AIR FORCE COMMUNICATIONS SERVICE
RICHARDS-GEBAUR AIR FORCE BASE, MISSOURI 64030

REPLY TO ATTN OF: OA

11 Jan 1977

SUBJECT: Research Proposal

TO: Lt Col Carl G. O'Berry
4111 Silver Oak Street
Dayton, OH 45424

1. The research proposal shown in your letter of 1 Dec 1976 dealing with the goal congruence between AFCS Headquarters and the six Areas and between the Areas and the Operating Units has been reviewed, and the following comments are offered:

a. We agree in principle with the proposal; the four decision criteria (personnel, service quality, compliance and maintenance quality) appear realistic and independent. Moreover, they represent valid indicators which relate to the decision making policies associated with this Command.

b. The data collection method for the proposed research should be coordinated with AFCS prior to actual implementation. The anticipated requirements for AFCS resources must be defined prior to final approval.

2. Point of contact at this Headquarters is Mr. Thomas Yium, AUTOVON 465-3631, or (816) 348-3631.

THOMAS YIUM
Director
Operations Research Analysis Office

Providing the Reins of Command

4111 Silver Oak Street
Dayton, Ohio 45424
1 December 1976

Mr. Thomas Yium
AFCS/OA
Richards-Gebaur AFB, MO 64030

Dear Tom:

Per our recent telephone discussion the attached research proposal is forwarded for your consideration. I will be free during the week of 20 December and can travel to Richards-Gebaur for further discussion of the proposal should you so desire. It may prove mutually advantageous for us to get together to insure that we are in complete agreement on decision criteria and research objectives. I would appreciate hearing from you as soon as you have had the opportunity to look the proposal over. I think we can do a good job for you.

Regards,

Carl G. O'Berry
Lt. Col., USAF

A Research Proposal

Submitted to

Air Force Communications Service/OA

by

Carl G. O'Berry, Lt. Col., USAF

Background

1. There are two unanswered questions pertaining to the Air Force Communications Service management structure which seem to occur to nearly every unit and Area commander at one time or another. These same questions also seem to recur regularly within the staff agencies of both the Areas and the command headquarters. A general form taken by these questions might be stated as follows:

a. To what degree does the next higher command level need to be involved with the day-to-day activities of the operating unit/Area?

b. How much decision-making autonomy should the Headquarters grant to the Areas and the Areas to the operating units?

2. Both the above questions appear related to the need (or lack of need) for some type of management information system. There has been an almost continuous attempt since the early 1960's to satisfy varying requirements for information at all AFCS command levels. AFCSR 100-17 and AFCSR 125-1 both detail reporting requirements intended to keep the command informed of activities at the units. There are also several other reporting systems which provide information to the command, such as those prescribed in AFM 65-110

and AFM 65-265. The questions persist, nonetheless, and it appears that it might prove fruitful to take a new approach to these questions.

3. If it can be established that the two questions cited above actually stem from a single basic question related to management of the command, then the picture can be somewhat simplified. This kind of simplification is suggested by a technique known in management accounting as goal congruence testing. Specifically, the need for management information systems can be tied to the one very precise question: Does goal congruence exist between the various echelons of the organization?

4. There are a number of techniques for analyzing an organization for goal congruence. Extensive work is currently being done in the area of statistical modeling for assessment of personal and organizational behavior, and this work is adaptable to the AFCS community. For example, multivariate regression analysis is a familiar statistical means for establishing relationships in behavior patterns. Regression analysis, coupled with the use of recently developed policy-capturing techniques, can be used to predict the behavior of individuals and groups with considerable accuracy.

5. The particular research problem proposed for your consideration is the following: <u>Does goal congruence exist between AFCS Headquarters and the six Areas, and between the Areas and the operating units</u>? Applying statistical analysis techniques to this question may reveal possibilities for application of innovative management ideas. By carefully

choosing the analytical techniques, insuring the gathering of unbiased data through random selection processes and drawing the correct conclusions from the research, it is entirely possible to derive information about the command which may be very far-reaching in impact. Until something is known about the nature of the relationships between the various command echelons it is difficult to establish either an optimal management information system or any meaningful measure of unit efficiency. These relationships are complex management equations which are influenced by many internal and external factors, some of which may wield greater power than is presently known. Therefore, the answer to the basic question of goal congruence appears to be essential for meaningful evaluation of the command management system as a whole.

Objectives and Purpose of Research

1. To insure that the question of goal congruence can be addressed for the entire command while at the same time limiting the research to managable proportions, it is proposed that AFCS sponsor two separate, but related, simultaneous research endeavors. One of these would be directed at the MAJCOM/Area interface and the second would address the Area/ operating unit relationship. Contact has been made with a second AFIT student, Captain Jacob P. Miller, who is interested in pursuing research in this area, and with a member of the AFIT faculty who has indicated not only interest in the research but willingness to serve as a consultant to AFCS for this and any follow-on effort which may

result. The faculty member, Lt Col Adrian Harrell, holds a Ph.D. in accounting and has conducted a study similar to that proposed here as a basis for his doctoral dissertation.

2. The product of the research herein proposed would be a potentially powerful management aid to AFCS. The research could also be used as the basis for comparative analysis against other studies or as the starting point for further scientific management study within the command. The research should prove to have considerable utility to the command in developing and producing an effective management information system and for other management applications.

Methodology

1. The data collection method for the proposed research has not yet been fully developed, since there are some points which must be jointly decided upon by the command and those conducting the research. The suggested approach involves a field experiment to collect data related to the decision-making policies of middle management personnel throughout the command. By selecting appropriate decision criteria and testing randomly selected personnel at the headquarters, Areas and operating units it is hoped that a basis may be extablished for determining the degree to which these personnel are in agreement in interpreting policy and to determine the respective weights that various levels place on the pre-selected decision criteria. Specifically, each participant would be asked to evaluate a number of hypothetical AFCS units on the basis of whether or not the decision criteria were satisfied for each unit. The proposed decision criteria

should be selected on the basis of relevance, independence, and uniformity of interpretation (lack of ambiguity). The following criteria appear to meet these requirements: personnel factors, quality of service factors, compliance factors, and maintenance quality factors.

a. Personnel. Includes factors such as morale/welfare programs, unit disciplinary rates, IG complaint rates, retention rates.

b. Service Quality. Factors related to the service provided to the customer by the unit being evaluated. Measured by means of speed of service, message handling time, operator courtesy, air traffic control quality, responsiveness to new requirements, etc.

c. Compliance. Factors related to how closely the unit follows AF, AFCS, and Area directives as determined by IG reports, ATC analysis reports, staff visit reports.

d. Maintenance Quality. Factors indicative of maintenance effectiveness and efficiency, such as ready rates, uptime rates, etc.

2. Assuming agreement on these four decision criteria, each participant would evaluate a total of 16 hypothetical units, rating each unit on a scale of 1 through 8 (highly unsatisfactory to highly satisfactory) based on preassigned grades of satisfactory or unsatisfactory for each of the decision criteria. Sixteen is the number of units chosen for the test in order to cover all possible combinations of grading (S or U) of all four decision criteria (see figure 2). The assignment of the grades of S or U to the criteria

would be done in a random fashion to avoid possible sequential biases and the evaluated units would be arranged in random order to discourage "gaming." The evaluation sheets would appear essentially as shown in figure 1. The data thus collected would be subjected to the appropriate statistical analysis to determine what, if any, relationship there is between decisions made at various levels of the command.

3. In view of the complexity of the AFCS organization and command lines it would be surprising if the proposed field experiment did not yield some highly interesting results. It is entirely possible that external factors could have significant impact on unit response to AFCS/ Area policy and direction. Conversely, it is also possible that there is a very close coincidence of goals between the various echelons. The latter case could indicate that greater autonomy than is presently thought possible would produce greater efficiency and better service to AFCS customers. In either case, the field experiment should be of significant benefit to AFCS and the cost of this effort to the command would be very small compared to the cost for use of a professional consulting service.

4. If the command accepts sponsorship of the proposed research project, the following tenative schedule would apply:

a. Finalization of field experiment brochure: Jan 77

b. Completion of literature survey: May 77

c. Conduct of field experiments: 1-30 Jun 77

d. Defense of theses: 1 Aug 77

e. Final thesis to AFCS: NLT 1 Sep 77

Note: This schedule is prolonged due to an unexpected change in AFIT policy regarding its treatment of the independent study portion of the degree program. It was originally planned that the field experiment could be conducted in the late March - early April time period; however, the new school policy is to extend the independent study phase over two academic quarters instead of one, thus preventing completion of the proposed research by June 1977 as originally indicated.

References

1. Although a complete literature survey has not yet been made relative to the proposed research project, the following are some initial sources of information pertaining to the techniques suggested for this study:

Beach, Lee Roy, "Multiple Regression as a Model for Human Information Utilization." Organizational Behavior and Human Performance, Vol 2, pp 276-289 (1967).

Bottenberg, R.A. and J.H. Ward, Jr., "Applied Multiple Linear Regression." PRL-TDR-63-6, AD-413 128. Lackland AFB, Texas: Personnel Research Laboratory, Aerospace Medical Division, March 1963.

Bottenberg, R.A. and R.E. Christal, "An Iterative Technique for Clustering Criteria Which Return Optimum Predictive Efficiency." The Journal of Experimental Education, Vol 36, No. 4, pp 28-34, Summer 1968.

Christal, Raymond E., "Selecting a Harem - and Other Applications of the Policy-Capturing Model." The Journal of Experimental Education, Vol 36, No. 4, pp 35-41, Summer 1968.

