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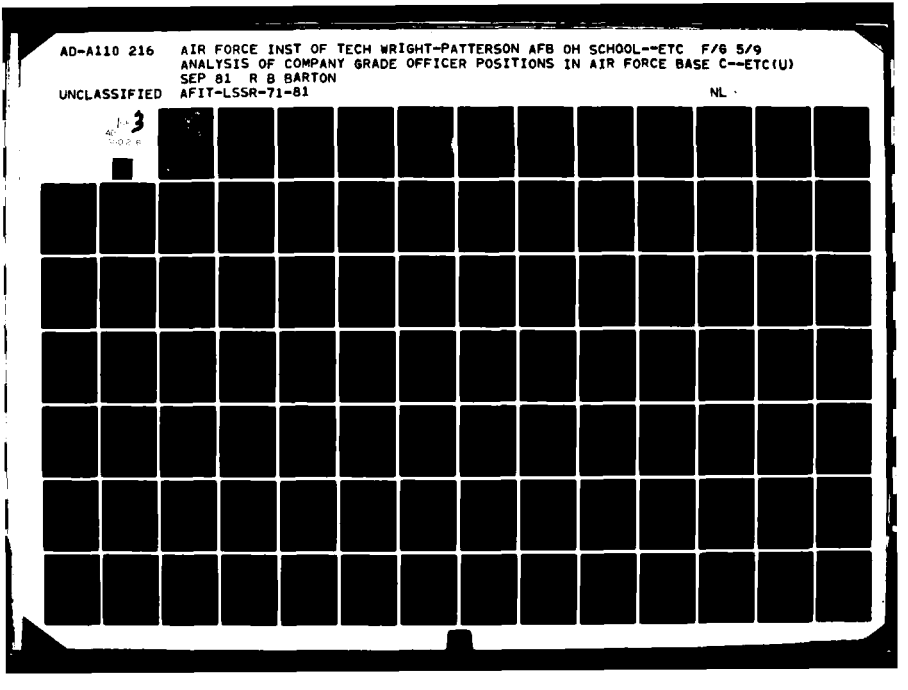

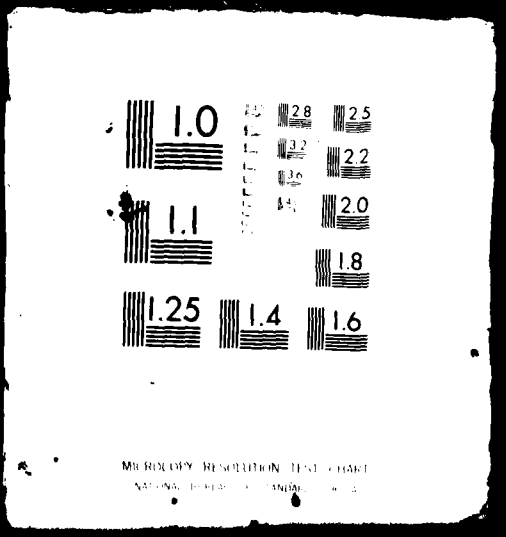

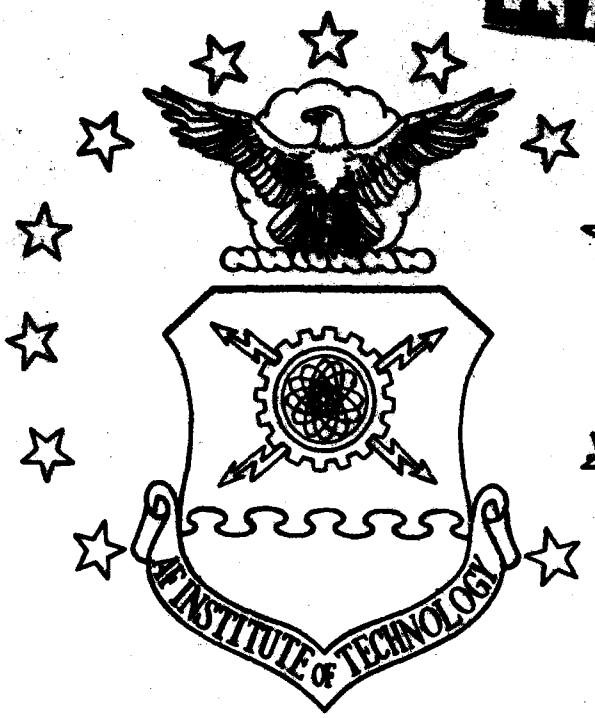

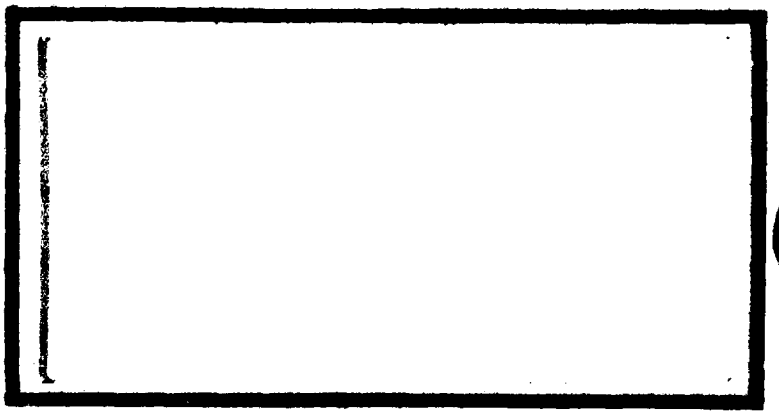

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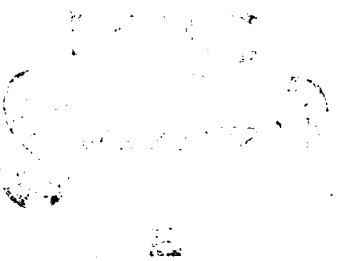

ANALYSIS OF COMPANY GRADE OFFICER POSITIONS IN AIR FORCE BASE CIVIL ENGINEERING AND SPECIFIC RECOMMENDATIONS FOR IMPROVEMENT

Robert B. Barton Jr., 1st Lt, USAF

LSSR 71-81

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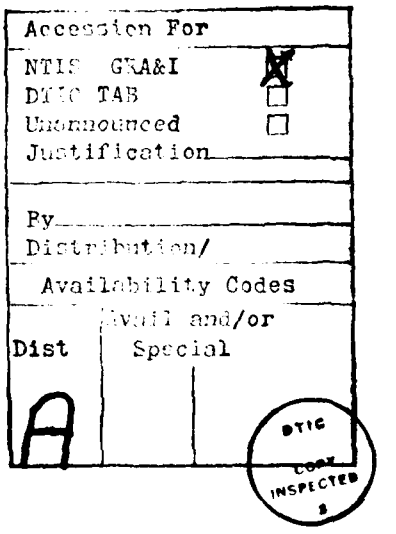

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The purpose of this study was to evaluate company grade officer positions in Base Civil Engineering, highlight strengths and weaknesses of each position, and recommend specific actions for improving the motivating potential of these positions. The Job Characteristics Model formed the basis of the analysis. Nearly 200 company grade officers in CONUS Base Civil Engineering units responded to the Job Diagnostic Survey. The survey provided measures of the Motivating Potential Score for each position and the Growth Needs Strength of each respondent. The researcher hypothesized that the Motivating Potential Score would be significantly lower for the Engineering and Environmental Planning positions than for the Chief of Readiness and Logistics, Chief of Resources and Requirements, or the Industrial Engineering positions. Although many of the individual constructs such as task autonomy and task significance were significantly lower in EEP positions, none of the Motivating Potential Scores in company grade Base Civil Engineering positions were found to be significantly different. A second hypothesis was formulated to compare Motivating Potential Scores and constructs of this study's sample with normative data. Base Civil Engineering company grade officer positions had Motivating Potential Scores that were significantly below the normative levels established for professionals.

LSSR 71-81

ANALYSIS OF COMPANY GRADE OFFICER POSITIONS IN AIR FORCE BASE CIVIL ENGINEERING AND SPECIFIC RECOMMENDATIONS FOR IMPROVEMENT

A Thesis

Presented to the Faculty of the School of Systems and Logistics

of the Air Force Institute of Technology

Air University

In Partial Fulfillment of the Requirements for the

Degree of Master of Science in Engineering Management

By

Robert B. Barton Jr., BSCE
1st Lt, USAF

September 1981

ABSTRACT

The purpose of this study was to evaluate company grade officer positions in Base Civil Engineering, highlight strengths and weaknesses of each position, and recommend specific actions for improving the motivating potential of these positions. The Job Characteristics Model formed the basis of this analysis. Nearly 200 company grade officers in CONUS Base Civil Engineering units responded to the Job Diagnostic Survey. The survey provided measures of the Motivating Potential Score for each position and the Growth Needs Strength of each respondent. The researcher hypothesized that the Motivating Potential Score would be significantly lower for the Engineering and Environmental Planning (EEP) positions than for the Chief of Readiness and Logistics, Chief of Resources and Requirements, or the Industrial Engineering positions. Although many of the individual constructs such as task autonomy and task significance were significantly lower in EEP positions, none of the Motivating Potential Scores in company grade Base Civil Engineering officer positions were found to be significantly different. A second hypothesis was formulated to compare Motivating Potential Scores of civil engineering officers with established standards. Base Civil Engineering company grade officer positions had Motivating Potential Scores that were significantly below the normative levels established for professionals.

This thesis, written by

1st Lt Robert B. Barton Jr.

has been accepted by the undersigned on behalf of the Faculty of the School of Systems and Logistics in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE IN ENGINEERING MANAGEMENT

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I also wish to recognize the efforts of other AFIT faculty members whose expertise and experience contributed immeasurably to key elements of this thesis. Lt Col David R. Lee, program manager, was largely responsible for the success of the survey mailout. Major Russell F. Lloyd provided guidance on the Job Characteristic Model and obtained much of the preliminary data used in this research. Captain Brian T. Woodruff allocated many hours of his time in the statistical analysis and evaluation of the survey data.

Finally a special acknowledgement to my wife Sallie and daughter Jennifer for their encouragement, patience, and sacrifice; without which the accomplishment of this thesis would have been impossible.

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CHAPTER I

INTRODUCTION

BACKGROUND

Base Civil Engineering Company Grade Officer Positions

The mission of the Base Civil Engineering Organization (BCE) according to AFR 85-1 is to maintain and repair all existing base facilities and to construct or acquire any new facilities required to support the operational missions of the base.(14:1-1) In order to accomplish this mission, the organization needs engineering expertise and middle managers with engineering backgrounds. These are the two basic roles of the company grade officer in the BCE organization. Figure 1-1 is an organizational chart showing the formal BCE organization; company grade officer positions are asterisked. Most of the highly technical engineering expertise is required in the Engineering and Environmental Planning (EEP) branch and this is typically the first branch a company grade officer is assigned. The middle management positions in the BCE organization for company grade officers include the Chief of Industrial Engineering (IE), the Chief of Readiness and Logistics (R&L), and the Chief of Resources and Requirements (R&R).

The Engineering and Environmental Planning branch is further divided into three major sections; Environmental and Contract Planning, Construction Management, and Engineering Technical and Design. A company grade officer may be assigned to one or all of these sections depending on the base, branch chief, and experience of the company grade officer. The Chief of Industrial Engineering is usually a company grade officer with an Industrial Engineering or management science background. The Chief of Readiness and Logistics requires no specific educational or

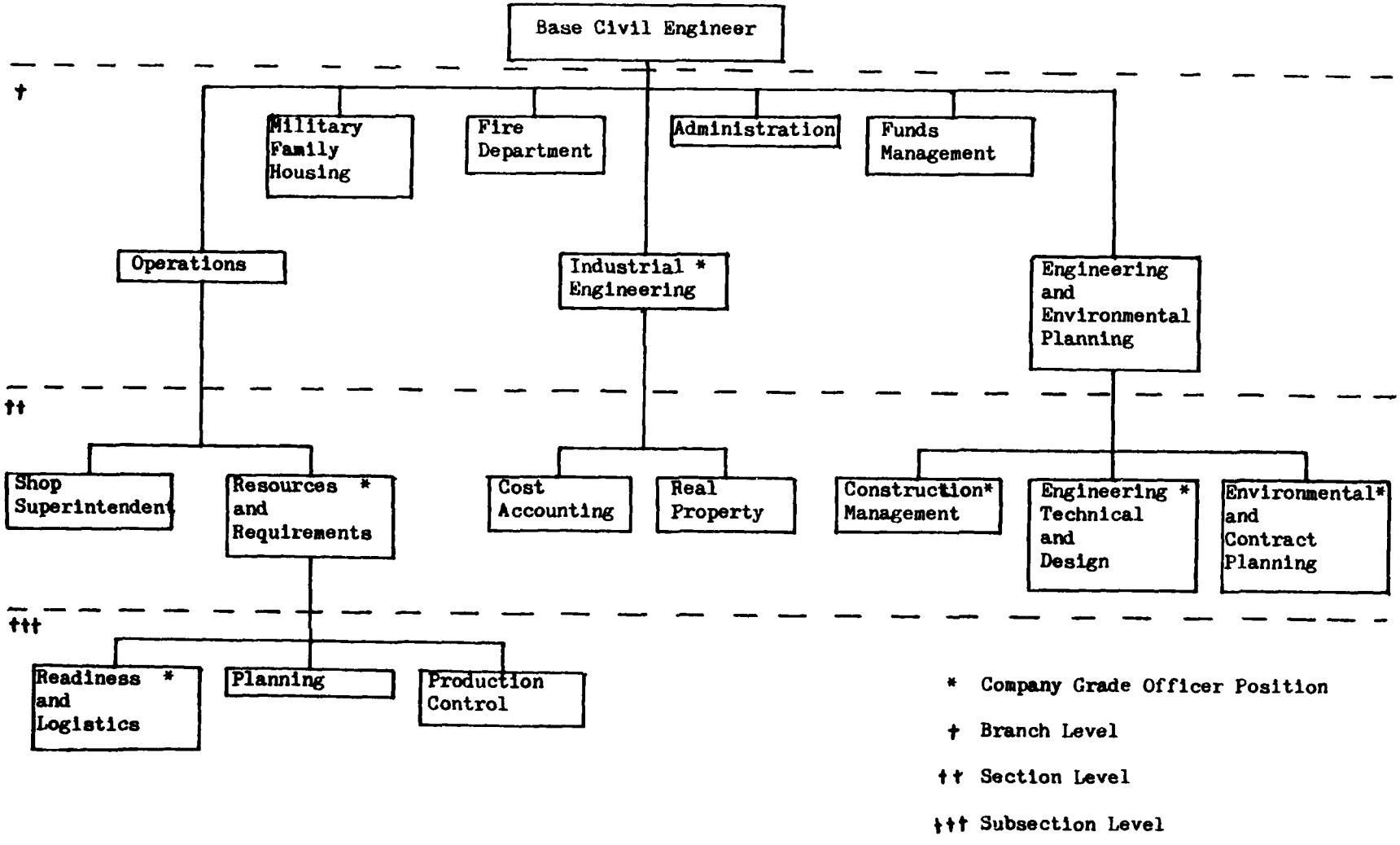


Figure 1-1 BCE Organizational Chart

training background and is normally manned by company grade officers with some previous experience in base civil engineering. The Chief of Resources and Requirements requires an extensive knowledge of BCE operations and is most often manned by an O-2 or O-3.

Environmental and Contract Planning. The direct responsibilities of officers assigned to Environmental and Contract Planning include community planning, environmental protection planning, natural resource planning, and contract planning. As a community planner the officer must develop, coordinate, and implement comprehensive and land use plans. The position also requires the establishment and analysis of Air Installation Compatable Use Zones (AICUZ). Environmental Planning involves the development of environmental impact assessments, Air Quality Assessment Modeling (AQAM), water, oil, and noise pollution control, and solid waste management. Wildlife, fish, and forest management are part of the natural resource planning responsibilities. The contract planner maintains plans and programs for all work performed by contract and prepares budget information for contract requirements. Indirect responsibilities of officers assigned to this section include limited supervision, administration, training, and other miscellaneous duties not including additional duties. Manning authorized for this section ranges from 2 to 6 company grade officers with a mode of 3 officers authorized. (11:3)

Construction Management. The officers assigned to Construction Management are responsible for three basic types of contracts; project, surveillance, and service. The project contract is one involving construction, repair, or maintenance of a facility. The surveillance contract is essentially a contract for inspection services on a project or service contract. A service contract is a contract for such services as custodial, refuse collection, or alarm system maintenance. The construction manager is responsible for

contract initiation, compliance inspection, acceptance inspection, and the warranty and guarantee program. Initiation involves a constructability and familiarization review of the contractor's proposals, approval or disapproval of the contractor's progress schedule, shop drawings, material submittals, and equipment, and coordination of Government Furnished Equipment and Services. The compliance inspection requires a daily in-progress inspection, identification of field changes, and reporting contractor non-compliance. In addition to completion of numerous reports, the compliance inspection duties include coordination of disputes, revision of as-built drawings and coordination of utility outages. Before the acceptance inspection, the construction manager is responsible for coordinating and confirming the inspection date and time, transferring custody of the site from the contractor to the government, and disposition of excess supplies, material, and equipment. The warranty and guarantee program manager monitors the coverages of warranties, the exercise of those warranties in the event of facility failure, and the reporting of contractor default on warrantied items. Indirect responsibilities of officers assigned to this section include limited supervision, training, administration, and other miscellaneous duties not including additional duties. Manning authorized for this section varies from base to base with the normal requirement being for one captain and two lieutenants. (9:2)

Engineering Technical and Design. The responsibilities of the officers in this section include project design, military construction program (MCP) project preparation, architect-engineer (A-E) project design, and surveying and engineering support. This section interacts with the contract planning section in such areas as utility, recurring and non-recurring contracts. Project design involves coordination of the design with the using agency, investigation of site conditions, preparation of the project package for

procurement and administration of site visits. Changes in site conditions and initiation of contract modifications are responsiblilities of the project design engineer. MCP project preparation is the development of the 12-tab project book which requires coordination with the contract planner, review of the preliminary and final design, and assistance to the MCP inspector. Designing an architect-engineer project requires the development of a statement of work, conferences and negotiations with the A-E firm, and preparation of the project package for procurement. In addition, the preparation and maintenance of an A-E qualifications file is part of these responsibilities. Surveying support includes airfield obstruction and airfield pavement condition surveys. Corrosion control, energy conservation, traffic engineering, and fallout shelter analysis are important duties of engineering support. Utility contracts involve the monitoring of electric, water, sewage disposal, and television service contracts. Recurring and non-recurring service contract resposibilities include the preparation or revision of the technical specifications and development of cost estimates. Indirect duties in this section are limited supervision, administration, training, and other miscellaneous duties not including additional duties. Up to twenty company grade officers may be assigned to this section at very large installations. The number authorized varies depending on the amount and type of design work programmed for that base. (10:4)

Chief of Industrial Engineering. The Chief of Industrial Engineering is a branch chief at the same organizational level as the Chief of Operations and Chief of Engineering and Environmental Planning. Amoung the primary duties of the IE are work analysis, methods improvement engineering, evaluation, and supervision. Under work analysis, the Chief of Industrial Engineering

conducts analytical studies on the effective uses of CE resources, conducts manpower analysis to verify and validate BCE Unit Manning Document authorizations, develops and analyzes effectiveness of Engineered Performance Standards. Work analysis by the IE also includes the presentation and preparation of statistical and graphical analysis, the random sampling of completed work orders and BCE ledger to validate accuracy, and the monitoring of the Base Engineering Automated Management System. In order to meet the methods improvement engineering requirements, the IE must preview performance standards and conduct operational analysis and work measurement studies. The IE evaluates the BCE work force on the quality and efficiency of accomplished work orders. The IE also evaluates BCE activities including BCE staff functions to determine if required standards are being maintained. The evaluation includes report preparation, briefing and follow-up evaluation. Supervision is perhaps the most important function of the Chief of Industrial Engineering. Under the IE function are cost analysis and real property. Typically the IE is a lieutenant with anywhere from 2-5 subordinates in the section. Subordinate supervision requires the use of a variety of management skills including motivation and counseling. (12:3)

Chief of Readiness and Logistics. The R&L function is relatively new and manpower standards are not yet available. According to AFR 85-1, the Chief of Readiness and Logistics is responsible for the operation of the Prime Base Engineer Emergency Force program, vehicle control, and material control. Operation of the Prime BEEF program includes the training, equipage, and planning for the entire base military CE force for possible contingencies and mobilization worldwide. Training includes the scheduling of BCE manpower for training attendance, developing the lesson plan for the training, conducting the training, and reporting training status to the Major Air Commands.

Equipping the Prime BEEF force includes determining the materiel requirements of the contingency force teams, obtaining the funds authorization from the BCE, and ordering, receiving and storing the material until issue. The Chief of R&L must also develop the BCE annex to the mobility plan and develop a Base Recovery Plan to include civilian responsibilities in a contingency environment. Management of the BCE vehicle fleet involves monitoring the status of vehicles, conducting accident/incident investigations, reviewing BCE vehicle fleet requirements with vehicles available and obtaining funds for vehicle operation. The largest responsibility of the R&L officer is the management of the BCE material control section. The responsibilities of this section include the ordering, monitoring, receiving, storing, and issuing of all BCE materiel requirements. The Chief of R&L is primarily a manager. This section typically consists of a lieutenant and an NCO or civilian chief of the three major subsystems. The R&L section is one of the most diverse in areas of operation in the BCE organization; it, therefore, requires a great deal of management skill.

Chief of Resources and Requirements. Probably the broadest responsibility a company grade officer may attain in the BCE organization is as the Chief of Resources and Requirements (R&R). The R&R function has three major subsystems, Production Control, Readiness and Logistics, and Planning. Readiness and Logistics has already been examined and will not be addressed in this section. Production Control is responsible for the scheduling of the CE workforce, the monitoring of work requirements, and customer service. The Planning function determines the work and materials required to accomplish work requirements submitted to the organization. The direct duties of the Chief of R&R include the management of subordinate work center personnel. The Chief of Resources and Requirements' role is primarily as a manager

and as such the position allows for the broadest resposibilities assigned to a company grade officer. Under these management duties, the Chief of R&R indoctrinates newly assigned personnel and rates the performance of subordinate work center personnel. This position also includes the scheduling and monitoring of work center activity, reviewing reports and statistical data, developing budget estimates and inspecting facilities. The Chief of R&R must also review the visual and automated production control charts to discern potential problem areas and insure the validity of the inservice work program and work schedules. The R&R section usually consists of an experienced company grade officer such as a 1st lieutenant or junior captain but do to some personnel shortages, discussed in the next section, many new 2nd lieutenants have been assigned as the Chief of R&R. (13:2)

Current Civil Engineering Company Grade Officer Force Structure

As of May 1981, there were 2004 officers authorized in Air Force civil engineering and only 1716 of those were actually assigned. As Figure 1-2 shows, the percentage of assigned officers versus authorized, has been decreasing at an alarming rate. The most significant shortfall of assigned officers is at the rank of captain where only 508 are assigned versus 905 authorized. At the same time 638 lieutenants are assigned versus 355 authorized making this rank quite overmanned. The result of this force alignment is that lieutenants, which have traditionally filled technical roles in EEP, are now performing middle management tasks previously identified for captains. The projected manning for these middle management positions is not expected to change as a result of high turnover of company grade officer personnel. As the lieutenant has reached the four year commitment he or she has separated from the Air Force. Together, the company grade

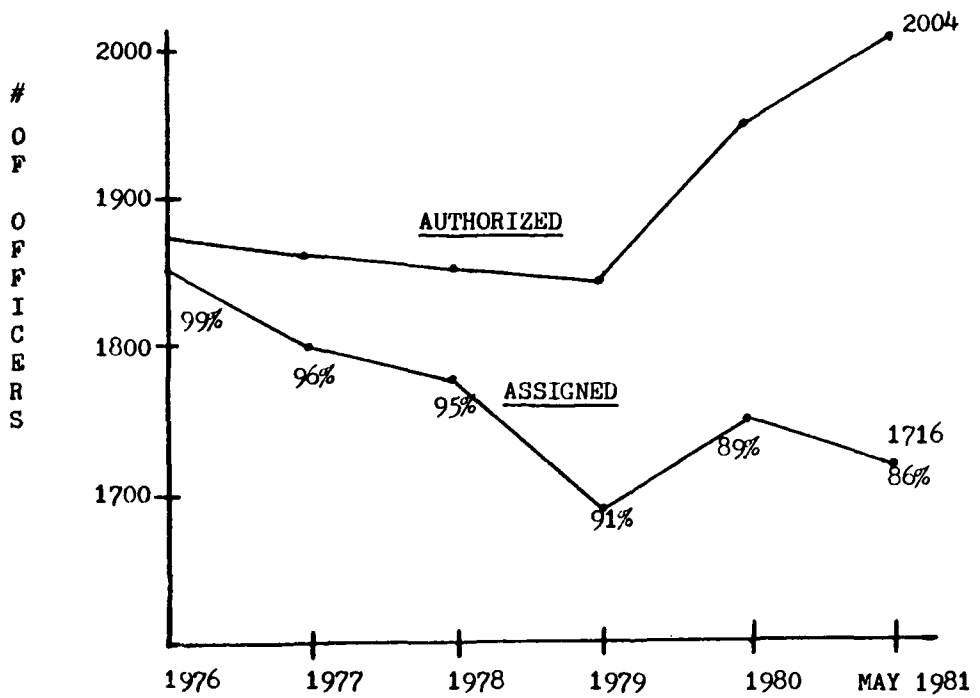


Figure 1-2 AFCE Force Dynamics

civil engineering officer force of 1146 assigned constitutes 67% of the total civil engineering officer force. (6)

Within base civil engineering 71% of the lieutenant and 40% of the captain authorizations in the continental U.S. (CONUS) are in EEP. One thousand four hundred and seventy officers are authorized in BCE CONUS units, however, emphasis has been on 100% manning of overseas BCE units thus creating an even greater shortfall of middle management experience at CONUS bases. The void created by the lack of middle management has been filled with the surplus of lieutenants resulting in 63% of the authorized captain positions currently being manned by lieutenants. (3) Therefore, lieutenants are manning positions such as Resources and Requirements, Industrial Engineering, and Readiness and Logistics on a much more frequent basis.

PROBLEM STATEMENT, PURPOSE, SCOPE

Problem Statement

The high rate of turnover of civil engineering company grade officers is a symptom or consequence of problems associated with being an Air Force officer in the civil engineering career field. These problems may often be job related in that the tasks and responsibilities required in base civil engineering company grade officer positions may be of such a nature as to cause a high rate of turnover. The high rate of turnover causes a loss of middle management experience and should be reduced by correcting the deficiencies which are job related.

Purpose

The purpose of this thesis effort is to identify the deficiencies

in base civil engineering company grade officer positions and make recommendations for corrective action. This will be accomplished through extensive collection and analysis of data on the four positions; EEP, IE, R&L, and R&R outlined earlier in this chapter. The results of this analysis, based on thoroughly tested and validated models of job characteristics and outcomes, will highlight specific weaknesses within these positions which, if corrected, could result in decreased rates of company grade officer turnover. The recommendations are to include an implementation strategy which will insure that the full impact of the changes is realized.

Scope

This investigation into the problems which have resulted in high turnover rates will be strictly limited to the analysis of the job characteristics of company grade officer positions in base civil engineering. Many other explanations may exist for the high rate of turnover such as pay dissatisfaction, military and Air Force civil engineering image, Air Force lifestyles, etc; however, job modification is one of the least complicated and most readily available solutions to the problem. This limitation is also important since it is the company grade officer positions which most heavily influence the decision of the four year lieutenant to separate from the Air Force. The research will involve comparisons of positions within civil engineering as well as a comparison of the base civil engineering positions with equivalent civilian industry positions which have attracted the Air Force civil engineering officer in the past.

RESEARCH ON OFFICER RETENTION

Some investigations into the area of company grade officer turnover

have been conducted in the Air Force. These studies have considered many of the variables that are measured in this study.

Major Ronald L. Blackburn and Captain Randall L. Johnson conducted research in 1978 on the relationships between retention determinants and job satisfaction and expressed career intent. Retention determinants included age, tenure, pay, promotion, peer group integration, role clarity, job autonomy, responsibility, task repetitiveness, supervisory style, and similarity of job interests. The relationship between job satisfaction and determinants was significant for most of the determinants. Only pay and promotion did not have a significant impact on job satisfaction. Expressed career intent and its relationship with the determinant variables was found to be insignificant.(26)

Major Willis K. Whichard Jr. conducted research in 1974 on the low retention of junior officers in the civil engineering career field. The sample consisted of company grade civil engineering officers in Air Training Command. The researcher attempted to determine the impact of low retention rates on CE mission accomplishment and the cost associated with replacing these officers. Whichard found that high rates of officer turnover was perpetuated by the dissatisfaction of the officer with the lack of adequate manpower to accomplish the mission. Therefore, these dissatisfied officers were in turn leaving the Air Force. Whichard also found that the management and supervision of the junior officer engineers impacted the retention rate. The relationship between these variables was not defined in the study. (33)

Major Richard L. Thompson in 1980 found that the interpersonal relationships between the civil engineering officers and their immediate supervisors impacted the officers' career intentions. Three significant

observations were identified. The first was the quality of supervision of the company grade officer affected the rate of retention. The second observation concluded that engineering officers received more feedback than most line officers. The final observation stated that supervisors should be made aware of their impacts on officer turnover. (34)

Johnson and Blackburn's study addressed many variables in their study. Their sample, however, did not focus on civil engineering officers. Whichard's study considered a small subset of company grade civil engineering officers in Air Training Command. His research concentrated on the impacts of low retention as opposed to their causes. Thompson's research was limited to the impact of a supervisor's characteristics on the company grade officer's retention rate. This research will address a large cross section of company grade officers and identify many more of the job related variables affecting turnover.