Freund, John E., Mathematical Statistics. Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1971.

Horngren, Charles T., Cost Accounting: A Managerial Emphasis. Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1972.

2. For further information concerning this proposal,

contact Lt Col Carl G. O'Berry, (513) 236-4376, or Lt Col Adrian Harrell, Wright-Patterson AFB extension 52549.

FIGURE I

Performance Evaluation of Squadron Number__1__

S=Satisfactory U=Unsatisfactory

1. Personnel programs in this squadron are rated. . . . . S

2. The quality of service provided by this squadron is rated. . . . . U

3. Compliance with AF/AFCS/Area directives in this squadron is rated as. . . . . S

4. The quality of maintenance in this squadron is considered to be. . . . . S

The overall performance of this AFCS squadron should be evaluated as:

Highly Unsatisfactory		Unsatisfactory		Satisfactory		Highly Satisfactory	

APPENDIX B

DATA COLLECTION INSTRUMENT

A copy of the data collection instrument for the field experiment is presented in this Appendix. In addition to the basic instrument, a copy of the cover letter signed by the AFCS Chief of Staff is included, as is an example of the letters used to forward the experimental exercise to each of the eight senior AFCS executives. In addition to completing the basic evaluation exercise, each senior executive was asked to specify the weights he felt should be applied to each performance criterion, in the manner shown on the page following the example explanatory letter.

During the exercise, the subjects were asked to rate the performance of a number of hypothetical AFCS communications squadrons, using the information provided as to whether or not the four performance criteria were satisfied. Since each criterion was categorized as being either met (satisfactory) or not met (unsatisfactory), and four performance criteria were used, there were $2^4 = 16$ distinct combinations of these criteria. In this experiment, all 16 possible cases were presented to the subject for his evaluation.

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS AIR FORCE COMMUNICATIONS SERVICE
RICHARDS-GEBAUR AIR FORCE BASE, MISSOURI 64030

REPLY TO ATTN OF: CS

9 MAR 1977

SUBJECT: Decision Making Analysis

TO:

1. The attached exercise is designed to investigate certain aspects of the decision-making behavior of AFCS managers. Request your participation in the exercise by rating the performance of sixteen hypothetical Type I communications squadrons based upon whether each unit is rated satisfactory or unsatisfactory with respect to four different performance criteria. The data gathered will be analyzed statistically and summarized in a thesis to be prepared by Air Force officers studying at the Air Force Institute of Technology. This project is being performed under the sponsorship of HQ AFCS and has full command support.

2. You will not be identified with the data in the final report and your individual responses in this exercise will not be made known to anyone except the officers conducting the study at AFIT. If you wish, an analysis of your decision-making performance will be provided to you at a later date. If you would like to receive this analysis, so indicate on page 3 of this booklet. The analysis will be sent directly to you by the AFIT students conducting the study.

3. Please follow the instructions for this exercise carefully. Your support can help to increase our understanding of AFCS decision dynamics and may aid in finding areas for improvement in management of the command. If you received this booklet by mail, use the enclosed self-addressed envelop to return it promptly to AFIT/ENS. Thank you for your cooperation.

FOR THE COMMANDER

RICHARD W. [illegible]
Chief of Staff

1 Atch
Decision Analysis Exercise

DECISION ANALYSIS EXERCISE

PROVIDING the REINS of COMMAND

AIR FORCE COMMUNICATIONS SERVICE

SPRING 1977

AIR FORCE COMMUNICATIONS SERVICE

NOTICE

This booklet will be returned directly to AFIT/ENS. All personal data will be removed from the exercise and a numeric identifier will be attached to each booklet returned. No personal data will be forwarded to AFCS, nor will any such data be included in the research report. Collection of the above data is necessary to validate the authenticity of the exercise results and to aid in statistical analysis. No permanent record of personal data will be retained after the analysis is completed.

BIOGRAPHICAL DATA

Please circle or write in the appropriate response.

1. Are you a military officer or a civilian?

   A. Military officer
   B. Civilian

2. Please indicate your grade.

A. 0-1	F. GS-9
B. 0-2	G. GS-10
C. 0-3	H. GS-11
D. 0-4	I. GS-12
E. 0-5	J. GS-13

3. Military officers please indicate your date of rank. (Indicate year/month, e.g.: March 1974 = 7403)

   ____

4. What is your present unit?

   A. Hq AFCS
   B. NCA
   C. SACCA
   D. SCA
   E. TCA
   F. Group/Squadron, (Indicate unit number, e.g.: 2046, 1898)

   ____

5. What is your office symbol?

   ____

6. What year/month were you assigned to your present unit? (Indicate as above, e.g.: October 1975 = 7510)

   ____

7. Have you attended a resident PME course other than SOS or the Communications-Electronics Staff School?

   A. Yes
   B. No

8. Have you attended the Communications-Electronics Staff School?

A. Yes
B. No

9. What was your previous assignment?

A. MAJCOM
(1) USAF/JCS/DOD
(2) ADCOM
(3) AFCS
(4) MAC
(5) SAC
(6) TAC
(7) USAFSS
(8) Other ________

B. Unit Level
(1) Hq
(2) Area/NAF
(3) Group/Sq
(4) Other _____

10. What is your highest level of education?

A. Less than a bachelor's degree
B. Bachelor's degree
C. Graduate work beyond a bachelor degree
D. Master's degree
E. Postgraduate work beyond a master's degree
F. Doctorate degree

11. What was/is your most recent major field of study?

A. Engineering
B. Science/mathematics
C. Management
D. Other

12. Do you wish to receive an analysis of your performance on this exercise?

A. Yes
B. No

13. If you indicated "Yes" in question 12, please print your name here.

____

INSTRUCTIONS

In this exercise you are requested to rate the performance of sixteen hypothetical AFCS Type I communications squadrons. The performance criteria upon which you will base your evaluation of each squadron consist of the following:

1. Personnel Programs. Indicates the success of the unit in terms of morale and welfare programs, disciplinary rate, IG complaint rate, retention rate, etc.

2. Quality of Service. Indicates unit success in factors related to the service provided to the customer. Includes such factors as speed of service, message handling time, operator courtesy, accuracy, air traffic control quality, and responsiveness to new customer requirements.

3. Compliance. Indicates how closely the unit being rated follows Air Force, AFCS, and Area directives, as determined by IG reports, Air Traffic Control Analysis reports, and staff visit reports.

4. Maintenance Quality. Indicates maintenance effectiveness and efficiency as reflected by maintenance analysis reports, operational ready rates, uptime rates, etc.

These four performance criteria are to be viewed as independent of one another. A rating of satisfactory or unsatisfactory for any single criterion is not related to, and does not influence, the ratings of the other criteria. You are to use only the information provided for each squadron to rate the overall performance of that unit as one of the following:

1. Highly Satisfactory. Minor deficiencies may exist. Some minor corrective action may be required.

2. Satisfactory. A few significant deficiencies may exist. Some monitoring by the Area staff might be indicated in certain areas.

3. Unsatisfactory. Some major deficiencies exist. Limited on-site Area staff assistance may be required. The replacement of at least one key unit manager might be considered.

4. Highly Unsatisfactory. Many major deficiencies exist. Immediate corrective action and extensive on-site Area staff assistance are required. Replacement of at least one key unit manager is recommended.

Refer to the example on the following page. You may refer back to previously completed evaluations at any time, but do not change any that have already been completed. You may remove this page for easy reference during the exercise if you wish.

EXAMPLE

Performance Evaluation of Squadron Number X

S=Satisfactory U=Unsatisfactory

1. Personnel programs in this squadron are rated. . . . S

2. The quality of service provided by this squadron is rated . . . . S

3. Compliance with AF/AFCS/Area directives in this squadron is rated as . . . . S

4. The quality of maintenance in this squadron is considered to be . . . . S

The overall performance of this AFCS squadron should be evaluated as:

Highly Unsatisfactory		Unsatisfactory		Satisfactory		Highly Satisfactory	
							X

Performance Evaluation of Squadron Number 1

S=Satisfactory U=Unsatisfactory

1. Personnel programs in this squadron are rated. . . . S

2. The quality of service provided by this squadron is rated . . . . U

3. Compliance with AF/AFCS/Area directives in this squadron is rated as . . . . U

4. The quality of maintenance in this squadron is considered to be . . . . U

The overall performance of this AFCS squadron should be evaluated as:

Highly Unsatisfactory		Unsatisfactory		Satisfactory		Highly Satisfactory	

Performance Evaluation of Squadron Number 2

S=Satisfactory U=Unsatisfactory

1. Personnel programs in this squadron are rated. . . . U

2. The quality of service provided by this squadron is rated . . . . S

3. Compliance with AF/AFCS/Area directives in this squadron is rated as . . . . S

4. The quality of maintenance in this squadron is considered to be . . . . S

The overall performance of this AFCS squadron should be evaluated as:

Highly Unsatisfactory		Unsatisfactory		Satisfactory		Highly Satisfactory	

Performance Evaluation of Squadron Number __3__

S=Satisfactory U=Unsatisfactory

1. Personnel programs in this squadron are rated. . . . __S__

2. The quality of service provided by this squadron is rated . . . . __U__

3. Compliance with AF/AFCS/Area directives in this squadron is rated as . . . . __U__

4. The quality of maintenance in this squadron is considered to be . . . . __S__

The overall performance of this AFCS squadron should be evaluated as:

Highly Unsatisfactory		Unsatisfactory		Satisfactory		Highly Satisfactory	

Performance Evaluation of Squadron Number 4

S=Satisfactory U=Unsatisfactory

1. Personnel programs in this squadron are rated. . . . U

2. The quality of service provided by this squadron is rated . . . . S

3. Compliance with AF/AFCS/Area directives in this squadron is rated as . . . . S

4. The quality of maintenance in this squadron is considered to be . . . . U

The overall performance of this AFCS squadron should be evaluated as:

Highly Unsatisfactory		Unsatisfactory		Satisfactory		Highly Satisfactory	

Performance Evaluation of Squadron Number 5

S=Satisfactory U=Unsatisfactory

1. Personnel programs in this squadron are rated. . . . S

2. The quality of service provided by this squadron is rated . . . . S

3. Compliance with AF/AFCS/Area directives in this squadron is rated as . . . . S

4. The quality of maintenance in this squadron is considered to be . . . . S

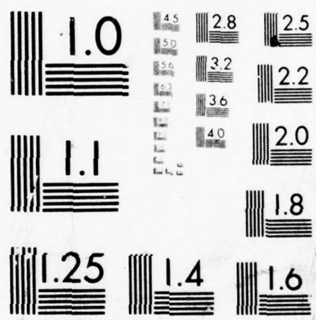
The overall performance of this AFCS squadron should be evaluated as:

Highly Unsatisfactory		Unsatisfactory		Satisfactory		Highly Satisfactory	

AD-A045 996 AIR FORCE INST OF TECH WRIGHT-PATTERSON AFB OHIO SCH--ETC F/G 5/1
AN EXPERIMENTAL TEST FOR GOAL CONGRUENCE IN AN AIR FORCE MAJOR --ETC(U)
SEP 77 C G O'BERRY
UNCLASSIFIED AFIT/GSM/SM/77S-13 NL

2 OF 2
AD
A045996

END
DATE
FILMED
11-77
DDC



MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

Performance Evaluation of Squadron Number 6

S=Satisfactory U=Unsatisfactory

1. Personnel programs in this squadron are rated. . . . S

2. The quality of service provided by this squadron is rated . . . . S

3. Compliance with AF/AFCS/Area directives in this squadron is rated as . . . . U

4. The quality of maintenance in this squadron is considered to be . . . . U

The overall performance of this AFCS squadron should be evaluated as:

Highly Unsatisfactory		Unsatisfactory		Satisfactory		Highly Satisfactory	

Performance Evaluation of Squadron Number 7

S=Satisfactory U=Unsatisfactory

1. Personnel programs in this squadron are rated. . . . U

2. The quality of service provided by this squadron is rated . . . . U

3. Compliance with AF/AFCS/Area directives in this squadron is rated as . . . . U

4. The quality of maintenance in this squadron is considered to be . . . . S

The overall performance of this AFCS squadron should be evaluated as:

Highly Unsatisfactory		Unsatisfactory		Satisfactory		Highly Satisfactory	

Performance Evaluation of Squadron Number 8

S=Satisfactory U=Unsatisfactory

1. Personnel programs in this squadron are rated. . . . S

2. The quality of service provided by this squadron is rated . . . . S

3. Compliance with AF/AFCS/Area directives in this squadron is rated as . . . . S

4. The quality of maintenance in this squadron is considered to be . . . . U

The overall performance of this AFCS squadron should be evaluated as:

Highly Unsatisfactory		Unsatisfactory		Satisfactory		Highly Satisfactory	

Performance Evaluation of Squadron Number 9

S=Satisfactory U=Unsatisfactory

1. Personnel programs in this squadron are rated. . . . U

2. The quality of service provided by this squadron is rated . . . . S

3. Compliance with AF/AFCS/Area directives in this squadron is rated as . . . . U

4. The quality of maintenance in this squadron is considered to be . . . . S

The overall performance of this AFCS squadron should be evaluated as:

Highly Unsatisfactory		Unsatisfactory		Satisfactory		Highly Satisfactory	

Performance Evaluation of Squadron Number 10

S=Satisfactory U=Unsatisfactory

1. Personnel programs in this squadron are rated. . . . S

2. The quality of service provided by this squadron is rated . . . . U

3. Compliance with AF/AFCS/Area directives in this squadron is rated as . . . . S

4. The quality of maintenance in this squadron is considered to be . . . . U

The overall performance of this AFCS squadron should be evaluated as:

Highly Unsatisfactory		Unsatisfactory		Satisfactory		Highly Satisfactory	

Performance Evaluation of Squadron Number 11

S=Satisfactory U=Unsatisfactory

1. Personnel programs in this squadron are rated. . . . U

2. The quality of service provided by this squadron is rated . . . . U

3. Compliance with AF/AFCS/Area directives in this squadron is rated as . . . . S

4. The quality of maintenance in this squadron is considered to be . . . . S

The overall performance of this AFCS squadron should be evaluated as:

Highly Unsatisfactory		Unsatisfactory		Satisfactory		Highly Satisfactory	

Performance Evaluation of Squadron Number 12

S=Satisfactory U=Unsatisfactory

1. Personnel programs in this squadron are rated. . . . U

2. The quality of service provided by this squadron is rated . . . . U

3. Compliance with AF/AFCS/Area directives in this squadron is rated as . . . . U

4. The quality of maintenance in this squadron is considered to be . . . . U

The overall performance of this AFCS squadron should be evaluated as:

Highly Unsatisfactory		Unsatisfactory		Satisfactory		Highly Satisfactory	

Performance Evaluation of Squadron Number 13

S=Satisfactory U=Unsatisfactory

1. Personnel programs in this squadron are rated. . . . S

2. The quality of service provided by this squadron is rated . . . . U

3. Compliance with AF/AFCS/Area directives in this squadron is rated as . . . . S

4. The quality of maintenance in this squadron is considered to be . . . . S

The overall performance of this AFCS squadron should be evaluated as:

Highly Unsatisfactory		Unsatisfactory		Satisfactory		Highly Satisfactory	

Performance Evaluation of Squadron Number 14

S=Satisfactory U=Unsatisfactory

1. Personnel programs in this squadron are rated. . . . U

2. The quality of service provided by this squadron is rated . . . . U

3. Compliance with AF/AFCS/Area directives in this squadron is rated as . . . . S

4. The quality of maintenance in this squadron is considered to be . . . . U

The overall performance of this AFCS squadron should be evaluated as:

Highly Unsatisfactory		Unsatisfactory		Satisfactory		Highly Satisfactory	

Performance Evaluation of Squadron Number 15

S=Satisfactory U=Unsatisfactory

1. Personnel programs in this squadron are rated. . . . S

2. The quality of service provided by this squadron is rated . . . . S

3. Compliance with AF/AFCS/Area directives in this squadron is rated as . . . . U

4. The quality of maintenance in this squadron is considered to be . . . . S

The overall performance of this AFCS squadron should be evaluated as:

Highly Unsatisfactory		Unsatisfactory		Satisfactory		Highly Satisfactory	

Performance Evaluation of Squadron Number 16

S=Satisfactory U=Unsatisfactory

1. Personnel programs in this squadron are rated. . . . U

2. The quality of service provided by this squadron is rated . . . . S

3. Compliance with AF/AFCS/Area directives in this squadron is rated as . . . . U

4. The quality of maintenance in this squadron is considered to be . . . . U

The overall performance of this AFCS squadron should be evaluated as:

Highly Unsatisfactory		Unsatisfactory		Satisfactory		Highly Satisfactory	

DEPARTMENT OF THE AIR FORCE
AIR FORCE INSTITUTE OF TECHNOLOGY (AU)
WRIGHT-PATTERSON AIR FORCE BASE, OHIO 45433

24 May 1977

Colonel James L. Hodge
AFCS/LG
Richards-Gebaur AFB, MO 64030

Dear Colonel Hodge:

Several weeks ago copies of the attached analysis exercise were distributed to over 600 AFCS middle managers at the Headquarters, three different Areas, and numerous units. The purpose of the exercise is to capture each individual's unit rating policy, given specified evaluations of sixteen hypothetical units in terms of four performance criteria common to AFCS. More than 500 of the exercises have been completed and returned to me. The data thus gathered are being analyzed by myself and another AFIT graduate student with the intent of identifying, if possible, any differences in rater policies at the various levels of the Command.

While we are concentrating our basic study on the middle management segment of AFCS (O-1 through O-5 and GS-9 through GS-13), we would also like to have a standard taken from among the most senior officers of the Command with which to compare the weights given the performance criteria by AFCS middle managers. You can assist us in this effort if you will take a few moments from your busy schedule to complete the attached exercise, ignoring the request for biographical data at the beginning. It is our intent to use the data collected from you and other senior AFCS managers to calculate a figure of merit for comparison purposes.

I realize that some senior people might well feel uncomfortable if asked to reveal their personal unit evaluation policies. In order to assure that your personal policies cannot be identified, I have asked the Head of the AFIT Systems Management Department, Colonel Ronald A. Luhks, to act as a disinterested collection agent for the data requested above. If you will have your secretary return the completed attachment to him, Colonel Luhks will remove any identifying information and turn only the sterilized results over to me.