CHAPTER II

THE JOB CHARACTERISTICS MODEL

THE MODEL

There is currently a vast amount of literature concerning job design and worker motivation. In 1974, J. Richard Hackman of Yale University and Greg R. Oldham of the University of Illinois developed the Job Characteristics Model to "extend, refine, and systematize the relationship between job characteristics and individual responses to the work." [21:255] Figure 2-1 is a diagram developed by Hackman and Oldham to conceptualize their model. The three critical psychological states are the core of the Job Characteristics Model. According to Hackman and Oldham, ". . . an individual experiences positive affect to the extent that he learns (knowledge of results) that he personally (experienced responsibility) has performed well on a task that he cares about (experienced meaningfulness of the work)." [21:256] The positive affect caused by the presence of the three psychological states results in reinforcement to the individual to perform well in that position in the future. Hackman and Oldham also point out that a lack of any of these states in a job will result in significantly lower positive affect even given the presence of the other two states. Five core job dimensions, shown in the model, foster the emergence of the three critical psychological states. Skill variety, task identity, and task significance combine to contribute to the experienced meaningfulness of the work. Skill variety is the requirement of the individual to use a variety or number of the individual's skills and talents in the job. Task identity is defined as the degree to which the job requires completion of a "whole" or identifiable piece of work. Task significance is a measure of how much impact the job

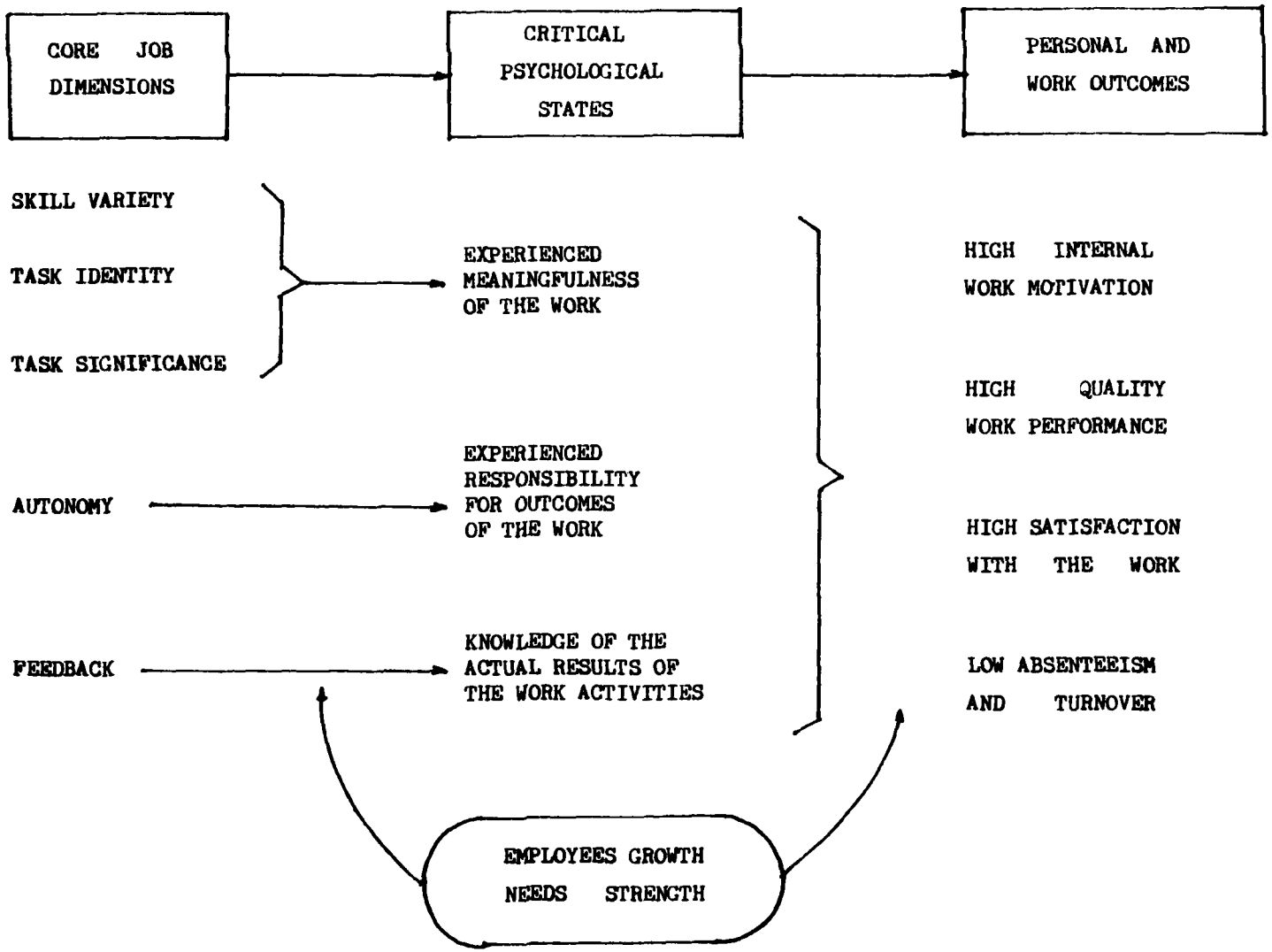


Figure 2-1 Job Characteristics Model

has on the lives or well being of other people. To the extent the job requires completion of a whole piece of work, a number of complex skills and talents, and has substantial impact on the well being of other people, experienced meaningfulness of the work will be present. Autonomy is the core job dimension which will result in experienced responsibility for outcomes of the work. If the job provides freedom for the individual to schedule the work and determine the method for accomplishing the job, it is considered to be high in autonomy. The psychological state of knowledge of results depends on the feedback core job dimension. Feedback is defined as the amount of clear and direct information received by the individual on the effectiveness of job performance. Hackman and Oldham summarized the core job dimensions into a Motivating Potential Score (MPS) which is a measure of the degree to which the job meets the conditions of the core dimensions. MPS is calculated as:

$$\text{Motivating Potential Score} = \frac{\text{Skill Variety} + \text{Task Identity} + \text{Task Significance}}{3} \times \text{Feedback} \times \text{Autonomy}$$

If all the above conditions are met, the job will have a high MPS and there are some expected outcomes of the job. A high MPS will result in, according to the model, high internal work motivation, high quality work performance, high satisfaction with the work, and low absenteeism and turnover. Of particular interest is the outcome low turnover of personnel. Hackman and Oldham's model differs from most other job factor models in that the Job Characteristics Model accounts for individual differences in employees and their affective reactions to jobs that are high in motivating potential. Hackman and Oldham defined this variable as an Individual's Growth Needs Strength (GNS). GNS is simply the desire an individual has for meaningful

work, feedback, and experienced responsibility for work outcomes. GNS, according to the model, moderates the individual's reaction to the psychological states and resulting outcomes of a high MPS job. An individual with high GNS would react more favorably to a high MPS job than a co-worker with a low GNS. (21:259)

The Job Characteristics Model was tested using data from 658 employees working on 62 different jobs in seven organizations. The data collection instrument was the Job Diagnostic Survey (JDS) which will be discussed later in this chapter. The results of this testing validated the model and relationships between the critical psychological states, core job dimensions, and expected outcomes.

RESEARCH ON THE MODEL AND GROWTH NEEDS STRENGTH

Subsequent research on the Job Characteristics Model and intervening variables such as Growth Needs Strength has been conducted since Hackman and Oldham introduced the model in 1974. Much of the research tested the effects of individual differences and moderators other than growth needs strength. Seeborg (1978) found that the way job changes are implemented are as important as the job changes themselves. Stone (1976) and Steers (1976) researched the effects of need for achievement as a moderator of task characteristics but these studies resulted in contradictory findings. Ganster (1979) and Cherrington (1979) tested the moderating effects of the presence of a protestant work ethic; both found a lack of evidence supporting significant effects. White and Mitchell (1978) found social cues emitted by co-workers to significantly moderate the job characteristics and job satisfaction/performance relationship. This study was further validated in a later study by O'Reilly and Caldwell (1978). Stone found that field

independence, the individual's ability to ignore situational factors, was directly related to perceptions of task characteristics. Three other studies investigated the impacts of socioeconomic status and individual background on perceptions of job characteristics. Most of the evidence fails to support the significant influence of these variables.

The studies which directly tested the moderating effects of growth needs strength are conflicting in their results. In a follow up study by Hackman and Oldham in 1976, they replicated their previous results for the moderating effects of high levels of growth needs strength but found that the model was only weakly supported for lower levels of this variable. Other studies which tended to support the hypothesis set forth by Hackman and Oldham include Beehr (1975), Halim (1979), and Arnold (1978), and the model was at least partially supported by Pierce (1979). Gilmore (1979) found that growth needs strength did not moderate all the job characteristics identified in the model; only those of task significance and feedback were significantly moderated. The studies which directly contradict the Job Characteristics Model of growth needs strength are just as prevalent as those that support the model. Ganster (1979), Cherrington (1979), White (1977), and Evans (1976) found only limited support for growth needs strength as a moderator. Goodale (1977) found support for the relatively unchanging nature of levels of growth needs strength within individuals. Finally, Dunham (1976) concluded that two variables identified by Hackman and Oldham in 1974, task variety and task significance, actually formed one factor.

Although review of the research tends to suggest that growth needs strength by itself does not adequately explain employee reactions to job characteristics, the model is still extremely useful in the analysis of the BCE company grade officer positions. The limitations of the model discussed

in this review must be considered in the conclusions derived from the analysis of collected data on these positions. The data collection instrument, the Job Diagnostic Survey (JDS), remains a valid instrument for model analysis and will be discussed in the following section. A detailed description of the research reviewed in this section is presented in Appendix F.

THE JOB DIAGNOSTIC SURVEY

Introduction

The Job Diagnostic Survey (JDS) was designed to measure three classes of variables in the Job Characteristics Model, the objective characteristics, the personal affective reaction of individuals toward their jobs, and the readiness of individuals to respond to enriched jobs. The objective characteristics are the core job dimensions which include skill variety, task identity, task significance, autonomy, and feedback. The personal affective reactions of individuals are the feelings an individual obtains from doing the job and include general satisfaction and internal work motivation. Individual growth needs strength measured by the JDS is the willingness of individuals to respond favorably toward enriched jobs.

The JDS itself had been developed and tested for over two years before being introduced in May 1974. Hackman and Oldham's goals in the JDS development included linking the instrument closely to the Job Characteristics Model, providing more than one way to measure each variable, and maintaining a distinction between objective descriptions of job factors and perceived affective reactions to the job. According to Hackman and Oldham, the instrument had undergone three major revisions and had been taken by over 1500 individuals in 100 different jobs in 15 organizations prior to its

final revision.

The Instrument

Hackman and Oldham developed two forms of the JDS a long and short form. Since the short form is used in this research, its characteristics will be discussed. All responses on the JDS are based on a Likert scale, however, the range of responses on the scale vary across the five sections of the instrument. Sections one and two are used to measure the objective core job dimensions in the Job Characteristics Model. Section one provides a Likert scale response for each statement with scores ranging from 1 to 7. Section two contains a Likert scale from 1 to 7 from very inaccurate to very accurate and the respondent is asked to measure the accuracy of each statement based on the respondent's current job. Section three deals with individual perceptions about the position and section four measures the individual's affective reactions to the job; both have Likert scales ranging from 1 to 7. Section five deals with the individual's growth needs strength and has a Likert scale from 4 to 10. The measures for each variable in the model are derived from averages of several responses on the JDS. Appendix C shows the short form used and the scoring of the JDS.

JDS Testing

The JDS was tested using data obtained from 658 employees working on 62 different jobs in seven organizations. The data base represented blue collar, white collar, and professional work, as well as industrial and service organizations from the east, southeast, and midwest in both urban and rural settings. The data were collected by the researchers on site in 6 procedural steps. The first step included briefing second and third level managers on the nature of the research. Next the JDS was

administered to groups of employees who were assured of strict confidence but were asked to identify themselves on the survey instrument. The third and fourth steps involved supervisors and researchers completing a Job Rating Form developed by Hackman and Oldham on their perceptions of the target jobs. Next, management was asked to rate the work performance of employees completing the survey on the effort they expended on the job and their work quality and quantity. Finally, absence data was collected on the respondents from company records.

Hackman and Oldham concluded from this study that the JDS displays satisfactory psychonometric characteristics and that the variables it measures relate as predicted to the Job Characteristics Model. Internal consistency and validity of the instrument were found to be generally satisfactory. (22)

Diagnostic Use of the JDS

Hackman and Oldham outlined a specific strategy for the use of the JDS and its relationship to a planned job redesign strategy. The first step is to insure that job motivation and satisfaction are really the problem behind unacceptable work outcomes. Therefore, the JDS scores must be closely examined to insure they highlight deficiencies in the job itself. The second step is to examine the Motivating Potential Scores of the target jobs and compare these scores to determine if the job itself is the cause of unacceptable work outcomes. If the MPS indicates that the job itself is problematic, step 3 leads to the definition of specific job related weaknesses. This involves an examination of the core job dimensions outlined by the Job Characteristics Model and measured by the JDS. Once the specific weaknesses have been identified, the employees' growth needs strength must

be examined to determine the readiness of the individual to accept an enriched job. Finally, before actual implementation, the organization must be assesed by management to anticipate possible roadblocks to change.

Some cautions were listed by Hackman and Oldham for use of the JDS. The respondents must be moderately literate and should take the instrument under the conditions of anonymity. The instrument should not be used for job placement and is not recommended for diagnosing the job of a single individual. The experimental design and the subjects used in this research meet all the criteria for proper use of the JDS.

CHAPTER III

PRELIMINARY INVESTIGATION

INTRODUCTION

A preliminary investigation into the area of job analysis and the problems associated with high rates of employee turnover, revealed a tremendous amount of data available on Air Force positions and personnel. The Leadership and Management Development Center (LMDC) created in 1975 at Maxwell AFB Alabama, has been tasked with the mission of, ". . . providing instruction and consultation services in the fields of leadership, management, and the job environment . . ." [25:2] In their roles as consultants, LMDC has collected a wealth of data in virtually every type of Air Force organization using a collection instrument known as the Organizational Assessment Package (OAP). The OAP survey instrument was developed jointly by the Air Force Human Resources Laboratory, Brooks AFB, Texas and LMDC in order to measure and evaluate an organization's characteristics. (25:4) The OAP is actually an extension of the Job Diagnostic Survey (JDS) developed by Hackman and Oldham. The JDS and the model it was developed to support were discussed in chapter 2. Since 1975, the OAP has been administered to over 58,000 Air Force members, military and civilian, officer and enlisted. By request from the researcher, LMDC provided data on all company grade officers in base civil engineering that have completed the OAP. This data is used to draw some preliminary conclusions about the base civil engineering company grade officer positions.

Other data was available on Air Force base civil engineering top management views of the high turnover problems noted in chapter 1. The Air Force Institute of Technology (AFIT) School of Civil Engineering

conducts a semi-annual BCE Staff Officer Course MGT 400. The course involves seminars and lectures dealing with top level management problems and includes a required paper on the retention rate of company grade officers. The data from these papers were made available by the course director for use in this research effort. The responses of 41 BCEs, Deputy BCEs, and Chiefs of Operations, military and civilian, were analyzed and provided an interesting picture of top level BCE management perceptions of the problem.

LMDC ANALYSIS

The OAP

The Organizational Assessment Package consists of 109 questions and statements about the respondents' organizations with responses based on a Likert scale of 0 or 1 to 7. The most recent version of the OAP is provided in Appendix A. The OAP contains six sections including background information for demographic data, the job inventory based on Hackman and Oldham's model (see chapter 2), the supervisory inventory which identifies the respondent's supervisor's characteristics, the organizational climate inventory, perceived productivity, and job satisfaction questionnaire. Each of the responses is combined to form 24 factors ranging from skill variety to a measure known as Motivating Potential Score which is itself an average of some of the previous 23 factors. The OAP has been validated by data collected from 4,786 individuals at five Air Force bases. (25:6)

Analysis

As of June 1981, LMDC has developed a total data base of 58,768 Air Force members who have completed the OAP. Of that sample, 54 were company grade officers with base civil engineering AFSCs. LMDC provided

the researcher with the means and standard deviations of 90 responses and all 25 constructs derived from those responses on the OAP. Appendix B shows the data for each variable and the statement or question number each is related to on the OAP. With the exception of 5 of the 24 model constructs, constructs are computed as straight averages of the variables indicated at the end of Appendix B. Since the OAP does not specify the position the respondent is occupying at the time of OAP completion, comparison of scores within the BCE organization was impossible. Another factor to be considered in this analysis is that this data has been collected during the past six years and it is highly possible that two of the response sets may be from the same respondent at different times during the past six year period. As noted in the BCE force structure presentation in chapter 1, the extremely rapid deterioration of the BCE middle management structure is a fairly recent phenomenon (since 1978) and data that is possibly six years old may not be valid. However, this data did provide an initial starting point for further investigation.

The analysis of this data involved a one sample test about μ with σ known. The object of this testing was to highlight any statistically significant differences between the BCE company grade officer positions and the Air Force. In order to accomplish this test, some assumptions must be made regarding the Air Force sample and the relative relationship of the BCE sample. The Central Limit Therom states that "the distribution of the means of random samples taken from a population having as its mean μ and finite variance σ^2 approaches the normal distribution with mean μ and variance σ^2/n as n goes to infinity;" [24:206] therefore, both the Air Force sample of 58,768 and the BCE sample of 54 are large enough to be considered normal. Considering the other limitations of the samples, the

BCE sample can be considered a simple random sample representation of the BCE company grade officer force during the past 6 years for the purposes of analysis. Although this assumption may be an oversimplification of reality, it serves the purpose of an initial identification of problem areas for further research. For the purposes of completing a one sample test about μ, the Air Force sample means of the 58,768 respondents are assumed to represent the Air Force population means. This assumption is valid due to the extremely small values of σ^2/n where n=58,768. Finally, a limitation of the conclusions drawn from this test is the fact that the variables tested are not statistically independent. Since the constructs are computed from the responses to other variables on the OAP, they are dependent on the answers to those preceding variables. Although this may somewhat limit the validity of the statistical inferences, the conclusions may still provide an adequate starting point for research. The test procedure used in this preliminary investigation involved computing a z-value and comparing it to an $\alpha/2$ value for all variables at .05. The variables found to be significant are highlighted in Appendix B.

Results and Conclusions

The results of this analysis highlighted some strengths and weaknesses of the BCE company grade officer positions as compared to Air Force normative data. Only the statistically significant variables will be discussed.

The BCE mean score for the first variable was significantly higher than the Air Force mean indicating that these officers felt their jobs required the use of a variety of their skills and talents. Another positive variable for the BCE positions was the extent to which the position gave the BCE

company grade officers more freedom to do the work as they saw fit than did the Air Force as a whole. The BCE company grade officers perceived their positions as requiring less repetitive tasks and more variety in the types of problems they were asked to solve. The BCE officers also felt they had more ability to progress up the career ladder and more freedom and independence in scheduling their work and selecting procedures to accomplish this work. These officers also perceived that they had more opportunity to learn skills which would improve their promotion potential. Ideas developed by work groups, to which these officers belonged, were more readily accepted by management personnel above their immediate supervisor. Complaints of the BCE company grade officer were aired more satisfactorily and the organization seemed more interested in the attitudes of the work group towards their jobs and the welfare of its people. These officers had a higher sense of pride in working for the organization and felt more responsible for the accomplishment of the organization mission. They felt they had more opportunity to show and demonstrate their work and were more motivated to contribute their best effort towards mission accomplishment. BCE company grade officers had a more intense feeling of helpfulness in that they perceived the chance to help people and improve their welfare through job performance. The officer's family had a better attitude towards the officer's present job and there was more flexibility in the officer's work schedule. There was more chance to acquire valuable skills which would prepare the officer for future opportunities and the BCE company grade officers were more satisfied with their jobs as a whole than the Air Force members in general. As indicated by the above results, the major constructs which proved significantly positive for the BCE company grade officer included more skill variety, a higher degree of task autonomy, lower work

repetition, higher job related satisfaction, and a better organizational climate. Two of these factors require more detailed explanations. A higher degree of task autonomy indicates that these officer perceived a greater degree of control over their work environment and the process they select to accomplish this work. A better organizational climate for these engineers indicate that the organization in which they work meets more of their perceived needs of a work environment than do organizations in which most of the Air Force members work. It is important to note that the BCE company grade officers' perceptions of their jobs were significantly higher in the above respects than the Air Force members' perceptions as a whole. However, this does not necessarily indicate that these positions were satisfying or autonomous enough nor does it indicate that these positions would compare favorably in these areas with other Air Force or civilian industry positions for professionals with a similar educational and training background.

The OAP also identifies needs which can be used to measure the importance of some of the other OAP factors to the respondents. The BCE company grade officers have a higher need for independence in their work than does the average Air Force member. The need for a meaningful job and for personal growth was higher in the BCE officer respondents. They also had a higher need for use of the skills they had developed in their work and a greater need to perform a variety of tasks. Related to these needs were requirements for tasks that were less repetitive and more difficult and challenging to accomplish. Overall the BCE company grade officer had a significantly higher need for enrichment which indicates a more positive response to jobs that are higher in skill variety, task autonomy, and task significance than the average Air Force member. The results of the needs

analysis indicates that the engineers value most of the positive aspects highlighted by the OAP.

Negative aspects of the BCE company grade officer positions concerned the amount of feedback and the actions of immediate supervisors. Additional duties interfered more in the BCE positions than the Air Force as a whole. These officers felt that they were less likely to know exactly what was expected of them in performing their jobs. They also felt they were less able to determine how well they were doing on the job and that job performance goals were much less clear and specific. The BCE officer felt that the immediate supervisors did not establish good work procedures nor did they explain the importance of a task in contributing to the overall civil engineering mission. The supervisors were also found lacking in feeding back poor performance on tasks by subordinates. Since there are these negative aspects of the BCE company grade officer positions and lack of adequate standards to make substantial conclusions about the positive aspects, further research into this area is recommended.

STAFF OFFICER INTERVIEWS

Data Collection

During 1981, nearly 75 staff officers from worldwide installation civil engineering organizations completed the BCE Staff Officer Course MGT 400 at the AFIT School of Civil Engineering. As part of the course requirements, the students attending the school were to complete a paper describing how they would improve the retention rate of company grade officers in their organization. The paper was to be approximately 4 to 6 pages in length and submitted within two weeks of the assignment date. During the course and prior to paper submittal, the students received briefings by MPC

on the state of the BCE company grade officer force and lectures on behavioral and job factor models such as Hertzberg's two factor theory. None of these class periods specifically addressed possible solutions to the officer retention problem; however, class members were not prohibited from discussing the paper prior to submittal. In subsequent interviews with some class members, discussion about the paper and possible solutions to the company grade officer retention problem frequently took place. Therefore, the results of the paper cannot be considered statistically significant or independent. The paper was further biased by limiting the solutions to those available to class members in their organizations. Depending on the perspective of the respondent, "your orgaization" can be interpreted as broadly as the Department of Defense or as narrowly as a specific BCE organization. Despite the biases introduced in these interviews, the results offer some interesting contrasts on the perceptions of the BCE staff officers.

Since this research is to specifically address the BCE organization, the total sample analyzed was reduced to include only Base Civil Engineers, Deputy Base Civil Engineers, and Chiefs of Operations. The sample breakdown of the 41 respondents is listed in Table 3-1.

Results

All the respondents were categorized into 16 common solutions including such factors as increasing pay and compensation and quicker promotions. The sixteen categories and brief definitions of each are outlined in Figure 3-1. Little more than half of the respondents felt that salary was a key factor in the BCE company grade officer retention rates. This result must be considered in light of the bias introduced in the question which limited

TABLE 3-1

CROSS TABULATION OF STAFF

OFFICER SAMPLE

POSITION	BCE	DEPUTY BCE	OPS CHIEF	TOTAL
RANK				
COLONEL	9	0	0	9
LT COLONEL	14	0	2	16
MAJOR	2	0	1	3
CAPTAIN	1	0	0	1
GS-14	0	4	0	4
GS-13	0	8	0	8
TOTAL	26	12	3	41

the range of respondent solutions. Very few of the respondents considered performance ratings as influencing the decision of officers to remain in the Air Force. It is interesting to note that none of the 28 field grade respondents felt that the ratings on the Officer Evaluation Report (OER) had a significant impact on officer retention. The Air Force and Base Civil Engineering image was considered an important factor by over 25% of the respondents. They felt that by improving the military image and the image the Air Force personnel have towards the civil engineering officer, officer motivation would increase. Over half of the respondents and most of the field grade respondents included increased management responsibility as a key factor in increasing officer retention. Increasing the scope of responsibility assigned to the company grade officer included expanding the officers role in organizational decision making. A very small percentage of the respondents included an increase in civilian support within the BCE

RESPONSE	FACTOR DEFINITION	% IMPORTANT	% NOT IMPORTANT
CAREER EDUCATION	Brief the engineers regularly on Air Force engineering opportunities	63.4	35.6
SALARY	Increased Pay and Benefits; professional pay etc.	56.1	43.9
INCREASE RESPONSIBILITY	Add some management and operational duties to existing position description	56.1	43.9
SPECIALIZATION	Broaden the technological tasks assigned to the engineers	29.3	70.7
AF & CE IMAGE	Through PR, etc., improve the current AF & CE image; CE badge or insignia	26.8	73.2
JOB SATISFACTION	Enrich positions to offer the engineer more satisfaction in the work	26.8	73.2
PROMOTIONS	Increase opportunities for engineers to attain command ranks	22.0	78.0
ADVANCED EDUCATION	Provide more Masters and PhD programs for the engineers	22.0	78.0
REDUCE REMOTES	Reduce the number of remote and overseas assignments required of an officer	22.0	78.0
ADDITIONAL DUTIES	Reduce the number of additional duties required of the CE officer	22.0	78.0
RECOGNITION	Increase feedback in the form of performance awards etc.	19.5	80.5
RELOCATION TRANSITIONS	Develop a good sponsorship program to ease the new assignment burdens of the engineers	14.6	85.4
PERFORMANCE RATINGS	Reform the OER system for engineers; increase performance perceptions	12.2	87.8
CAREER PROGRESSION	Provide for increased progression within the field to positions of responsibility	9.8	90.2
CIVILIAN AWARENESS	Alert civilians who supervise these officers as to common job related problems	7.3	92.7
NOTHING	No action should be taken to retain these officers who are not willing to stay	2.4	97.6

Figure 3-1 Staff Officer Response Categories

organization for company grade officers. This support would be in the form of a civilian supervisor education program including orientation on the problems and motivating potential of the BCE company grade officer. Surprisingly, increased promotion potential for the company grade officer was not considered by many to be an important factor. However, this also must be considered in light of the bias introduced limiting the range of possible responses to "your organization". One of the respondents felt that no action was required to increase officer retention. This respondent's reasoning included a reduction of the CE officer force to a core of individuals dedicated towards Air Force careers despite possible obvious shortcomings. Nearly 30% of the respondents included specialization of company grade officer positions as a key factor. Specialization involves directing these officers to use their special skills and talents developed in undergraduate engineering studies. These respondents felt that company grade officers are motivated to use these talents in which they have invested a significant amount of time and effort. A small percentage of respondents considered a greater emphasis on the initial and first few subsequent relocation transitions of the officer as an important factor in retention. They felt a good sponsorship program to include orientation for the BCE company grade officer's family, would increase the organization's and Air Force image and therefore retention would increase. Only 22% of the respondents considered increased opportunity for advanced education, such as Masters degree programs, as a significant motivating factor. However, a majority of the respondents felt career education, such as briefings on Air Force opportunities and benefits, as an important factor. These career briefings are to highlight the advantages of an Air Force career and therefore provide the company grade officers with the information they need to make career decisions. A reduction of

remote and overseas assignments was considered by some to be a retention factor. The constant requirement for the company grade officer's family to relocate was perceived by these respondents to be a reason for declining retention rates. Only a quarter of the respondents felt that increasing job satisfaction would result in a significant increase in officer retention. This response is surprising considering the orientation of some of the course material towards job enrichment, the relative simplicity of the solution, and the fact that it is one of the solutions available to all managers in all organizations and thus not subject to the biases introduced in the question. Very few respondents considered increased recognition of officer accomplishments as an important factor. Those that considered recognition a key factor, cited commander's briefings, a civil engineering badge, frequent individual briefings with supervisors, and performance awards. Only 10% of the respondents felt that increasing the company grade officer's opportunity for career progression would result in an increased officer retention rate. Along the same lines as increased job satisfaction, nearly a quarter of the respondents considered a reduction of additional duties as important.

LMDC AND STAFF OFFICER COMPARISON

Some of the factors outlined by the staff officers in their papers can be compared to factors measured by the OAP. The OAP indicated that BCE company grade officers perceived they used a variety of their skills and talents in accomplishing their work yet the BCE staff officers indicated that emphasis on increased use of the engineers' skills would result in increased retention rates. Feedback and recognition was not considered an important factor by the BCE staff officers yet the OAP results indicate

feedback as one of the prominent weaknesses of the BCE company grade officers' positions. Although increased career education was considered a key element in retaining company grade officers by the BCE staff officers, the OAP indicates that most BCE company grade officers were more satisfied with their career opportunities than the average Air Force member. The BCE staff officers placed little emphasis on job satisfaction and in reduction of additional duties; actions which seem to be supported by the OAP results.

PRELIMINARY CONCLUSIONS

This preliminary investigation has resulted in highlighting several important questions concerning the position of the BCE company grade officer. The results of the OAP indicate that these officers are generally satisfied with their present positions as compared to the attitudes of the Air Force as a whole. The question remains, however, how do these engineers compare with their professional peers in civilian industry? Although the BCE company grade officer is more satisfied than the Air Force average, are these officers really satisfied with their present positions? The Limitations of the OAP sample, such as its relatively small size and the relative lack of current data on the BCE company grade officer, raise serious questions as to the validity of the analysis. The results of the BCE staff officer interviews indicate they perceive many opportunities to improve the positions of the company grade officer. The direction and types of improvements must be specifically defined and identified before any prudent action be attempted. These questions can be answered using the Job Characteristics Model developed by Hackman and Oldham.

CHAPTER IV

METHODOLOGY

INTRODUCTION

The overall approach to this investigation was a one shot experiment with no control. The data collection instrument was the Job Diagnostic Survey discussed in chapter 2 and shown in Appendix C. The JDS was mailed out to a sample of nearly 200 civil engineering company grade officers. The collected data was analyzed using the ANOVA and ONEWAY packages of the Statistical Package for the Social Sciences (SPSS). The researcher was primarily interested in comparing the scores for various constructs measured by the JDS between positions within civil engineering as well as comparing the overall scores for civil engineering company grade officers to the normative data collected by VanMaanen and Katz for equivalent positions in the civilian workforce. From these comparisons, strengths and weaknesses in these positions can be identified and solutions outlined for improvement in the weak areas. These differing scores may also explain, within limits of the Job Characteristics Model, some of the underlying causes for the high rates of employee turnover in the BCE company grade officer workforce.

THE HYPOTHESES

Two major hypotheses were set forth in this study. The first major hypothesis involves the comparison of the Motivating Potential Scores (MPS) between the positions manned by the company grade civil engineering officers. The second major hypothesis compares the average MPS of the sampled civil

engineering officers with the average MPS of professionals in civilian industry.

The null hypothesis in the first case states:

Ho: There is no difference in the Motivating Potential Scores of the Engineering and Environmental Planning, Industrial Engineering, Readiness and Logistics, and Resources and Requirements positions.