This study has been conducted under AFCS sponsorship and the results will be presented to AFCS/OA in the form of a graduate thesis which I hope to complete by early July. I honestly believe that we can help to improve understanding of the complex interfaces between the different AFCS command levels through this research effort. Please try to find the time to provide us with your valuable input to this effort and have your secretary return the completed attachment to:

Colonel R.A. Luhks
AFIT/ENS
Wright-Patterson AFB, OH 45433

Sincerely,

CARL G. O'BERRY, Lt Col, USAF

Please indicate in the space provided next to each performance criterion the importance you feel <u>should be</u> associated with that factor when assessing the overall performance of an AFCS unit. Use a total of 100 points as indicated (the more important you feel a factor is, the more points it should receive):

<u>Personnel Programs</u> (the success of the unit in terms of morale and welfare programs, disciplinary rates, IG complaint rate, retention rate).	____
<u>Quality of Service</u> (unit success in factors related to the service provided to the customer).	____
<u>Compliance</u> (the degree to which the unit adheres to higher headquarters directives).	____
<u>Maintenance Quality</u> (maintenance effectiveness and efficiency).	____
Total	100

Now please proceed with the remainder of the exercise.

A P P E N D I X C

FEEDBACK PROVIDED TO SUBJECTS

Each experimental subject was afforded the opportunity to request an analysis of his individual performance in the decision exercise, as an incentive to improve the response rate. A computer program was prepared to generate the indicated feedback to the subject, as shown in this Appendix. The computer program selected the subject on the basis of a coded data entry, calculated his individual relative predictor weights and consistency index (R^2), and printed the indicated message. The analyses were mailed in bulk to the appropriate units for distribution to participants who had requested the feedback.

NAME: DOUGLAS L. MOQUIN UNIT: F1905CC

THANK YOU FOR PARTICIPATING IN OUR RECENT AFCS DECISION ANALYSIS EXERCISE. YOU REQUESTED THAT WE PROVIDE YOU WITH AN ANALYSIS OF YOUR PERFORMANCE IN THAT EXERCISE. THE FOLLOWING STATISTICS COMPARE YOUR 16 UNIT EVALUATIONS AGAINST THOSE MADE BY ALL PARTICIPANTS AS A GROUP. THE WEIGHT SHOWN FOR EACH PERFORMANCE FACTOR IS THE RELATIVE IMPORTANCE GIVEN THAT FACTOR IN DECIDING HOW THE UNIT SHOULD BE EVALUATED OVERALL.

	WEIGHTS ASSIGNED BY ALL PARTICIPANTS AS A GROUP:	WEIGHTS USED BY YOU IN EVALUATING THE 16 HYPOTHETICAL UNITS:
PERSONNEL FACTORS	.14	.03
QUALITY OF SERVICE	.49	.36
COMPLIANCE	.14	.09
QUALITY OF MAINTENANCE	.23	.52

THE CONSISTENCY WITH WHICH YOU APPLIED THE WEIGHTS INDICATED ABOVE IN EVALUATING THE UNITS WAS 97.9%. THE CONSISTENCY DISPLAYED BY ALL 513 PARTICIPANTS AS A GROUP WAS 78.5%. THIS MEANS THAT YOUR PERSONAL EVALUATION POLICY, ONCE ESTABLISHED, WAS EFFECTIVELY APPLIED IN 97.9% OF THE 16 DECISIONS YOU MADE IN THE EXERCISE, AS OPPOSED TO CONSISTENT POLICY APPLICATION IN 75.8% OF THE DECISIONS MADE BY THE COLLECTIVE TEST GROUP.

THANKS ONCE AGAIN FOR YOUR COOPERATION AND PATIENCE.

LT COL C.G. O'BERRY
CAPT J.P. MILLER
AFIT/ENS
WRIGHT-PATTERSON AFB, OH 45433

APPENDIX D

EXAMPLE OF SPSS PROGRAM AND TYPICAL OUTPUT

This Appendix contains an example of the control cards required as input for the Statistical Package for the Social Sciences (SPSS) regression algorithm as used in this study. Also included is a typical last regression step output, showing the Analysis of Variance (ANOVA) table and statistics produced by the algorithm.

Since 513 AFCS middle managers responded to this experiment, there were 513 x 16 = 8,208 separate evaluations made. Each of these decisions is included in the overall regression model, then the respondents are broken out by headquarters and Area-grouped operating units for separate regression runs. The average regression after this grouping process included more than 2000 evaluations; hence each model thus produced was quite insensitive to the effects of extremes in individual evaluation cases. The data base was screened for obvious attempts to introduce inaccuracies (marking all entries high or low, choosing all the same values, etc.), but none were detected. If any subject elected to simply mark his exercise randomly this would not materially affect the regression outcome, with such large numbers of decisions being included in each regression run. It was apparent that some respondents used models to make their evaluations, since there were six cases out of 513 where ther individual R^2 was 1.000.

```
VOGELBACK COMPUTING CENTER
NORTHWESTERN UNIVERSITY

S P S S - - STATISTICAL PACKAGE FOR THE SOCIAL SCIENCES

VERSION 6.50 -- APRIL 1, 1976


            RUN NAME         SENIOR AFCS MANAGER ANALYSIS
            PRINT BACK       CONTROL
            VARIABLE LIST    STATUS,GRADE,DORYR,DORMO,HDQ,UNIT,OFFSYM,ASGNYR,ASGNMO,PMF,
                             CFSTAFF,PPMAJCOM,PRLVL,FOLVL,FOFLD,ANRO,UNDES,BOOKNR,NAME,FVAL,
                             P1 TO P4
            INPUT FORMAT     FIXED(2A1,2F2.0,A1,F4.0,A3,2F2.0,2A1,2F1.0,4A1,F2.0,A25,5F1.0)

THE INPUT FORMAT PROVIDES FOR  24 VARIABLES.   24 WILL BE READ
IT PROVIDES FOR  1 RECORDS (*CARDS*) PER CASE.  A MAXIMUM OF   58 *COLUMNS* ARE USED ON A RECORD.

WARNING - AN ALPHANUMERIC VARIABLE HAS A WIDTH GREATER THAN 10.  EXCESS RIGHTMOST CHARACTERS WILL BE LOST.

            INPUT MEDIUM     DISK
            N OF CASES       UNKNOWN
            RECODE           UNDES('H'=1)('N'=2)('S'=3)('T'=4)('B'=5)('C'=6)('D'=7)
            MISSING VALUES   STATUS TO EVAL(0)
            REGRESSION       VARIABLES=EVAL,P1 TO P4/
                             REGRESSION=EVAL WITH P1 TO P4(1)/
            OPTIONS          2,11
            STATISTICS       ALL

         051300 CM NEEDED FOR REGRESSION


END OF FILE ON FILE DATA
AFTER READING     112 CASES FROM SUBFILE NONAME
```

FILE NONAME (CREATION DATE = 06/13/77)

* M U L T I P L E R E G R E S S I O N *

DEPENDENT VARIABLE.. EVAL

VARIABLE(S) ENTERED ON STEP NUMBER 4.. P1

MULTIPLE R	.87102	ANALYSIS OF VARIANCE	DF	SUM OF SQUARES	MEAN SQUARE	F	SIGNIFICANCE
R SQUARE	.75858	REGRESSION	4.	13012.91019	3253.22755	4064.14286	0
ADJUSTED R SQUARE	.75849	RESIDUAL	5171.	4139.23432	.80047		
STD DEVIATION	.89469	COEFF OF VARIABILITY	22.5 PCT				

-------------------- VARIABLES IN THE EQUATION --------------------

VARIABLE	B	STD ERROR B	F / SIGNIFICANCE	BETA / ELASTICITY
P2	2.2295360	.248717111E-01	8035.5878 / 0	.6123819 / .28002
P4	1.5479284	.248717111E-01	3973.3828 / 0	.4251662 / .19441
P3	1.1653936	.248717111E-01	2195.5023 / 0	.3200962 / .14637
P1	1.1538165	.248717111E-01	2152.0385 / 0	.3169163 / .14491
(CONSTANT)	.93272922	.278074188E-01	1125.0957 / .000	

---------- VARIABLES NOT IN THE EQUATION ----------

VARIABLE	PARTIAL	TOLERANCE	F / SIGNIFICANCE

ALL VARIABLES ARE IN THE EQUATION.

COEFFICIENTS AND CONFIDENCE INTERVALS.

VARIABLE	B	STD ERROR B	T	95.0 PCT CONFIDENCE INTERVAL	
P2	2.2295360	.248717111E-01	89.641440	2.1807769 ,	2.2782951
P4	1.5479284	.248717111E-01	62.236507	1.4991694 ,	1.5966875
P3	1.1653936	.248717111E-01	46.955188	1.1166345 ,	1.2141526
P1	1.1538165	.248717111E-01	46.390716	1.1050574 ,	1.2025756
CONSTANT	.93272922	.278074188E-01	33.542461	.87821493 ,	.98724352

APPENDIX E

CALCULATION OF F-TEST VALUES

The F-Test values used to compare regression models in this study were calculated using the following formula:

$$F_o = \frac{[SS_e - \sum_{j=1}^{p} SS_{ej}]/[(p-1)(k+1)]}{[\sum_{j=1}^{p} SS_{ej}]/[n-p(k+1)]}$$

where SS_e is the residual sum of squares derived by regressing all compared groups of decisions together, SS_{ej} is the residual sum of squares for the jth group of evaluations, p is the number of groups being compared (number of subsets of data in the regression), k is the number of predictor variables (four, in all cases for this study), and n is the total number of decisions in all groups being compared.