In statistical notation, the null and alternative hypotheses were established as:

$$Ho: \mu_{EEP} = \mu_{IE} = \mu_{R\&R} = \mu_{R\&L}$$

$$H_1: \mu_{EEP} \neq \mu_{IE} \neq \mu_{R\&R} \neq \mu_{R\&L}$$

The emphasis by the researcher was on determining that the average MPS in EEP was significantly less than the average MPS for the other three positions. The development of the first major hypothesis was based solely on the personal experiences of the researcher and discussions with fellow officers who have occupied EEP positions as well as positions in the operations branch of civil engineering. Due to the availability of data, a related hypothesis was tested. Since the Growth Needs Strength (GNS) of the CE officers will impact their perceptions of a job high in MPS, the researcher wished to determine if there were significant differences in the average GNS of the individuals filling these various positions. The related null hypothesis states:

Ho: The average GNS of individuals in EEP will significantly differ from the GNS of individuals filling IE, R&L, and R&R positions.

In statistical notation, the null and alternative hypotheses were established as:

$$Ho: \mu_{EEP} = \mu_{IE} = \mu_{R\&R} = \mu_{R\&L}$$

$$H_1: \mu_{EEP} = \mu_{IE} = \mu_{R\&R} = \mu_{R\&L}$$

The null hypothesis in the second case states:

Ho: The average MPS for Air Force civil engineering company grade officers is not significantly different from the average MPS for professionals identified by VanMaanen and Katz.

In statistical notation, the null and alternate hypotheses were established as:

$$Ho: \mu_{AFCE} = \mu_{PROF}$$

$$H_1: \mu_{AFCE} = \mu_{PROF}$$

VanMaanen and Katz defined professionals as individuals in occupations which require specialized and theoretical knowledge usually obtained from college training or experience. (22:3) Engineers were included in the list of occupations meeting these standards. Professionals formed the largest subsample of their study and included 477 respondents from four various governmental agencies (two cities, one county, and one state). The average MPS for this sample was 167. Although the averages for most of the remaining constructs was determined, data for the average Growth Needs Strength of these individuals was not available. Therefore, a related hypothesis for the second major hypothesis was not considered.

DATA COLLECTION

The Sample

Due to the limitations of time and cost of mailing surveys to non-CONUS civil engineering units, the targeted sample included only company grade officers at CONUS bases. The AFIT School of Civil Engineering programs and operations section provided the researcher with a current

list of all the CONUS civil engineering organizations and addresses. Seventy-five units were identified on the listing and three officers from each unit were asked to complete the Job Diagnostic Survey; resulting in a total sample space of 225 respondents. A letter of instructions preceding the survey was addressed to the base civil engineer. The purpose of the letter was to identify the subjects of the experiment. Any company grade officer from the Engineering and Environmental Planning branch, one company grade officer from the Industrial Engineering branch, and one company grade officer acting as Chief of Readiness and Logistics or Chief of Resources and Requirements were asked to complete the survey. The stratification of the sample was necessary in order to draw conclusions from the hypotheses identified in the previous section. The researcher intended to obtain as much data on each position as possible. A random sample may have resulted in the over-representation of one position and not enough data for statistical analysis in others. Equal sample sizes would facilitate a statistical contrast analysis of the data obtained. The unavoidable biases introduced in this stratified sample included the fact that the sample is not representative of all the company grade officers in civil engineering. Although this sampling technique should have included most of the population of IE, R&L, and R&R officers at CONUS base CE units, only a small fraction of the company grade officers in EEP were represented. This bias should not affect the testing of the first major hypothesis, but does limit the conclusions that can be drawn from testing the second major hypothesis since the officers in IE, R&L, and R&R may be over-represented in the Air Force CE mean MPS scores. A bias that is impossible to measure is the bias introduced by the individual administering the survey instrument. Biases could have been introduced to the respondent/subordinate as

negative or positive statements about the value of completing the survey. These statements were not recorded or measured and are assumed, for the purposes of analysis to have had little impact on the outcomes of the experiment. In an attempt to temper these biases, the letter of instructions to the base civil engineer was included in each survey instrument so that each respondent had at least as much factual information about the experiment as the base civil engineer. Since the base civil engineer chose the survey subjects in each position, additional biases may have been introduced. This bias could have significantly affected the representativeness of the EEP sample since the base civil engineer had the most flexibility in selecting these respondents.

Demographic Data and Survey Approval

Demographic Data. Certain demographic questions had to be included in the survey instrument for meaningful statistical analysis to be performed on the collected data. The demographic questions and statements attached to the beginning of the survey instrument do not invalidate the results of the JDS according to Major Russell F. Lloyd, Assistant Professor of Organizational Behavior at the AFIT School of Systems and Logistics. The demographic data sought in this section included the respondent's rank, years of civil engineering service, academic degree, current position, previous positions, and some Prime BEEF data required in other research This data was used to determine the possible influence of these factors on the Motivating Potential Score of the company grade civil engineering officers.

Survey Approval. Approval of the survey instrument was obtained in accordance with applicable AFIT policies and Air Force regulations. The survey was

approved by Lt Colonel Willibord T. Silva, Chief, Research and Measurement Division at MPC. The survey was assigned Survey Control Number 81-49 on 15 April 1981 to expire on 30 June 1981. The approved and distributed survey is reproduced in its entirety in Appendix C. Upon receipt of the Survey Control Number, the surveys were reproduced and mailed to the CONUS CE units.

DATA ANALYSIS

Introduction

The analysis of the data involved a four step process. The first step involved the development and testing of the SPSS program which would perform the statistical analysis of the data and the coding procedure used to transfer the collected data from the survey instrument to the SPSS program. The next step involved the ANOVA analysis of the means for determining differences in scores between the respondents in each position. The third step was a ONEWAY statistical contrast of selected variables. The final step in the process was a one sample comparison of the civil engineering average MPS with the MPS scores of professionals.

SPSS Program Development

The Statistical Package for the Social Sciences represents a decade of system design and programming. The system was developed through the close cooperation of social science researchers, computer scientists, and statisticians. One of the most important limitations of the SPSS is that it only operates as a batch program, which prevents adequate interaction between the researcher and computer. (5:xxii) The program developed for the analysis of collected data in this experiment is shown in Figure 4-1.

The program is separated into four distinct parts; data identification and coding, calculation of construct scores, the ANOVA function and the ONEWAY function.

Data Identification. The variable list function shows the number of data points collected on the survey instrument. The rank of the respondents ranged from 2Lt to Captain and is represented by the variable RANK. The years of service of the respondent is represented by the variable YRSRV; the ranges of each classification in this variable are shown in Appendix C. The purpose of this independent variable was to determine the effects of CE experience on the perceptions of the job characteristics. The variable DEGREE represents the academic degree of the respondent. The variables CURPOS and OPOS represent the respondent's current and previous base civil engineering positions. Since the JDS measures the characteristics of the respondents' current positions, this factor was given the most emphasis in the analysis. V201 to V207 represent the seven responses to the questions and statements in section one of the JDS; V301 to V314 represent responses to the fourteen statements in section two; V401 to V407 are the seven responses in section three; V501 to V514, the fourteen responses in section four; and V601 to V611, the eleven responses in section five. Data coding is discussed in the next section. The value labels function identifies the ranges of responses in each of the demographic or independent categories. Within the CURPOS variable, DEEP represents the Design Engineer in EEP, CMEEP represents the Contract Manager in EEP, and EPREEP the Environmental Planner in EEP.

Calculation of Construct Scores. The COMPUTE function represents the consolidation of data points on the Job Diagnostic Survey to form the the constructs of the Job Characteristics Model. V701 to V716 represent

```
VARIABLE LIST   RANK,YRSRV,DEGREE,CURPOS,OPOS,TCHIEF,PBFREQ,TRNG,
                V201 TO V207, V301 TO V314, V401 TO V407, V501 TO V514,
                V601 TO V611
INPUT MEDIUM    CARD
INPUT FORMAT    FIXED(8A1,53F1)
N OF CASES      179
RECODE          RANK,YRSRV,DEGREE,CURPOS,OPOS,TCHIEF,PBFREQ,TRNG ('A'=1)
                ('B'=2) ('C'=3) ('D'=4) ('E'=5) ('F'=6) ('G'=7) ('H'=8)
RECODE          V601 TO V611(0=10)
VALUE LABELS    RANK (1)2LT(2)1LT(3)CAPT/
                YRSRV (1)0-6MOS(2)7-18MOS(3)19MOS-5YRS(4)OVER 5YRS/
                DEGREE (1)ARCHITECTURE(2)CIVIL(3)ELECTRICAL(4)GENERAL(5)INDUSTRIAL
                (6)MECHANICAL(7)OTHER/
                OPOS (1)R AND R(2)R AND L(3)IE(4)DEEP(5)CMEEP(6)EPREEP(7)OTHER/
                CURPOS (1)R AND R(2)R AND L(3)IE(4)DEEP(5)CMEEP(6)EPREEP(7)OTHER
COMPUTE         V701=(V204+V301+(8-V305))/3
COMPUTE         V702=(V203+V311+(8-V303))/3
COMPUTE         V703=(V205+V308+(8-V314))/3
COMPUTE         V704=(V202+V313+(8-V309))/3
COMPUTE         V705=(V207+V304+(8-V312))/3
COMPUTE         V706=(V206+V310+(8-V307))/3
COMPUTE         V707=(V201+V302+(8-V306))/3
COMPUTE         V708=(V402+V406+(8-V404))/3
COMPUTE         V709=(V401+V403+V405+(8-V407))/4
COMPUTE         V710=(V502+V509)/2
COMPUTE         V711=(V501+V511)/2
COMPUTE         V712=(V504+V507+V512)/3
COMPUTE         V713=(V505+V508+V514)/3
COMPUTE         V714=(V503+V506+V510+V513)/4
COMPUTE         V715=(V601+V603+V606+V608+V610+V611-18)/6
COMPUTE         V716=((V701+V702+V703)/3)*V704*V705
VAR LABELS      V701 SKILL VARIETY/V702 TASK IDENTITY/V703 TASK SIGNIFICANCE/
                V704 AUTONOMY/V705 FEEDBACK FROM THE JOB ITSELF/
                V706 FEEDBACK FROM AGENTS/V707 DEALING WITH OTHERS/
                V708 GENERAL SATISFACTION/V709 INTERNAL WORK MOTIVATION/
                V710 PAY SATISFACTION/V711 SECURITY SATISFACTION/
                V712 SOCIAL SATISFACTION/V713 SUPERVISORY SATISFACTION/
                V714 GROWTH SATISFACTION/ V715 INDIVIDUAL GROWTH NEED STRENGTH/
                V716 MOTIVATING POTENTIAL SCORE
BREAKDOWN       VARIABLES=V201 TO V716(LO,HI)/RANK(1,4),CURPOS(1,8),YRSRV(1,4),
                DEGREE(1,7)/
                CROSSBREAK=V201 TO V716 BY RANK,CURPOS,YRSRV,DEGREE
READ INPUT DATA
ANOVA           V201 TO V716 BY RANK(1,3) CURPOS(1,4) DEGREE(1,4) YRSRV(1,4)
STATISTICS      ALL
OPTIONS         4
ONEWAY          V201 TO V716 BY CURPOS (1,4)/
                CONTRAST= 1 1 1 -3/
                CONTRAST= 1 0 -1 0/
                CONTRAST= -1 2 -1 0/
FINISH
```

Figure 4-1 SPSS Program

the 16 constructs from Skill Variety, V701, to Motivating Potential Score, V716. The computation of these constructs was developed by Hackman and Oldham and outlined in Appendix C. Constructs are identified on the VARIABLE LABELS card and further definition of each variable can be found in Appendix C.

BREAKDOWN Function. The BREAKDOWN function "calculates and prints the sums, means, standard deviations, and variance of a dependent variable amoung subgroups of the cases in the file." [5:249] The BREAKDOWN function in this study was used primarily to format the survey results for future comparison with LMDC results of the Organizational Assessment Package. This function compared the mean responses and scores from V201 to V716, with the respondent's rank, current position, degree, and years of service within civil engineering. The high and low values of the dependent variables were unspecified due to the wide ranges of the variables and construct scores. The limitations to the BREAKDOWN function include the use of no more than 200 variables specified in the function and a maximum of 250 tables. The maximum number of dimensions available for the function is six; only two were used in this program.

ANOVA Function. The ANOVA function "performs one-to five-way analysis of variance and covariance . . . for factorial designs . . ." [5:410] The ANOVA function was used in this research to determine the effects of rank, years of service, academic degree, and current position on the variables and construct scores. The ANOVA highlights significant differences of the mean scores within each of the independent variables. Several ANOVA functions had to be used in order to accomodate all the dependent variables. Only five dependent variables can be specified in the list and only five lists may appear in each ANOVA function. Three-way and higher interactions

of the independent variable were assumed to be insignificant and involved an inordinate amount of computer time, therefore, OPTION 4 was specified in conjunction with the ANOVA. The limitations of the ANOVA function, in addition to those already identified, include the importance of the sample size being larger than the combined total of dependent and independent variables specified for each ANOVA analysis. The STATISTICS function was used to develop cell means for each of the variances.

ONEWAY Function. The ONEWAY function was used in this analysis to contrast the mean scores within selected independent variables. This function will show which of the variables caused the ANOVA to be significant. A priori contrasts using the CONTRAST subfunction of ONEWAY evaluates the mean scores in each class of variables according to a previously determined statistical hypothesis. The program uses the t-statistic to accept or reject the hypothesis represented by the CONTRAST. Limitations for the ONEWAY function include a maximum of 20 dependent variables and one independent variable for each execution of the subfunction. The one independent variable tested in this research was the respondent's current position. The use of the ONEWAY, therefore, was limited to determining which of the current positions resulted in the statistical significance of the variance.

Coding Collected Data

The respondent recorded the data for each statement or question on the survey instrument. The responses were transferred to a data sheet by hand and were subsequently key punched onto data cards. The first eight responses involved alpha characters and were coded as such on the data card. Through the recode function of the SPSS, most of these alpha characters were recoded to numerical characters for analysis purposes. The remaining

responses on the JDS were numerical with response ranges from 1 to 10. Due to the format of the data card, a response of "10" would be coded as two responses of "1" and "0" respectively; therefore, JDS responses of "10" were coded into the data deck as a "0" and subsequently recoded by the SPSS recode function. In all, 61 responses were coded for each respondent to the JDS. Due to the extreme importance of accurate data to the validity of the research, data coding was thoroughly checked using a three step process. The data recorded on the data sheet was compared with the responses on the JDS response sheets and then compared with the data coded on the cards. Finally, the data cards were compared with the JDS response sheets. Two iterations were required, the second check showed no errors in any of the comparisons.