The null hypothesis being tested is:

$$H_o: \underline{\beta}_1 = \underline{\beta}_2 = \underline{\beta}_3 = \ldots = \underline{\beta}_p, \text{ where } \underline{\beta}_i = \begin{matrix} \beta_o \\ \beta_1 \\ \cdot \\ \cdot \\ \beta_k \end{matrix}$$

The alternate hypothesis is:

$$H : \underline{\beta}_i \neq \underline{\beta}_j, \text{ for at least one i,j pair.}$$

The null hypothesis is rejected if:

$$F_o > F_{\alpha, [(p-1)(k+1)],[n-p(k+1)]}$$

where $\alpha = 0.05$ in all comparisons made for this study.

A P P E N D I X F

REGRESSION STATISTICS AND RELATIVE WEIGHTS

AFCS RELATIVE PREDICTOR WEIGHTS

REGRESSION GROUP	UNIT
1	ALL UNITS COMBINED
2	HQ AFCS
3	NCA
4	SACCA
5	TCA
6	COMBINED OPERATING UNITS
7	NCA UNITS
8	SACCA UNITS
9	TCA UNITS

RELATIVE WEIGHTS COMPUTED FOR PREDICTOR VARIABLES, LISTED BY REGRESSION GROUP

P = 6
K = 4
N = 8209

SPSS REGRESSION RUN BETA WEIGHTS

	ALL UNITS	HQ AFCS	NCA	SACCA	TCA	COMBINED OPERATING UNITS
P1	.3282215	.3534649	.3576236	.3302284	.3616129	.3067959
P2	.6095076	.6076846	.5643008	.6301606	.6173115	.6136972
P3	.3212979	.2791534	.3332323	.3140704	.3252636	.3314549
P4	.4193598	.4346199	.4121910	.4170775	.3967088	.4225600

SS(1) = 6932.83279	RSQ(1) = .75832
SS(2) = 893.47437	RSQ(2) = .76104
SS(3) = 818.16979	RSQ(3) = .72728
SS(4) = 786.04348	RSQ(4) = .77875
SS(5) = 617.27047	RSQ(5) = .77501
SS(6) = 3230.18941	RSQ(6) = .75917

RELATIVE WEIGHTS

ALL UNITS	HQ AFCS	NCA	SACCA	TCA	COMBINED OPERATING UNITS
RW(1)= .1420632	RW(1)= .1641667	RW(1)= .1759534	RW(1)= .1400331	RW(1)= .1687254	RW(1)= .1239824
RW(2)= .4893981	RW(2)= .4852315	RW(2)= .4378443	RW(2)= .5099228	RW(2)= .4917014	RW(2)= .4961000
RW(3)= .1361330	RW(3)= .1023949	RW(3)= .1526837	RW(3)= .1266648	RW(3)= .1365097	RW(3)= .1447138
RW(4)= .2311098	RW(4)= .2482057	RW(4)= .2336121	RW(4)= .2233755	RW(4)= .2030656	RW(4)= .2352002

F - TEST VALUE FOR COMPARING THE 5 REGRESSION MODELS IN THIS ANALYTIC RUN:

37.99533

RELATIVE WEIGHTS COMPUTED FOR PREDICTOR VARIABLES, LISTED BY REGRESSION GROUP

P = 3
K = 4
N = 2112

SPSS REGRESSION RUN BETA WEIGHTS

	TWO GROUPS COMBINED	HQ AFCS	NCA
P1	.3552627	.3534649	.3576236
P2	.5876802	.6076846	.5643008
P3	.3037876	.2791534	.3332323
P4	.4242441	.4346199	.4121910

SS(1) = 1726.19435   RSQ(1) = .74385
SS(2) = 893.47437   RSQ(2) = .76104
SS(3) = 818.16979   RSQ(3) = .72728

RELATIVE WEIGHTS

TWO GROUPS COMBINED	HQ AFCS	NCA
RW(1)= .1695734	RW(1)= .1641667	RW(1)= .1758534
RW(2)= .4642979	RW(2)= .4852315	RW(2)= .4378443
RW(3)= .1240666	RW(3)= .1023949	RW(3)= .1526837
RW(4)= .2419615	RW(4)= .2482057	RW(4)= .2336121

F - TEST VALUE FOR COMPARING THE 2 REGRESSION MODELS IN THIS ANALYTIC RUN:

3.57370

RELATIVE WEIGHTS COMPUTED FOR PREDICTOR VARIABLES, LISTED BY REGRESSION GROUP

P = 3
K = 4
N = 2224

SPSS REGRESSION RUN BETA WEIGHTS

	TWO GROUPS COMBINED	HQ AFCS	SACCA
P1	.3419985	.3534649	.3302284
P2	.6186887	.6076846	.6301606
P3	.2963071	.2791534	.3140704
P4	.4259469	.4346199	.4170775

SS(1) = 1684.77902 RSQ(1) = .76897
SS(2) = 893.47437 RSQ(2) = .76104
SS(3) = 786.04348 RSQ(3) = .77875

RELATIVE WEIGHTS

TWO GROUPS COMBINED	HQ AFCS	SACCA
RW(1)= .1521034	RW(1)= .1641667	RW(1)= .1400331
RW(2)= .4977772	RW(2)= .4852315	RW(2)= .5099228
RW(3)= .1141760	RW(3)= .1023949	RW(3)= .1266648
RW(4)= .2359400	RW(4)= .2482057	RW(4)= .2233755

F - TEST VALUE FOR COMPARING THE 2 REGRESSION MODELS IN THIS ANALYTIC RUN:

1.39709

RELATIVE WEIGHTS COMPUTED FOR PREDICTOR VARIABLES, LISTED BY REGRESSION GROUP

P = 3
K = 4
N = 2049

SPSS REGRESSION RUN BETA WEIGHTS

	TWO GROUPS COMBINED	HQ AFCS	TCA
P1	.3567778	.3534649	.3616129
P2	.6114877	.6076846	.6173115
P3	.2991617	.2791534	.3252636
P4	.4177060	.4346199	.3967088

SS(1) = 1522.92704 RSQ(1) = .76518
SS(2) = 893.47437 RSQ(2) = .76104
SS(3) = 617.27047 RSQ(3) = .77501

RELATIVE WEIGHTS

TWO GROUPS COMBINED	HQ AFCS	TCA
RW(1)= .1663535	RW(1)= .1641667	RW(1)= .1687254
RW(2)= .4886657	RW(2)= .4852315	RW(2)= .4917014
RW(3)= .1169630	RW(3)= .1023949	RW(3)= .1365097
RW(4)= .2280226	RW(4)= .2482057	RW(4)= .2030656

F - TEST VALUE FOR COMPARING THE 2 REGRESSION MODELS IN THIS ANALYTIC RUN:

3.28677

RELATIVE WEIGHTS COMPUTED FOR PREDICTOR VARIABLES, LISTED BY REGRESSION GROUP

P = 3
K = 4
N = 5184

SPSS REGRESSION RUN BETA WEIGHTS

	TWO GROUPS COMBINED	HQ AFCS	COMBINED OPERATING UNITS
P1	.3169163	.3534649	.3067959
P2	.6123819	.6076846	.6136972
P3	.3200962	.2791534	.3314549
P4	.4251662	.4346199	.4225600

SS(1) = 4139.23432
SS(2) = 893.47437
SS(3) = 3230.18941

RSQ(1) = .75868
RSQ(2) = .76104
RSQ(3) = .75917

RELATIVE WEIGHTS

TWO GROUPS COMBINED	HQ AFCS	COMBINED OPERATING UNITS
RW(1)= .1323825	RW(1)= .1641667	RW(1)= .1239824
RW(2)= .4942948	RW(2)= .4852315	RW(2)= .4961000
RW(3)= .1350524	RW(3)= .1023949	RW(3)= .1447138
RW(4)= .2382642	RW(4)= .2482057	RW(4)= .2352002

F - TEST VALUE FOR COMPARING THE 2 REGRESSION MODELS IN THIS ANALYTIC RUN:

3.90730

RELATIVE WEIGHTS COMPUTED FOR PREDICTOR VARIABLES, LISTED BY REGRESSION GROUP

P = 3
K = 4
N = 2095

SPSS REGRESSION RUN BETA WEIGHTS

	TWO GROUPS COMBINED	NCA	SACCA
P1	.3429088	.3576236	.3302284
P2	.5994187	.5643008	.6301606
P3	.3229459	.3332323	.3140704
P4	.4147404	.4121910	.4170775

SS(1) = 1617.43714 RSQ(1) = .75319
SS(2) = 818.16979 RSQ(2) = .72728
SS(3) = 786.04348 RSQ(3) = .77875

RELATIVE WEIGHTS

TWO GROUPS COMBINED	NCA	SACCA
RW(1)= .1561179	RW(1)= .1758534	RW(1)= .1400331
RW(2)= .4770414	RW(2)= .4378443	RW(2)= .5099228
RW(3)= .1384698	RW(3)= .1526837	RW(3)= .1266648
RW(4)= .2283748	RW(4)= .2336121	RW(4)= .2233755

F - TEST VALUE FOR COMPARING THE 2 REGRESSION MODELS IN THIS ANALYTIC RUN:

3.43907

RELATIVE WEIGHTS COMPUTED FOR PREDICTOR VARIABLES, LISTED BY REGRESSION GROUP

P = 3
K = 4
N = 1920

SPSS REGRESSION RUN BETA WEIGHTS

	TWO GROUPS COMBINED	NCA	TCA
P1	.3594256	.3576236	.3616129
P2	.5896094	.5643008	.6173115
P3	.3293393	.3332323	.3252636
P4	.4046398	.4121910	.3967088