ANOVA Analysis

Although the SPSS program ANOVA automatically produces the required information on each dependent variable, it is important to outline the procedure used to arrive at the conclusions of this research. The ANOVA allowed the researcher to test the first major hypothesis and involved a multiple comparison of four independent variables. Two assumptions were established for the multiple comparison analysis of variance. The first assumption states that the mean of the random error is equal to zero, normally distributed and the variance is the same for all combinations of the independent variable. The second assumption states that the random error terms are independent. These assumptions are reasonable since random error should not influence the significance of an independent variable. The output of the ANOVA table is an F-test statistic measuring the significance of the differences within that independent variable. According

to Donald L. Harnett of Indiana University, "researchers in the social sciences often use a level of significance of $\alpha = 0.05$, indicating that they are willing to accept a five percent chance that they are wrong when Ho is rejected." [24:273] This is the level of significance which this study has established as acceptable. Before an F value can be calculated, the sum of squares for errors in rank, current position, academic degree, and years of service, the mean square, and degrees of freedom must be calculated. The total sum of squares (SST) is equal to the total summation of the square of the difference between each variable and the mean square of that variable. Computationally:

$$SST = \sum \sum \sum \sum (Y_{EEP,IE,R\&L,R\&R} - \bar{Y})^2$$

The sum of squares for each independent variable is the summation of the square of the differences between each dependent variable and the mean score of that variable. Computationally:

$$SS_{EEP} = \sum (Y_{EEP} - \bar{Y})^2$$

The mean square (MS) of each independent variable is the sum of squares for the independent variable divided by the degrees of freedom (DF) of each variable. The degrees of freedom for each independent variable is the number of classes or categories within that variable minus one. The calculation of the F-statistic is the mean square of each dependent variable divided by the mean square of the residual error (e.g. differences in the mean scores that are not explained by the independent variables). The sum of squares of the residual error is the difference between the sum of squares which is explained by the independent variables and the sum of squares total. Computationally:

$$SS_{RESIDUAL}=SST-(SS_{EEP}+SS_{IE}+SS_{R\&L}+SS_{R\&R})$$

$$MS_{RESIDUAL}=SS_{RESIDUAL}/(\text{Total Sample Size}-DF_{EEP}-DF_{IE}-DF_{R\&L}-DF_{R\&R})$$

$$F_{EEP}=MS_{EEP}/MS_{RESIDUAL}$$

For each F value, the significance of F is determined from an F distribution published in tables and part of the SPSS program based on the degrees of freedom in the independent variables. Figure 4-2 shows the format of the SPSS output. For the purposes of testing the first major hypothesis, some recoding of the independent variables was necessary. The current positions of the respondents were recoded to include the Environmental Planner, Contract Manager, and Design Engineer positions under one independent variable for the Engineering and Environmental Planning Branch. Respondents specifying "other" as their position were categorized under the most appropriate position based on the respondent's description of the duties involved. Recoding these positions may alter the true significance of the independent variables in EEP. If one of the three positions in EEP is significantly different than the other two, this fact may be hidden by the moderate scores in the other positions. Although some inferences may be drawn from inspection of the variation in the significant means, testing these separate positions for significance is beyond the scope of this study.

ONEWAY Analysis

The ONEWAY analysis involves the test of a series of hypotheses based on the ANOVA analysis. Those variables found significant in the ANOVA analysis with respect to the respondent's current position will be analyzed to determine which of the positions were significantly different.

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
MAIN EFFECTS	xx.xxx	xx	x.xxx	.xxx	.xxx
RANK	x.xxx	x	x.xxx	.xxx	.xxx
CURPOS	xx.xxx	x	x.xxx	x.xxx	.xxx
YRSRV	x.xxx	x	x.xxx	.xxx	.xxx
DEGREE	xx.xxx	x	x.xxx	x.xxx	.xxx
2-WAY INTERACTIONS	xx.xxx	xx	x.xxx	.xxx	.xxx
RANK CURPOS	xx.xxx	x	x.xxx	.xxx	.xxx
RANK YRSRV	x.xxx	x	x.xxx	.xxx	.xxx
RANK DEGREE	xx.xxx	x	x.xxx	x.xxx	.xxx
CURPOS YRSRV	xx.xxx	x	x.xxx	x.xxx	.xxx
CURPOS DEGREE	xx.xxx	x	x.xxx	x.xxx	.xxx
YRSRV DEGREE	xx.xxx	x	x.xxx	.xxx	.xxx
EXPLAINED	xxx.xxx	xx	x.xxx	.xxx	.xxx
RESIDUAL	xxx.xxx	xxx	x.xxx		
TOTAL	xxx.xxx	xxx	x.xxx		

Figure 4-2 SPSS ANOVA Output Format

Since the researcher anticipates unequal class sizes due to the nature of the experiment, orthogonal contrasts or hypotheses which are statistically independent were established. It is necessary to test each of these hypotheses in order for the SPSS to weight the various classes and accurate statistical inferences drawn from the analysis. The hypothesis the study is primarily interested in is the first of the three hypotheses which form the orthogonal contrasts for the current position variable. This hypothesis determines whether or not the lowest scoring current position is statistically different compared to the other three classes of current position. An example of the three hypotheses established for determining whether or not the EEP scores are significantly lower based on the ANOVA analysis is as follows:

$$Ho: 3\mu_{EEP} = \mu_{R\&L} + \mu_{R\&R} + \mu_{IE}$$

$$Ho: \mu_{R\&L} = \mu_{IE}$$

$$Ho: \mu_{R\&L} + \mu_{IE} = 2\mu_{R\&R}$$

The alternate hypothesis for each of these null hypotheses are that each side of the equal sign is not equal to the other. The second and third hypothees are of little value to this research effort and their results will not be reported. Computing the contrasts involves multiplying the coefficients of the means in the hypothesis by the mean values of each variable. An ANOVA table must be established listing the sum of squares for each contrast. The sum of squares is equal to the contrast calculation squared, divided by the weighted number of sample points in each category, divided by the sum of squares of each coefficient. Computationally:

$$SS_{Ho} = \frac{(3\mu_{EEP} - \mu_{IE} - \mu_{R\&L} - \mu_{R\&R})}{r(9+1+1+1)}$$

The degrees of freedom for each contrast is 1. The mean square for each contrast and the t value is calculated exactly as in the ANOVA calculations.

One Sample Tests About μ with σ Known

Testing the mean score for twelve of the sixteen constructs involves comparing the Air Force mean for each construct with the normative data collected by VanMaanen and Katz for professionals. Some important assumptions are necessary for this analysis including the assumption that the distribution of data approximates a normal distribution. This assumption is reasonable based on the Central Limit Therom. Since over 200 surveys were to be administered, there should be enough of a response to make this assumption valid. A second assumption is that the values of the normative

data approximate the population mean for professionals in civilian industry positions. According to Greg R. Oldham in a telephone interview, this normative data represents the only mean JDS scores collected to date; therefore, no other comparisons are possible. (28) The second major hypothesis is to be tested in this analysis. The procedure involves the calculation of a test statistic z and comparing this statistic with $Z_{.05}=1.645$. If the absolute value of the calculated test statistic z is greater than 1.645, the Air Force sample mean is significantly different from the normative data. Z is computed by calculating the differences in the mean values and dividing by the variance of the Air Force sample divided by the square root of the sample size. Computationally:

$$z=\frac{\bar{X}_{AF}-\mu_{PROF}}{\sigma_{AF}/\sqrt{n_{AF}}}$$

CHAPTER V

RESULTS

INTRODUCTION

This chapter examines the results of the Job Diagnostic Survey and analysis discussed in chapter 4. The survey response rate and sample composition are discussed with respect to the numbers of respondents in each category of independent variable. The results of the ANOVA analysis are defined considering only those variables which showed significant differences within the mean scores. These significant variables will be discussed by an inspection of the means for the independent variables of rank, years of service in base civil engineering, and academic degree. The statistically significant means for current position were analyzed using ONEWAY analysis and the results of these contrasts will be reported as they reject the null hypotheses. The final section of this chapter will discuss the results of the one sample test about μ with σ known and the comparison of Air Force company grade officer scores and the scores of civilian professionals.

SURVEY RESPONSE AND SAMPLE

Survey Response

Of the 225 surveys mailed to 75 CONUS base civil engineering units, 188 were completed and returned to the researcher for analysis. Although 3 surveys were sent to each CONUS unit, many bases do not have a position for either the Industrial Engineer or Readiness and Logistics which reduced the total possible sample space to 207. Therefore, 188 responses represent a 91% response rate for the mail out survey. This high response rate

exceeded the expectations of the researcher and proved adequate for the analysis of collected data and the research hypothesis. Of the 188 responses, 9 responses were invalidated resulting in a total sample of 179. Two of the 9 invalidated responses were invalidated because it was determined that one respondent had completed three surveys. This was obvious from the duplication of comments on each survey response sheet, the exact duplication of the responses, and the close proximity of arrival of the response sheets. Four of the response sheets were completed by civilians within civil engineering. Although these respondents may have provided interesting comparisons, there were not enough civilian respondents to make statistical inferences. Two responses were returned with significant portions of the survey incomplete which would result in invalid results if included in the analysis. The last survey was invalidated because the respondent was a lieutenant colonel.

Sample

Appendix E shows the crosstabulation of the sample with respect to the independent variables. Figure 5-1 lists each of the categories of independent variables and the number of respondents in each. The majority of the respondents were 2nd lieutenants, followed by captains and 1st lieutenants in order of subsample size. Although the size of the captain's response sample is smaller than their relative size in the CE force, the sample is fairly representative of the CONUS manning with captains assigned to overseas slots. Most of the respondents were from Engineering and Environmental Planning positions; the remainder of the sample was divided among Industrial Engineers, Resources and Requirements, and Readiness and Logistics. In Engineering and Environmental Planning, an overwhelming

majority of the respondents were design engineers; the rest of the sample consisted of environmental planners and contract managers in equal proportions. This could result in the design engineers skewing the EEP scores and caution must be used in drawing statistical inferences about the other two positions in EEP. Most of the respondents had between 19 months and 5 years experience, a significant portion had between 7 and 18 months experience and very few had less than 6 months or greater than 5 years of base civil engineering experience. The majority of the respondents had civil engineering degrees, members with industrial engineering degrees comprised the second largest subsample, and the rest were evenly split between architecture, electrical, mechanical, and general engineering degrees.

RESPONDENT'S RANK	#	%
2nd Lieutenant	99	55
1st Lieutenant	29	16
Captain	49	27
RESPONDENT'S CURRENT POSITION		
Resources and Requirements	39	22
Readiness and Logistics	36	20
Industrial Engineering	39	22
Engineering and Environmental Planning	63	36
Design Engineer	42	67
Contract Monitor	10	16
Environmental Planner	12	19

RESPONDENT'S YEARS OF SERVICE	#	%
0-6 Months	15	9
7-18 Months	58	32
19 Months-5 Years	79	44
Over 5 Years	27	15
RESPONDENT'S ACADEMIC DEGREE		
Architecture	13	7
Civil Engineering	73	40
Electrical Engineering	16	9
General Engineering	9	5
Industrial Engineering	48	27
Mechanical Engineering	17	10
Other	3	2

Total Sample Size - 179

Figure 5-1 Sample Composition

ANOVA RESULTS

Introduction

The analysis of variance within the mean values for each independent variable highlights significant differences between the mean scores for CE company grade officers. The ANOVA also shows the impact each independent variable has on the difference in mean scores. In this section, each significant independent variable will be discussed and means inspected for the significant variables of the respondent's rank, academic degree, and years of service.

Rank

The respondent's rank influenced many of the variances in the mean scores. Appendix D shows the ANOVA tables for each dependent variable. The hypothesis tested by the ANOVA was:

$$H_o: \mu_{CAPT} = \mu_{1LT} = \mu_{2LT}$$

$$H_1: \mu_{CAPT} \neq \mu_{1LT} \neq \mu_{2LT}$$

The findings of this analysis included:

1. As the CE officers increased in rank, the amount of autonomy they felt in their jobs decreased. An inspection of the mean scores shows that 2nd lieutenants perceive a significantly greater amount of autonomy than 1st lieutenants or captains.

2. First lieutenants felt that doing their jobs did not provide as much feedback about their job performance.

3. The 1st lieutenants perceived their jobs requiring much less cooperation with other people.

4. Interestingly, captains felt they were much more satisfied with

their pay and fringe benefits than the lieutenants.

5. Satisfaction with the amount of personal growth and development in the job varied significantly with the respondent's rank. Second lieutenants were much more satisfied with growth than either 1st lieutenants or captains.

6. Satisfaction with the degree of respect and fair treatment was also found to be significantly different. Second lieutenants perceived a higher level of satisfaction with the fair treatment they received.

7. The chance to get to know other people while on the job varied significantly with the respondent's rank. Inspection of the mean scores indicates 2nd lieutenants, the new members of the organization, were more satisfied with their chances to get to know people.

Years of Service

The respondent's years of service did not influence nearly as many dependent variables as did the rank of the respondent. The hypotheses tested by this ANOVA was:

$$H_o: \mu_{0\text{-}6 \text{ months}} = \mu_{7\text{-}18 \text{ months}} = \mu_{19 \text{ months-}5 \text{ years}} = \mu_{\text{Over } 5 \text{ years}}$$

$$H_1: \mu_{0\text{-}6 \text{ months}} \neq \mu_{7\text{-}18 \text{ months}} \neq \mu_{19 \text{ months-}5 \text{ years}} \neq \mu_{\text{Over } 5 \text{ years}}$$

The results of this analysis showed:

1. Perceptions of working closely with other people depended significantly on the respondent's experience. Members of the organization with less than 6 months of service perceived much less contact with other people than members with more experience.

2. The feeling of worthwhile accomplishment varied with the experience of the respondent. Members with between 7 and 18 months of experience

were much less satisfied with their feeling of worthwhile accomplishment.

3. The degree of satisfaction with the support and guidance received from the respondent's supervisor was significant. Members with less than 6 months experience felt much more satisfied with the guidance and support they received.

4. The degree to which the respondents felt fairly paid varied significantly with the experience level of the respondent. Members with less than 6 months experience were much more satisfied with fair payment than members with more experience. This apparent contradiction with the results previously cited, can be explained by the differences and overlaps in classes and class sizes between the two independent variables of rank and years of service.

5. The desire for opportunities to learn new things in the work varied significantly with the respondent's years of service. Members with over 5 years of experience had less of a desire to learn new things than did members with other levels of experience.

6. The construct, supervisory satisfaction, was also dependent on the years of CE experience. Respondents with less than 6 months service experienced significantly more satisfaction with the supervisors than those respondents with greater than 6 months experience.

Academic Degrees

The academic degree of the respondent did influence some of the dependent variables measured by the JDS. The hypotheses tested by this ANOVA was:

$$H_o: \mu_{\substack{\text{Architecture}\\ \text{and}\\ \text{Civil Engineering}}} = \mu_{\substack{\text{General}\\ \text{and}\\ \text{Other}}} = \mu_{\substack{\text{Electrical}\\ \text{and}\\ \text{Mechanical}}} = \mu_{\substack{\text{Industrial}\\ \text{Engineering}}}$$

$$H_1: \mu_{\substack{\text{Architecture}\\\text{and}\\\text{Civil Engineering}}} = \mu_{\substack{\text{General}\\\text{and}\\\text{Other}}} = \mu_{\substack{\text{Electrical}\\\text{and}\\\text{Mechanical}}} = \mu_{\substack{\text{Industrial}\\\text{Engineering}}}$$

The results of this analysis showed:

1. The information received about the respondent's performance from doing the job itself varied with the respondent's academic degree. Architects and civil engineers as well as mechanical and electrical engineers received more information about their performance from doing the job than other CE officers.

2. The chance to complete an entire piece of work was also significant with respect to academic degrees. Respondents with electrical, mechanical, and industrial engineering degrees perceived their chances as better for completing an entire piece of work.

3. The desire for very friendly co-workers varied significantly with the respondent's academic degree. CE company grade officers with industrial engineering degrees had less of a desire for very friendly co-workers than did officers with other academic backgrounds.

The significant variables for current position will be discussed following the next section.

Two Way Interactions

Two way interactions are important in that they affect the level of significance or influence of the independent variable. Many interactions were found to be statistically significant but their physical significance is difficult to ascertain. These significant interactions are asterisked

in Appendix D and will not be discussed further.

Current Position

The single most influential factor on the variance in dependent variable scores was the current position of the respondent. This is to be expected since the purpose of the JDS is to measure characteristics of a position. The other independent variables had to be considered in order to remove their influence on the results of the ANOVA. This ANOVA tested the first major hypothesis restated here:

$$H_o: \mu_{EEP} = \mu_{IE} = \mu_{R\&L} = \mu_{R\&R}$$

$$H_1: \mu_{EEP} \neq \mu_{IE} \neq \mu_{R\&L} \neq \mu_{R\&R}$$

The variables which were significant enough to reject the null hypothesis will be briefly listed in this section. The next section presents the results of the ONEWAY analysis which statistically verifies the differences in the mean scores.

The extent to which the job required the respondent to work closely with other people varied significantly with the current position of the respondent. The degree of autonomy in the job also varied significantly with the respondent's current position. Other variables that were statistically significant across the various current positions included the extent the job required the completion of an entire piece of work, the variety of skills and talents required in the job, and the amount of cooperative work required with other people. The perception that the job can be accomplished alone without outside help, and the perception that the job denied the respondent any chance to use personal initiative in carrying out the work

depended on the respondent's current position. Also varying with the respondent's current position were the perceptions that the job was not very significant, the frequent feeling of quitting the job, and the amount of personal growth and development in the job. The feeling of worthwhile accomplishment in the job, the chance to get to know other people while on the job, and the amount of independent thought and action were also influenced by the respondent's current position. The remaining variates with current position included the amount of challenge in the work, the desire for quick promotions, task identity, autonomy, dealing with others, social satisfaction, and growth satisfaction. How these variables changed with current position of the respondent is the important question answered by the ONEWAY analysis in the next section.

ONEWAY RESULTS

Introduction

The evaluation of orthogonal contrasts in a oneway analysis of variance results in substantive statistical evidence that a hypothesis comparing the means of the independent variable can be rejected at a specified level of confidence. This level has been established at a probability of error equal to 0.05. This section of the analysis presents the ONEWAY results of testing three sets of orthogonal contrasts based on the variables found significant in the ANOVA analysis for current position. The first set of orthogonal contrasts analyzes the mean scores where, by inspection, EEP differs significantly from the other three positions. The second compares those scores of the IE with the other positions and the third compares the scores in R&R with the other positions. The scores of

variables in the R&L position were not significantly different in any of the dependent variables.

Hypothesis 1

The first set of contrasts compared the mean scores of EEP variables which appeared, by inspection and based on the ANOVA analysis, significantly different. The orthogonal contrasts established were:

$$Ho: \mu_{IE} + \mu_{R\&L} + \mu_{R\&R} = 3\mu_{EEP}$$

$$Ho: \mu_{IE} = \mu_{R\&L}$$

$$Ho: \mu_{IE} + \mu_{R\&L} = 2\mu_{R\&R}$$

As stated in chapter 4, only the first hypothesis of the contrast will be considered in this analysis. The results of the other two will not be reported. The respondents in EEP had a significantly lower mean response to the extent the job required the CE officer to work closely with other people. The respondents in EEP also perceived a lower level of variety in their job than did the respondents in other positions. EEP respondents perceived their jobs requiring much less cooperation with outsiders and their job can be accomplished alone. The job denied the EEP respondent many more chances to use personal intiative and judgment in carrying out the work. The personal growth and development received from doing the job was much lower in the EEP positions compared to the R&L, R&R, and IE positions. EEP respondents had much less of a chance to get to know other people while in the job. EEP respondents also scored their jobs significantly lower in the perceived security for a future in their organization. Challenge in the job was found lacking by the EEP respondents. Despite these

shortcomings, the EEP respondent had a significantly less desire for quick promotions. The respondents in EEP perceived their jobs overall providing less freedom, independence, and discretion in scheduling and determining the procedures for work accomplishment. Overall interpersonal relationships are lacking in the EEP positions as evidenced by the three previous variables addressing this factor. Finally, social growth satisfaction was perceived significantly lower by the EEP respondents.

Hypothesis 2

The second set of contrasts compared the dependent variable scores in IE with those in other positions. The hypotheses were established as:

$$\text{Ho: } 3\mu_{IE} = \mu_{R\&L} + \mu_{R\&R} + \mu_{EEP}$$

$$\text{Ho: } \mu_{R\&L} = \mu_{R\&R}$$

$$\text{Ho: } \mu_{R\&L} + \mu_{R\&R} = 2\mu_{EEP}$$

Respondents in the industrial engineering position perceived they had much more autonomy in their jobs than did the respondents in other positions. They also felt they had more of a chance to complete an entire piece of work in their jobs. Another positive aspect for the industrial engineering position was that they had perceived a significantly greater amount of independent thought and action in their tasks. The IE, based on the perceptions of completing entire tasks, had more task identity. It is important to note at this point, that although the IE position scored significantly better than the other positions in the areas described above, it was not necessarily better in all respects. It was, however, not significantly worse in any of the variables measured by the JDS.

Hypothesis 3

The third and final set of orthogonal contrasts compared the differences in scores in the Resources and Requirements position with the mean scores in other positions. The hypotheses tested were established as:

Ho: $3\mu_{R\&R} = \mu_{R\&L} + \mu_{IE} + \mu_{EEP}$

Ho: $\mu_{R\&L} = \mu_{EEP}$

Ho: $\mu_{R\&L} + \mu_{EEP} = 2\mu_{IE}$

The R&R respondents perceived their jobs as allowing for a much lower capability to complete a whole and identifiable piece of work. However, the R&R respondents thought of quitting their jobs much less frequently than the respondents in other positions. The R&R respondents also had a significantly higher feeling of worthwhile accomplishment.

SIGNIFICANT VARIABLES/NOT SIGNIFICANT

Only the statistically significant variables were investigated in the ONEWAY analysis. The mean scores for each variable were different in comparison to the scores for the other variables; some were higher, some lower; however, appropriate statistical inferences can only be drawn on those scores that were significantly different. Mean scores for each independent variable are provided in Appendix D.

The primary thrust of the first major hypothesis was to prove that the key construct, the Motivating Potential Score, in Engineering and Environmental Planning was significantly lower than the MPS in the other CE company grade officer positions. Despite the many deficiencies

of the EEP position and the fact that EEP had the lowest MPS, this construct was not found to be statistically significant. Therefore, the potential of the EEP job to elicit positive internal work motivation on the part of the CE company grade officer in EEP is not significantly different from the potential of R&R, R&L, or IE to elicit the same or similar responses.

Another important variable which was not significantly different across any of the independent variables was the employees' Growth Needs Strength. As expected by the researcher, the respondents in each of the positions have similar desires for obtaining growth satisfaction in the work they do. Although these two constructs of GNS and MPS compare favorably internal to the CE organization, comparison of these scores to civilians in similar jobs outside the military environment are important and will be investigated in the next section.

ONE SAMPLE TEST ABOUT μ WITH σ KNOWN

The second major hypothesis is tested in this section. Perhaps the most significant comparisons of the JDS parameters is not within the organization itself, but the comparisons of these constructs with similar positions in civilian industry. Figure 5-2 shows data which formed the basic analysis. Only some of the construct scores for professionals were made available by VanMaanen and Katz. Using the procedure outlined in chapter 4, the mean scores for the Air Force CE company grade officer are compared to the mean construct scores provided. Skill variety, the degree to which a job requires a variety of different activities in carrying out the work was significantly less in the Air Force CE company grade officer sample. Task identity, the degree to which the job requires the completion of a "whole" and identifiable piece of work was also significantly less

VARIABLE	$\bar{X}_{AFCE}$	AFCE	PROF	Z	SIGNIF OF Z
Skill Variety	5.286	1.263	5.84	6.06	.999
Task Identity	4.693	1.523	5.30	5.33	.999
Task Significance	5.622	1.187	6.22	6.74	.999
Autonomy	5.292	1.210	5.50	2.29	.989
Feedback from Job	4.721	1.238	5.25	5.72	.999
Feedback from Agents	4.322	1.521	4.31	-0.11	.440
Dealing with Others	6.443	0.712	6.05	-7.38	.001
Internal Work Motivation	5.807	0.901	5.86	0.79	.782
Motivating Potential Score	139.664	69.057	167.00	5.29	.999

Figure 5-2 One Sample Comparison

in Air Force CE positions. Task significance, autonomy, and feedback from the job itself were also found to be statistically significant and less than the mean scores for professionals. Task significance is the degree to which the job has a substantial impact on the lives or work of other people. Autonomy is the degree to which the job provides substantial freedom, independence, and discretion to the employees in sceduling the work and determining the procedures to carry it out. Feedback from the job itself is the degree to which carrying out the work activities required by the job results in the employees obtaining information about the effectiveness of their performance. The Air Force CE company grade officer scored significantly higher in dealing with others compared to the professional norms. The most significant variable tested was the Motivating Potential Score. The Air Force civil engineering positions scored significantly lower in their potential for eliciting positive internal work motivation on the part of the employees.

CHAPTER VI

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

SUMMARY

The objective of this research was to determine some of the causes of high employee turnover among company grade civil engineering officers. The primary target of this investigation was the Motivating Potential Score of typical CE company grade officer positions based on the Job Characteristics Model developed by J. Richard Hackman of Yale University, and Greg R. Oldham of the University of Illinois.

Six positions were analyzed in the base civil engineering organization. In the Engineering and Environmental Planning branch, three positions, the Environmental and Contract Planning, Construction Management, and Engineering Technical and Design, were defined and data gathered on each. The Environmental and Contract Planner develops the base comprehensive plans coordinating the usage of all natural resources on the installation. The Construction Management position develops and monitors base project, service, and surveillance contracts. In Engineering and Technical Design, the officers design and consult on all construction projects programmed for the installation. Primary duties of the industrial engineer include work analysis, methods improvement engineering, evaluation, and supervision. Company grade officers assigned as the Chief of Readiness and Logistics or Chief of Resources and Requirements were considered in this study. The Chief of Readiness and Logistics is responsible for the materiel needs of the CE unit, Prime BEEF training and planning, and vehicle control. The primary duty of the Chief of Resources and Requirements is the supervision of the CE control force.

Current civil engineering manning was discussed noting the trends of company grade officers assigned versus authorized. A severe decline in the availability of captains to fill middle management roles was shown. This shortage was attributed to, in part, the high rate of turnover of company grade CE officers within the workforce. Subsequently, lieutenants with relatively little civil engineering experience are filling middle management roles authorized for captains.

The problem statement, for this research effort, aimed at reducing the job related deficiencies which have resulted in high rates of employee turnover. The purpose was to specifically identify these deficiencies and to recommend an implementation strategy for overcoming each deficiency identified. The scope was limited to those job characteristics which, according to the Job Characteristics Model, may be causal of high rates of employee turnover. The research involved only the characteristics of CE company grade officer positions and the comparison of these characteristics internal to the organization as well as external with similar positions in non-military organizations.

A preliminary investigation was conducted using available data on the subject from the Leadership and Management Development Center and data provided by the AFIT School of Civil Engineering. The LMDC data was derived from the Organizational Assessment Package which measured the job characteristics of over 58,000 Air Force members. The AFIT School of Civil Engineering data was the result of one question interviews conducted with 41 base civil engineering staff officers on the subject of officer retention.

The LMDC analysis involved a one sample comparison of 117 OAP factors on a sample of 54 civil engineering company grade officers. The results of this analysis highlighted some strengths and weaknesses with

civil engineering positions compared to the overall Air Force average. Strengths of the CE position included skill variety, autonomy, task significance, and organizational climate. Weaknesses highlighted a lack of feedback, guidance, and supervisory support. Limitations of the conclusions of the LMDC analysis include the small sample size, the lack of information on the respondents' backgrounds, and the comparison of CE positions with overall Air Force means. This analysis did provide, however, added justification for further research into this area since many apparent weaknesses were found.

The staff officer interviews were papers assigned at the AFIT School of Civil Engineering for determining the attitudes of CE staff officers towards the problem of retention in the CE company grade officer work force. Since these officers represent the company grade officers' upper levels of management, their attitudes are important in deriving the solution to this problem. Some of the important characteristics these officers found lacking in the CE company grade officer positions included pay and benefits, increased management responsibility for these officers, and career education briefings. Somewhat less important considerations included job satisfaction, career progression, performance ratings, and the Air Force civil engineering image. Although the size of this sample represents a large cross section of the BCE staff officer force, statistical inferences about the total staff officer population were invalid. This is due to the fact that the interview responses were not statistically independent and there was a degree of outside influence on the possible range of solutions. These results did, however, provide some interesting comparisons with the LMDC results.

The Job Characteristics Model formed the basis for this research.

Hackman and Oldham developed the model to explain the effects of certain job characteristics (core job dimensions), on critical psychological states, leading to personal work outcomes, modified by a dimension known as the employees' Growth Needs Strength. The core job dimensions include skill variety, task identity, task significance, autonomy, and feedback. The presence of these dimensions lead to critical psychological states of experienced meaningfulness of the work, experienced responsibilities for work outcomes, and knowledge of the actual results of the work activities. Personal and work outcomes are derived from these states and include high internal work motivation, high quality work performance, high satisfaction with the work, and low absenteeism and turnover. The relationship between these three constructs is modified by the presence or absence of an employees' Growth Needs Strength. Low growth needs strength will result in weak relationships between the constructs while high growth needs strength has the opposite effect. The measure of the presence of core job dimensions in a position is the Motivating Potential Score. A high MPS will result in positive work outcomes such as low rates of employee turnover. The research on the Job Characteristics Model and the construct of growth needs strength, although mostly supportive, highlighted some limitations of the model's application. Some of these limitations included the shortcomings of growth needs strength as an adequate explanation for the moderating effects on the MPS of a position. The model, however, was found to be extremely useful in its explanation of the relationship between the constructs of MPS and positive work outcomes.

The data collection instrument used to measure the constructs of the Job Characteristics Model was the Job Diagnostic Survey. The JDS measures the core job dimensions as well as the affective reactions of

workers to the presence of these dimensions. The short form of the JDS was used in this research to lessen the requirements of the respondent and hopefully obtain a better response rate than was possible with the long form. The diagnostic uses of the survey instrument were developed in accordance with the guidance provided by Hackman and Oldham.

The research methodology involved the testing of two major hypotheses. The first major hypothesis compared the mean scores between the positions in civil engineering for all variables measured by the JDS. The second major hypothesis compared the overall Air Force civil engineering mean to the normative data collected by VanMaanen and Katz.

Data was collected using 225 mail out survey instruments to 75 CONUS bases. The target sample was to include one company grade civil engineering officer each from EEP, IE, and R&L or R&R. The Job Diagnostic Survey was reproduced identical to the short form used by Hackman and Oldham with eight demographic data questions attached to the beginning of the survey. The survey was approved by MPC and assigned Survey Control Number 81-49.

The data analysis involved the development of an SPSS program to accomplish needed computations, data coding, ANOVA analysis with a ONEWAY, and a one sample comparison. The SPSS program was developed using the second edition of the Statistical Package for the Social Sciences manual. The program included data identification and calculation of construct scores. Coding collected data involved the transfer of data from the survey sheets to a data deck and validation of each step.

The analysis of variance, ANOVA, tested the first major hypothesis comparing the mean scores of each variable on the JDS between the independent variables of rank, years of service, academic degree, and current position. The sum of squares, mean square, degrees of freedom, and F test statistic

were calculated for each independent variable. The F value was compared with the significance of the differences in the mean scores and any value not exceeding a 5% probability of error was considered to have rejected the null hypothesis.