SS(1) = 1442.27451	RSQ(1) = .74902
SS(2) = 818.16979	RSQ(2) = .72728
SS(3) = 617.27047	RSQ(3) = .77501

RELATIVE WEIGHTS

TWO GROUPS COMBINED	NCA	TCA
RW(1)= .1724744	RW(1)= .1758534	RW(1)= .1687254
RW(2)= .4641255	RW(2)= .4378443	RW(2)= .4917014
RW(3)= .1448084	RW(3)= .1526837	RW(3)= .1365097
RW(4)= .2185968	RW(4)= .2336121	RW(4)= .2030656

F - TEST VALUE FOR COMPARING THE 2 REGRESSION MODELS IN THIS ANALYTIC RUN:

1.81873

RELATIVE WEIGHTS COMPUTED FOR PREDICTOR VARIABLES, LISTED BY REGRESSION GROUP

P = 3
K = 4
N = 5955

SPSS REGRESSION RUN BETA WEIGHTS

	TWO GROUPS COMBINED	NCA	COMBINED OPERATING UNITS
P1	.3163609	.3576236	.3067959
P2	.6042453	.5643008	.6136972
P3	.3317445	.3332323	.3314549
P4	.4205298	.4121910	.4225600

SS(1) = 4068.89578 RSQ(1) = .75210
SS(2) = 818.16979 RSQ(2) = .72728
SS(3) = 3230.18941 RSQ(3) = .75917

RELATIVE WEIGHTS

TWO GROUPS COMBINED	NCA	COMBINED OPERATING UNITS
RW(1)= .1330730	RW(1)= .1758534	RW(1)= .1239824
RW(2)= .4854572	RW(2)= .4378443	RW(2)= .4961000
RW(3)= .1463295	RW(3)= .1526837	RW(3)= .1447138
RW(4)= .2351354	RW(4)= .2336121	RW(4)= .2352002

F - TEST VALUE FOR COMPARING THE 2 REGRESSION MODELS IN THIS ANALYTIC RUN:

5.11949

RELATIVE WEIGHTS COMPUTED FOR PREDICTOR VARIABLES, LISTED BY REGRESSION GROUP

****

P = 3
K = 4
N = 2037

SPSS REGRESSION RUN BETA WEIGHTS

	TWO GROUPS COMBINED	SACCA	TCA
P1	.3441312	.3302284	.3616129
P2	.6242445	.6301606	.6173115
P3	.3189713	.3140704	.3252636
P4	.4078696	.4170775	.3967088

SS(1) = 1409.25344	RSQ(1) = .77621
SS(2) = 786.04348	RSQ(2) = .77875
SS(3) = 617.27047	RSQ(3) = .77501

RELATIVE WEIGHTS

TWO GROUPS COMBINED	SACCA	TCA
RW(1)= .1525699	RW(1)= .1400331	RW(1)= .1687254
RW(2)= .5020306	RW(2)= .5099228	RW(2)= .4917014
RW(3)= .1310762	RW(3)= .1266648	RW(3)= .1365097
RW(4)= .2143204	RW(4)= .2233755	RW(4)= .2030656

F - TEST VALUE FOR COMPARING THE 2 REGRESSION MODELS IN THIS ANALYTIC RUN

1.71161

****

RFLATIVE WFIGHTS COMPUTED FOR PREDICTOR VARIABLFS, LISTED BY REGRESSION GROUP

P = 3
K = 4
N = 5169

SPSS REGRESSION RUN BETA WEIGHTS

	TWO GROUPS COMBINED	SACCA	COMBINED OPERATING UNITS
P1	.3117510	.3302284	.3067959
P2	.6171710	.6301608	.6136972
P3	.3277699	.3140704	.3314549
P4	.4213928	.4170775	.4225600

SS(1) = 4019.20197 RSQ(1) = .76309
SS(2) = 786.04348 RSQ(2) = .77875
SS(3) = 3230.18941 RSQ(3) = .75917

RELATIVE WEIGHTS

TWO GROUPS COMBINED	SACCA	COMBINED OPERATING UNITS
RW(1)= .1273620	RW(1)= .1400331	RW(1)= .1239824
RW(2)= .4991548	RW(2)= .5099231	RW(2)= .4961000
RW(3)= .1407869	RW(3)= .1266648	RW(3)= .1447138
RW(4)= .2327011	RW(4)= .2233755	RW(4)= .2352002

F - TEST VALUE FOR COMPARING THE 2 REGRESSION MODELS IN THIS ANALYTIC RUN:

.76263

RELATIVE WEIGHTS COMPUTED FOR PREDICTOR VARIABLES, LISTED BY REGRESSION GROUP

P = 3
K = 4
N = 4992

SPSS REGRESSION RUN BETA WEIGHTS

	TWO GROUPS COMBINED	TCA	COMBINED OPERATING UNITS
P1	.3164576	.3616129	.3067959
P2	.6141618	.6173115	.6136972
P3	.3302596	.3252636	.3314549
P4	.4178439	.3967088	.4225600

SS(1) = 3961.73947 RSQ(1) = .76100
SS(2) = 617.27047 RSQ(2) = .77501
SS(3) = 3230.18941 RSQ(3) = .75917

RELATIVE WEIGHTS

TWO GROUPS COMBINED	TCA	COMBINED OPERATING UNITS
RW(1)= .1315971	RW(1)= .1687254	RW(1)= .1239824
RW(2)= .4956567	RW(2)= .4917014	RW(2)= .4961000
RW(3)= .1433255	RW(3)= .1365097	RW(3)= .1447138
RW(4)= .2294264	RW(4)= .2030656	RW(4)= .2352002

F - TEST VALUE FOR COMPARING THE 2 REGRESSION MODELS IN THIS ANALYTIC RUN:

3.69807

RELATIVE WEIGHTS COMPUTED FOR PREDICTOR VARIABLES, LISTED BY REGRESSION GROUP

P = 3
K = 4
N = 2752

SPSS REGRESSION RUN BETA WEIGHTS

	TWO GROUPS COMBINED	HQ AFCS	NCA UNITS
P1	.3348161	.3534649	.3221150
P2	.6054219	.6076846	.6039127
P3	.2978479	.2791534	.3106724
P4	.4268170	.4346199	.4205441

SS(1) = 2313.39928 RSQ(1) = .74901
SS(2) = 893.47437 RSQ(2) = .76104
SS(3) = 1413.81727 RSQ(3) = .74185

RELATIVE WEIGHTS

TWO GROUPS COMBINED	HQ AFCS	NCA UNITS
RW(1)= .1496667	RW(1)= .1641667	RW(1)= .1398640
RW(2)= .4893602	RW(2)= .4852315	RW(2)= .4916230
RW(3)= .1184408	RW(3)= .1023949	RW(3)= .1301036
RW(4)= .2432180	RW(4)= .2482057	RW(4)= .2384004

F - TEST VALUE FOR COMPARING THE 2 REGRESSION MODELS IN THIS ANALYTIC RUN:

1.45167

RELATIVE WEIGHTS COMPUTED FOR PREDICTOR VARIABLES, LISTED BY REGRESSION GROUP

P = 3
K = 4
N = 2489

SPSS REGRESSION RUN BETA WEIGHTS

	TWO GROUPS COMBINED	HQ AFCS	SACCA UNITS
P1	.3189534	.3534649	.2904820
P2	.6133575	.6076846	.6180874
P3	.3149648	.2791534	.3445501
P4	.4369982	.4346199	.4390004

SS(1) = 1917.66626 RSQ(1) = .76811
SS(2) = 893.47437 RSQ(2) = .76104
SS(3) = 1006.27949 RSQ(3) = .77785

RELATIVE WEIGHTS

TWO GROUPS COMBINED	HQ AFCS	SACCA UNITS
RW(1)= .1324436	RW(1)= .1641667	RW(1)= .1084782
RW(2)= .4897833	RW(2)= .4852315	RW(2)= .4911384
RW(3)= .1291518	RW(3)= .1023949	RW(3)= .1526191
RW(4)= .2486199	RW(4)= .2482057	RW(4)= .2477616

F - TEST VALUE FOR COMPARING THE 2 REGRESSION MODELS IN THIS ANALYTIC RUN:

4.55783

RELATIVE WEIGHTS COMPUTED FOR PREDICTOR VARIABLES, LISTED BY REGRESSION GROUP

****

P = 3
K = 4
N = 2192

SPSS REGRESSION RUN BETA WEIGHTS

	TWO GROUPS COMBINED	HQ AFCS	TCA UNITS
P1	.3297064	.3534649	.3044796
P2	.6154454	.6076848	.6241570
P3	.3120259	.2791534	.3474526
P4	.4202266	.4346199	.4040994

SS(1) = 1703.13600 RSQ(1) = .76143
SS(2) = 893.47437 RSQ(2) = .76104
SS(3) = 791.03265 RSQ(3) = .76711

RELATIVE WEIGHTS

TWO GROUPS COMBINED	HQ AFCS	TCA UNITS
RW(1)= .1427660	RW(1)= .1641667	RW(1)= .1208534
RW(2)= .4974496	RW(2)= .4852318	RW(2)= .5078437
RW(3)= .1278649	RW(3)= .1023949	RW(3)= .1573742
RW(4)= .2319194	RW(4)= .2482057	RW(4)= .2128721

F - TEST VALUE FOR COMPARING THE 2 REGRESSION MODELS IN THIS ANALYTIC RUN:

4.82615

****

RELATIVE WEIGHTS COMPUTED FOR PREDICTOR VARIABLES, LISTED BY REGRESSION GROUP

P = 3
K = 4
N = 2524

SPSS REGRESSION RUN BETA WEIGHTS

	TWO GROUPS COMBINED	NCA	NCA UNITS
P1	.3349530	.3576236	.3221150
P2	.5892047	.5643008	.6039217
P3	.3188215	.3332323	.3106724
P4	.4173202	.4121910	.4205441

SS(1) = 2245.38369 RSQ(1) = .73516
SS(2) = 818.16979 RSQ(2) = .72728
SS(3) = 1413.81727 RSQ(3) = .74185

RELATIVE WEIGHTS

TWO GROUPS COMBINED	NCA	NCA UNITS
RW(1)= .1526110	RW(1)= .1758534	RW(1)= .1398640
RW(2)= .4722267	RW(2)= .4378443	RW(2)= .4916377
RW(3)= .1382653	RW(3)= .1526837	RW(3)= .1301036
RW(4)= .2368956	RW(4)= .2336121	RW(4)= .2384004

F - TEST VALUE FOR COMPARING THE 2 REGRESSION MODELS IN THIS ANALYTIC RUN:

3.13790

RELATIVE WEIGHTS COMPUTED FOR PREDICTOR VARIABLES, LISTED BY REGRESSION GROUP

P = 3
K = 4
N = 2464

SPSS REGRESSION RUN BETA WEIGHTS

	TWO GROUPS COMBINED	SACCA	SACCA UNITS
P1	.3080714	.3302284	.2904920
P2	.6233184	.6301606	.6180874
P3	.3309416	.3140704	.3445501
P4	.4291519	.4170775	.4390004

SS(1) = 1802.11830 RSQ(1) = .77713
SS(2) = 786.04348 RSQ(2) = .77875
SS(3) = 1006.27949 RSQ(3) = .77785

RELATIVE WEIGHTS

TWO GROUPS COMBINED	SACCA	SACCA UNITS
RW(1)= .1221263	RW(1)= .1400331	RW(1)= .1084782
RW(2)= .4993496	RW(2)= .5099228	RW(2)= .4911384
RW(3)= .1409318	RW(3)= .1266648	RW(3)= .1526191
RW(4)= .2369891	RW(4)= .2233755	RW(4)= .2477616

F - TEST VALUE FOR COMPARING THE 2 REGRESSION MODELS IN THIS ANALYTIC RUN:

2.68230

RELATIVE WEIGHTS COMPUTED FOR PREDICTOR VARIABLES, LISTED BY REGRESSION GROUP

P = 3
K = 4
N = 2000

SPSS REGRESSION RUN BETA WEIGHTS

	TWO GROUPS COMBINED	TCA	TCA UNITS
P1	.3304499	.3616129	.3044796
P2	.6209472	.6173115	.6241570
P3	.3372976	.3252636	.3474526
P4	.4012187	.3967088	.4050994

SS(1) = 1415.19200	RSQ(1) = .76952
SS(2) = 617.27047	RSQ(2) = .77501
SS(3) = 791.03265	RSQ(3) = .76711

RELATIVE WEIGHTS

TWO GROUPS COMBINED	TCA	TCA UNITS
RW(1)= .1419021	RW(1)= .1687254	RW(1)= .1208534
RW(2)= .5010597	RW(2)= .4917014	RW(2)= .5078437
RW(3)= .1478450	RW(3)= .1365097	RW(3)= .1573742
RW(4)= .2091907	RW(4)= .2030656	RW(4)= .2139270

F - TEST VALUE FOR COMPARING THE 2 REGRESSION MODELS IN THIS ANALYTIC RUN:

1.94686

RELATIVE WEIGHTS COMPUTED FOR PREDICTOR VARIABLES, LISTED BY REGRESSION GROUP

P = 3
K = 4
N = 2992

SPSS REGRESSION RUN BETA WEIGHTS

	TWO GROUPS COMBINED	NCA UNITS	SACCA UNITS
P1	.3076825	.3221150	.2904820
P2	.6102335	.6039217	.6180874
P3	.3259705	.3106724	.3445501
P4	.4287756	.4205441	.4390004

SS(1) = 2431.30603 RSQ(1) = .75716
SS(2) = 1413.81727 RSQ(2) = .74185
SS(3) = 1006.27949 RSQ(3) = .77785

RELATIVE WEIGHTS

TWO GROUPS COMBINED	NCA UNITS	SACCA UNITS
RW(1)= .1250311	RW(1)= .1398640	RW(1)= .1084782
RW(2)= .4919180	RW(2)= .4916377	RW(2)= .4911384
RW(3)= .1403359	RW(3)= .1301036	RW(3)= .1526191
RW(4)= .2428133	RW(4)= .2384004	RW(4)= .2477616

F - TEST VALUE FOR COMPARING THE 2 REGRESSION MODELS IN THIS ANALYTIC RUN:

2.76237

RELATIVE WEIGHTS COMPUTED FOR PREDICTOR VARIABLES, LISTED BY REGRESSION GROUP

P = 3
K = 4
N = 2704

SPSS REGRESSION RUN BETA WEIGHTS

	TWO GROUPS COMBINED	NCA UNITS	TCA UNITS
P1	.3152028	.3221150	.3044796
P2	.6117128	.6039217	.6241570
P3	.3249600	.3106724	.3474526
P4	.4144714	.4205441	.4050994

SS(1) = 2210.26524 RSQ(1) = .75093
SS(2) = 1413.81727 RSQ(2) = .74185
SS(3) = 791.03265 RSQ(3) = .76711

RELATIVE WEIGHTS

TWO GROUPS COMBINED	NCA UNITS	TCA UNITS
RW(1)= .1323063	RW(1)= .1398640	RW(1)= .1208534
RW(2)= .4983055	RW(2)= .4916377	RW(2)= .5078437
RW(3)= .1406243	RW(3)= .1301036	RW(3)= .1573742
RW(4)= .2287651	RW(4)= .2384004	RW(4)= .2139270

F - TEST VALUE FOR COMPARING THE 2 REGRESSION MODELS IN THIS ANALYTIC RUN:

1.32334

RELATIVE WEIGHTS COMPUTED FOR PREDICTOR VARIABLES, LISTED BY REGRESSION GROUP

P = 3
K = 4
N = 2432

SPSS REGRESSION RUN BETA WEIGHTS

	TWO GROUPS COMBINED	TCA UNITS	SACCA UNITS
P1	.2964117	.3044796	.2904820
P2	.6203914	.6241570	.6180874
P3	.3456229	.3474526	.3445501
P4	.4239911	.4050994	.4390004

SS(1) = 1809.35773 RSQ(1) = .77179
SS(2) = 791.03255 RSQ(2) = .76711
SS(3) = 1006.27949 RSQ(3) = .77785

RELATIVE WEIGHTS

TWO GROUPS COMBINED	TCA UNITS	SACCA UNITS
RW(1)= .1138391	RW(1)= .1208534	RW(1)= .1084782
RW(2)= .4986920	RW(2)= .5078437	RW(2)= .4911384
RW(3)= .1547768	RW(3)= .1573742	RW(3)= .1526191
RW(4)= .2329241	RW(4)= .2139270	RW(4)= .2477616

F - TEST VALUE FOR COMPARING THE 2 REGRESSION MODELS IN THIS ANALYTIC RUN:

3.24645

APPENDIX G

t-TEST VALUES

This Appendix contains the results of t-Test computations for comparing middle management group evaluations against AFCS senior manager evaluations.

AFCS DECISION ANALYSIS

COMPARISON OF DECISIONS MADE BY SENIOR AFCS MANAGERS WITH THOSE OF MIDDLE MANAGERS

(STUDENT T - TEST, ALPHA = 0.05)

AFCS HEADQUARTERS

DECISION NUMBER	T - TEST VALUE
1	6.983
2	3.697
3	2.772
4	-.667
5	1.923
6	.726
7	-.637
8	-.900
9	.535
10	1.369
11	-1.108
12	3.751
13	-.622
14	0.000
15	1.655
16	1.061

DEGREES OF FREEDOM = 69

NORTHERN COMMUNICATIONS AREA

DECISION NUMBER	T - TEST VALUE
1	6.324
2	1.647
3	1.661
4	.216
5	1.462
6	-.592
7	.838
8	-.208
9	-2.030
10	2.305
11	-.183
12	5.801
13	.283
14	2.985
15	-1.139
16	-1.071

DEGREES OF FREEDOM = 60

SAC COMMUNICATIONS AREA

DECISION NUMBER	T - TEST VALUE
1	5.051
2	4.382
3	2.138
4	.343
5	1.008
6	1.125
7	-.478
8	.516
9	-.352
10	.679
11	-.894
12	2.751
13	-1.829
14	1.872
15	-.612
16	1.307

DEGREES OF FREEDOM = 68

TAC COMMUNICATIONS AREA

DECISION NUMBER	T - TEST VALUE
1	4.822
2	2.035
3	3.143
4	-.800
5	.499
6	.284
7	-1.634
8	.247
9	-2.387
10	1.714
11	-1.740
12	4.659
13	-2.020
14	2.258
15	-2.034
16	.909

DEGREES OF FREEDOM = 57

NCA UNITS

DECISION NUMBER	T - TEST VALUE
1	4.851
2	6.126
3	2.578
4	-.516
5	1.185
6	-1.145
7	-1.633
8	-.708
9	-.572
10	1.302
11	-1.916
12	2.605
13	-1.221
14	1.168
15	.421
16	.314

DEGREES OF FREEDOM = 101

SACCA UNITS

DECISION NUMBER	T - TEST VALUE
1	5.572
2	8.838
3	1.420
4	2.651
5	2.354
6	-.149
7	-.650
8	.430
9	1.983
10	.242
11	.946
12	4.084
13	.269
14	2.916
15	-.239
16	.196

DEGREES OF FREEDOM = 84

TCA UNITS

DECISION NUMBER	T - TEST VALUE
1	4.221
2	4.782
3	1.755
4	1.711
5	-.353
6	-1.338
7	-1.976
8	.269
9	-.593
10	1.521
11	-.760
12	3.574
13	-2.156
14	1.920
15	-2.246
16	.972

DEGREES OF FREEDOM = 66

BIBLIOGRAPHY

1. AFCSR 100-17. NAVAIDS Communications Management Office. Richards-Gebaur Air Force Base, Mo.: Air Force Communications Service, May 1975.

2. AFCSR 125-1. Reports of Serious Crimes/Incidents (RCS: CSV-IG (AR) 7102). Richards-Gebaur Air Force Base, Mo.: Air Force Communications Service, August 1974.

3. AFM 65-110. Standard Aerospace Vehicle and Equipment Inventory, Status and Utilization Reporting. Washington: Department of the Air Force, October 1975.

4. AFM 65-265. Communications-Electronics-Meteorological Equipment Status Reporting. Washington: Department of the Air Force, September 1973.

5. Beach, Lee Roy. "Multiple Regression as a Model for Human Information Utilization." Organizational Behavior and Human Performance, 2, 276-289 (1967).

6. Boneau, C. Alan. "The Effects of Violations of Assumptions Underlying the t-Test." Psychological Bulletin, 57, 49-64 (1960).

7. Brunswick, Egon. The Conceptual Framework of Psychology. Chicago: The University of Chicago Press, 1952.

8. Chow, Gregory C. "Tests of Equality Between Sets of Coefficients in Two Linear Regressions." Econometrica, 28, 591-605 (July 1960).

9. Christal, Raymond E. "JAN: A Technique for Analyzing Group Judgement." The Journal of Experimental Education, 36, 24-27 (1968a).

10. Christal, Raymond E. "Selecting a Harem - and Other Applications of the Policy-Capturing Model." The Journal of Experimental Education, 36, 35-41 (1968b).

11. Darlington, Richard B. "Multiple Regression in Psychological Research and Practice." Psychological Bulletin, 69, 161-182 (March 1968).

12. Draper, N. R., and Harry Smith. Applied Regression Analysis. New York: John Wiley and Sons, Inc., 1966.

13. Etzioni, A. Modern Organizations. Englewood Cliffs, N. J.: Prentice-Hall, Inc., 1964.

14. Freund, J. E. Mathematical Statistics. Englewood Cliffs, N. J.: Prentice-Hall, Inc., 1971.

15. Goldberg, Lewis R. "Man Versus Model of Man: A Rationale, Plus Some Evidence, for a Method of Improving on Clinical Inference." Psychological Bulletin, 73, 422-432 (1970).

16. Gross, B.M. Organizations and Their Managing. New York: Free Press, 1968.

17. Harrell, Adrian M. "Organizational Goals and the Decision-Making of Air Force Staff Officers: A Behavioral Experiment." AFIT Technical Report 75-6, Air Force Institute of Technology, Wright-Patterson Air Force Base, Ohio (May 1975).

18. Harrell, Adrian M. "The Monsen and Downs Theory: Some Empirical Evidence from a Military Organization." Proceedings of the American Institute for Decision Sciences, Western Regional Conference, 244-246 (March 1977).

19. Hoffman, Paul J. "The Paramorphic Representation of Clinical Judgement." Psychological Bulletin, 47, 116-131 (1960).

20. Hoffman, Paul J., Paul Slovic, and Leonard G. Rorer. "An Analysis of Variance Model for the Assessment of Configural Cue Utilization in Clinical Judgement." Psychological Bulletin, 69, 338-349 (May 1968).

21. Horngren, Charles T. Cost Accounting: A Managerial Emphasis. Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1972.

22. Leavitt, H.J., ed. The Social Science of Organizations. Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1963.

23. Knox, R.E., and P.J. Hoffman. "Effects of Variation of Profile on Intelligence and Sociability Judgements." Journal of Applied Psychology, 46, 14-20 (1962).

24. Litterer, J.A. The Analysis of Organizations. New York: Wiley and Sons, Inc., 1965.

25. Manley, T. Roger. "Personal Value Systems of Managers and the Operative Goals of the Organization: An In-depth Analysis of One Firm." AFIT Technical Report TR 72-5, Air Force Institute of Technology, Wright-Patterson Air Force Base, Ohio (May 1972).

26. Monsen, J.R., and Anthony Downs. "A Theory of Large Managerial Firms." The Journal of Political Economy, 211-236 (June 1965).

27. Nie, N.H., C.H. Hull, J.G. Jenkins, K. Steinbrenner, and D.H. Bent. Statistical Package for the Social Sciences. New York: McGraw-Hill Book Company, 1975.

28. Porter, L. W., E. E. Lawler III, and J. R. Hackman. Behavior in Organizations. New York: McGraw-Hill Book Company, 1975.

29. Schein, E. H. Organizational Psychology. Englewood Cliffs, N. J.: Prentice-Hall, Inc., 1970.

30. Scott, W. E. "Activation Theory and Task Design." Organizational Behavior and Human Performance, 1, 3-30 (1966).

31. Simon, H. A. "Comments on the Theory of Organization." American Political Science Review, 46, 1130-1139 (1952).

32. Simon, H. A. "On the Concept of Organizational Goal." Administrative Science Quarterly, 9 1-22 (June 1964).

33. Slovic, Paul, and Sarah Lichtenstein. "Comparison of Bayesian and Regression Approaches to the Study of Information Processing in Judgement." Organizational Behavior and Human Performance, 6, 649-744 (1971).

34. Speigel, Murray R. Probability and Statistics. New York: McGraw-Hill Book Company, 1975.

35. Wiggins, N., and E. S. Kohen. "Man Versus Model of Man Revisited: The Forecasting of Graduate School Success." Journal of Personality and Social Psychology, 19, 100-106 (1971).

V I T A

Carl G. O'Berry was born in Lansing, Michigan on April 11, 1936, the son of Gerald Ray O'Berry and Edith Watson O'Berry. He completed high school in Grand Ledge, Michigan in 1954, and enlisted in the U.S. Air Force in January, 1957, after working on an automobile assembly line for two years. He was commissioned through the Air Force Officer Candidate School in December, 1961. He received the Bachelor of Science degree in Electrical Engineering from New Mexico State University in January, 1973, and entered the Air Force Institute of Technology in June, 1976, to seek the Master of Science degree in Systems Management. He has served as a communications squadron Chief of Operations, Chief of Maintenance, and Commander. He has also held staff positions as Director of Operations in the Far East Communications Region (Japan), programming officer at Air Force Communications Service headquarters, and communications group Chief of Maintenance in Southeast Asia. He has attended the Air Force Squadron Officer School, the Air Force Communications-Electronics Staff School, and the Armed Forces Staff College.

Permanent Address: 229 Douglas Avenue
Lansing, Michigan 48906

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

1. REPORT NUMBER: (14) AFIT/GSM/SM/77S-13
2. GOVT ACCESSION NO.:
3. RECIPIENT'S CATALOG NUMBER:
4. TITLE (and Subtitle): (6) AN EXPERIMENTAL TEST FOR GOAL CONGRUENCE IN AN AIR FORCE MAJOR COMMAND.
5. TYPE OF REPORT & PERIOD COVERED: MS Thesis
6. PERFORMING ORG. REPORT NUMBER:
7. AUTHOR(s): (10) Carl G./O'Berry, Lt Col, USAF
8. CONTRACT OR GRANT NUMBER(s):
9. PERFORMING ORGANIZATION NAME AND ADDRESS: Air Force Institute of Technology (AFIT-EN), Wright-Patterson AFB, Ohio 45433
10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS:
11. CONTROLLING OFFICE NAME AND ADDRESS: (9) Master's thesis,
12. REPORT DATE: (11) September 1977
13. NUMBER OF PAGES: 149
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office): (12) 153p.
15. SECURITY CLASS. (of this report): Unclassified

15a. DECLASSIFICATION/DOWNGRADING SCHEDULE:

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; distribution unlimited.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

Approved for public release IAW AFR 190-17.
JERRAL F. GUESS, Captain, USAF
Director of Information

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Goals	Organizational Goals
Goal Congruence	Behavior Modeling
Linear Model	Decision Analysis
Multivariate Regression	Human Judgement
Regression Model	Policy Capturing

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

The policy-capturing model frequently used in psychological research was adapted in this study to test for goal congruence between managers at different levels of a large service organization of the U.S. Air Force. The data base was derived from a field experiment wherein 660 military officers and civilian managers were asked to make decisions based on identical information cues. The decisions were then grouped according to command level and a multivariate linear regression model was derived for each group. An

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

012 225

LB

F-test was used to compare these models for equality of regression coefficients, as a determinant of the effectiveness of goal communication between organizational layers. The linear regression model proved readily adaptable as an analytical instrument for organizational study. The results appeared reasonably conclusive, with significant differences in decision-making behavior being indicated at different command levels. Finally, a comparison of the decisions of senior executives against those of various middle management groups was made as a test of the importance of goal congruence. It was found that the decisions of senior managers and subordinate middle management groups, made under identical conditions, differed significantly in some cases. These differences suggest that goal congruence within the Command might have considerable importance, and that it might be improved through a more effective management information system.