The independent variables of rank, years of service, and academic degree were included in the ANOVA analysis in order to remove the effect of these variables on the current position of the respondent. The variables with significantly different means across current position were analyzed using orthogonal contrasts to determine which of the current positions were significantly different from the other three. The contrasts involved the development of three statistically independent hypotheses.

The final step in the analysis involved a one sample test about μ with σ known. Due to the large sample response size, the standard deviation and the sample mean were assumed to approximate the population variance and mean according to the Central Limit Therom. A z statistic was computed and compared to the distribution of z to determine the significance of the difference between the Air Force civil engineering mean for each construct and the professional normative data.

The results included an impressive response rate and a representative base civil engineering company grade officer sample. The analysis showed the affect of each of the independent variables on some of the JDS constructs, shortcomings of individual civil engineering positions, and the overall MPS of these positions.

The survey response rate was 91%. Some of the surveys returned were invalidated for various reasons resulting in a total sample size of 179. The sample was sufficiently representative of the civil engineering company grade officer population and there were enough data points to

validate the Central Limit Therom assumptions.

The results of the ANOVA analysis revealed that some of the dependent variables varied significantly with rank, years of service, and academic degree of the respondent. Significant variables with respect to rank include autonomy, information about the job, cooperation with other people, pay, and the satisfaction with personal growth. Working closely with other people, the feeling of worthwhile accomplishment, and the desire for the opportunity to learn new things varied with the respondents' level of experience. The academic degree of the respondent influenced the amount of information on the performance received from doing the job, the chance to complete an entire piece of work, and the desire for very friendly co-workers.

The current positions of the respondent had the most influence on the variance in dependent variable means. The extent to which the job required the respondent to work closely with other people, the variety of skills and talents required, and the chance to use personal initiative in the job depended on the respondent's current position. The current position also influenced task significance, the amount of personal growth in the work, and social and growth satisfaction.

The results of the ONEWAY analysis provided conclusive statistical proof of some of the strengths and weaknesses within various civil engineering positions. The EEP positions had significant weaknesses in task variety, interpersonal relationships, personal growth and development, and challenge in the job. The IE position, on the other hand, showed some significant strengths in the degree of autonomy, task identity, and independent thought and action in the position. The R&R position showed fewer chances to complete an entire piece of work but officers in this position thought

less frequently of quitting.

Neither the Motivating Potential Scores nor the growth needs strength varied significantly among the respondents. The R&L position did not show any significantly different mean scores in the dependent variables.

The results of the one sample test about μ with σ known revealed the civil engineering positions significantly deficient in almost every major construct measured. Only the construct, dealing with others, was significantly better in Air Force CE positions compared to the mean scores for professionals. Skill variety, task identity, task significance, autonomy, feedback from the job, internal work motivation, and the motivating potential scores were all significantly less in the CE company grade officer positions.

CONCLUSIONS

There are shortcomings in many of the company grade officer positions within civil engineering as well as the overall picture for the average CE officer. Some of the factors such as rank, years of service, and academic degree must be considered along with characteristics of the position. Although captains seem more satisfied with pay and fringe benefits, the captain respondents to the Job Diagnostic Survey represent those that have remained in the CE workforce after an initial commitment. Members that have left the Air Force are not represented in this sample; their reasons for leaving may or may not have been dissatisfaction with pay and fringe benefits.

Second lieutenants perceived their jobs as being much more favorable for growth and development. This, however, may be a result of subsequent disillusionment on the part of more experienced company grade officers. Officers with more technical backgrounds perceived a greater degree of

feedback from the job itself as well as a greater chance to complete an entire piece of work.

The Engineering and Environmental Planning positions appear to be the weakest with regards to the variables measured by the JDS. Interpersonal relationships within EEP need to be improved since these variables scored consistently low. This position must allow for much more personal growth and development. The need for this growth was not significantly different across the positions and yet the availability for growth was severely limited in EEP. This position must also increase the challenge and significance of the tasks assigned in order to increase its motivating potential.

Many of the company grade officer positions can be improved to match some of the strengths in the industrial engineering position. The autonomy, freedom and independence in scheduling the methods for work accomplishment, must be increased in other positions relative to the IE position. The members in the other CE company grade officer positions must be given more tasks that can be started and completed by the officer. Overall, the criticisms of the EEP position are not significant when the MPS is considered; since the MPS was not significantly different across the positions.

The most significant conclusions drawn from this study involve the comparison of the Air Force civil engineering company grade officer means for variables measured by the JDS and the mean scores for professionals in similar positions. The deficiencies highlighted by this analysis have significant impacts on the high rates of turnover currently being experienced in the CE officer force. These problems must be addressed in order to reduce the turnover of company grade civil engineering officers.

RECOMMENDATIONS

Recommendations in this section are based on the theoretical results and conclusions of the Job Diagnostic Survey and the measurement of characteristics of the various positions within civil engineering. Improving the areas highlighted as deficient in this study will result in improved rates of company grade officer retention in accordance with the Job Characteristics Model. Most of the recommendations focus on existing deficiencies in EEP. EEP showed the greatest amount of deficient characteristics, and since most of the company grade officers in CONUS CE units are assigned to EEP, improvement in these positions will result in the greatest overall benefit. The industrial engineering position had the highest MPS and requires only minor adjustments. The Chief of Resources and Requirements and Chief of Readiness and Logistics positions scored moderately well in job characteristics categories. Improvements in these positions must include increasing the capabilities for completing a whole and identifiable piece of work.

Specific recommendations for EEP include:

1. The branch chief must expand the engineer's work environment to facilitate meeting and cooperating with other people. This can be accomplished by giving the engineer "systems" responsibility. The engineer can perform as a consultant to the operations superintendents on all or major portions of mechanical, electrical, and building systems on the installation. Part of these responsibilities will include an interface with operational and work force control personnel.

2. Challenge in the job and the capability for completion of whole and identifiable pieces of work can be improved by adding responsibilities

to the engineers' positions. These responsibilities can include insuring major repair and maintenance work is identified, programmed, and successfully completed in-house. The challenge is provided in the additional responsibilities; visualization of whole and identifiable pieces of work results from the relatively short start to completion time of in-house work.

3. The EEP branch chief should provide an environment of freedom and independence in scheduling and determining methods of work accomplishment. This environment can be established by allowing the engineers some latitude in selecting design projects and encouraging the engineer to apply new and innovative techniques to their solution.

4. The engineers in EEP must be assigned tasks requiring the use of a variety of their skills and talents. Allowing the engineer to rotate through each EEP section or assigning tasks from each section to the engineer, (e.g. design, construction management, and environmental planning), could result in the desired level of skill variety.

The staff officer interviews provided some interesting comparisons with the perceptions of the company grade officer measured in this study. The staff officers did not consider job satisfaction important, however, the JDS results contradict their perceptions. The staff officers and the company grade officers in this study did agree that increasing responsibility and broadening the tasks assigned to the company grade officer were important. These comparisons, however, could not be statistically verified. The Job Rating Form developed by Hackman and Oldham can provide this statistical verification. In further research, the Job Rating Form can be administered to a representative sample of CONUS base civil engineering staff officers and measure their perceptions of their subordinates' positions. Comparing

the Job Rating Form results with the JDS results, will show which areas the supervisors' perceptions differ greatly from their subordinates.

This research effort did not address non-job related factors such as ethical, professional, and emotional requirements on an Air Force officer. Other factors such as frequency of reassignment, military commitments, and standards of conduct were not considered. There are instruments available which measure the impact of these factors and determine their impact on the company grade civil engineering officers' decision to remain in the Air Force.

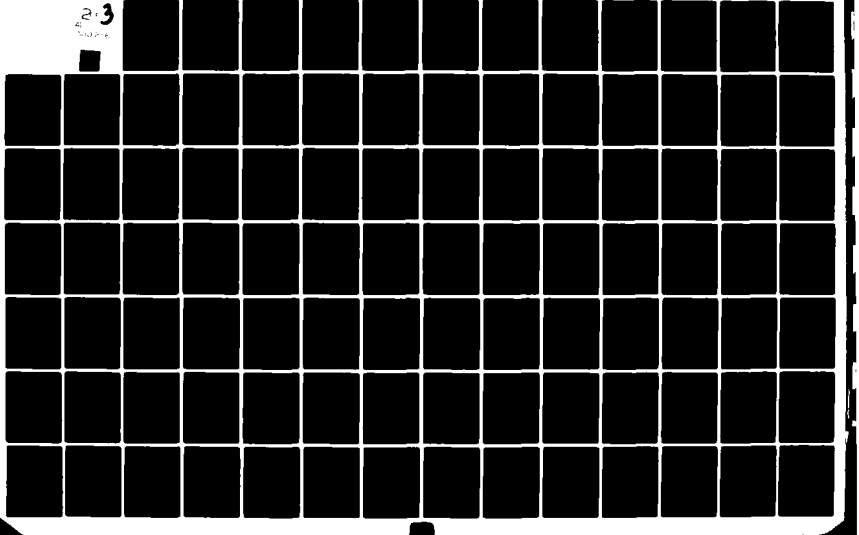
Changing the characteristics of the CE company grade officers' positions represents the least costly in terms of time, effort, and Air Force resources committed. These changes may be the least traumatic of any possible solutions to the high rate of employee turnover problems. They can be implemented at any base by any company grade officer supervisor, and the impact on retention rates should be significantly positive.

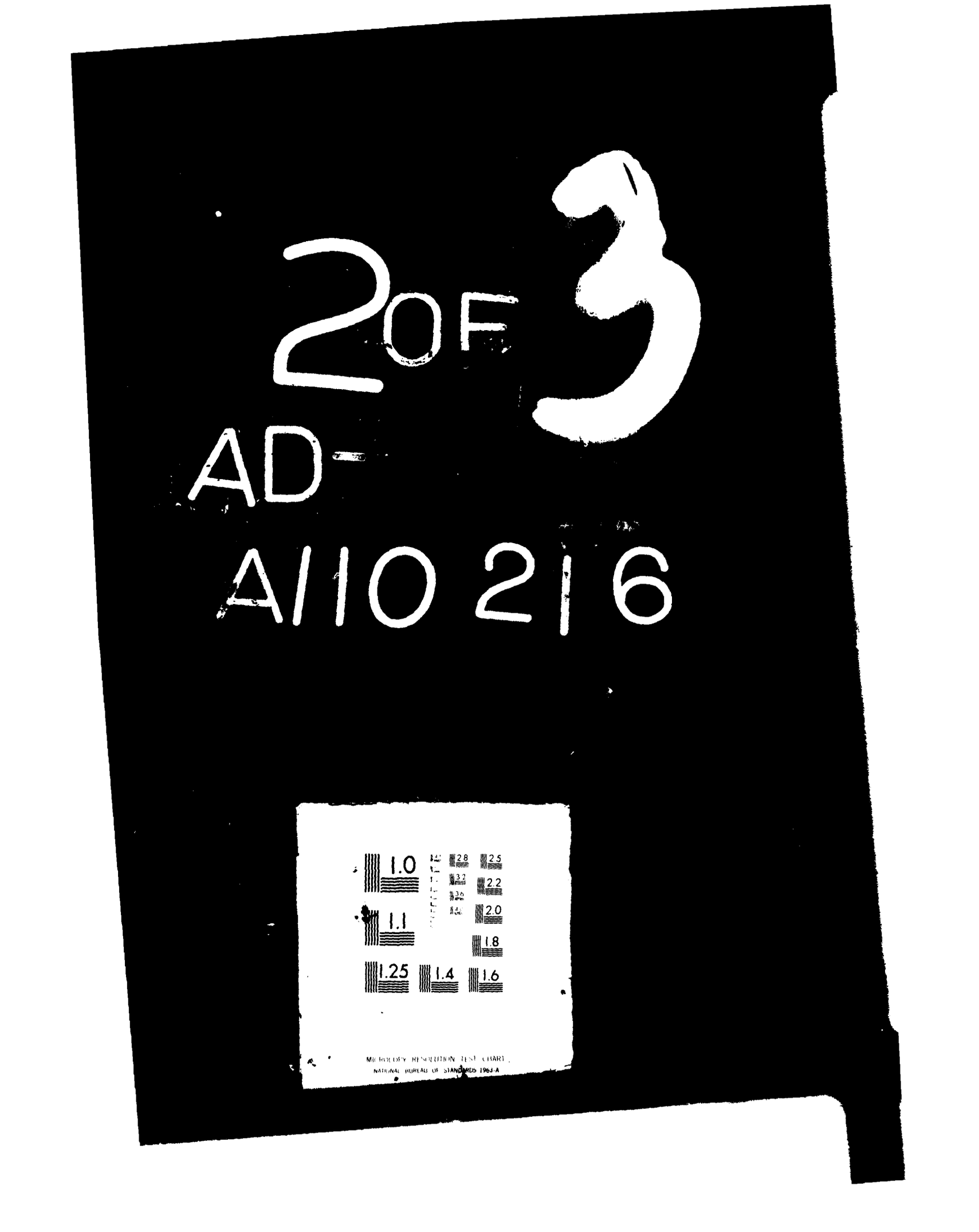
APPENDICES

APPENDIX A

ORGANIZATIONAL ASSESSMENT PACKAGE

AD-A110 216 AIR FORCE INST OF TECH WRIGHT-PATTERSON AFB OH SCHOOL--ETC F/G 5/9
ANALYSIS OF COMPANY GRADE OFFICER POSITIONS IN AIR FORCE BASE C--ETC(U)
SEP 81 R B BARTON
UNCLASSIFIED AFIT-LSSR-71-81 NL

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MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS 1963-A

THE ORGANIZATIONAL ASSESSMENT PACKAGE

PRIVACY ACT STATEMENT

In accordance with paragraph 30, AFR 12-35, The Air Force Privacy Act Program, the following information about this survey is provided:

a. Authority: 10 U.S.C., 8012, Secretary of the Air Force: Powers and Duties, Delegation by Compensation E. O. 9397, 22 Nov 43, Numbering System for Federal Accounts Relating to Individual Persons.

b. Principal Purpose: The survey is being conducted to assess your organization from a leadership and management perspective.

c. Routine Uses: Information provided by respondents will be treated confidentially. The averaged data will be used for organizational strength and weakness identification and Air Force wide research and development purposes.

d. Participation: Response to this survey is voluntary. Your cooperation in this effort is appreciated.

[PLEASE DO NOT TEAR, MARK ON, OR OTHERWISE DAMAGE THIS BOOKLET]

EXPIRATION DATE: 31 Oct 1981

SCN 81-23

GENERAL INFORMATION

The leaders of your organization are genuinely interested in improving the overall conditions within their areas of responsibility. Providing a more satisfying Air Force way of life and increasing organizational effectiveness are also goals. One method of reaching these goals is by continual refinement of the management processes of the Air Force. Areas of concern include job related issues such as leadership and management; training and utilization; motivation of and concern for people; and the communication process.

This survey is intended to provide a means of identifying areas within your organization needing the greatest emphasis in the immediate future. You will be asked questions about your job, work group, supervisor, and organization. For the results to be useful, it is important that you respond to each statement thoughtfully, honestly, and as frankly as possible. Remember, this is <u>not</u> a test, there are no right or wrong responses.

Your completed response sheet will be processed by automated eqiupment, and be summarized in statistical form. Your individual response will remain confidential, as it will be combined with the responses of many other persons, and used for organizational feedback and possibly Air Force wide studies.

KEY WORDS

The following should be considered as key words throughout the survey:

-- Supervisor: The person to whom you report directly.

-- Work Group: All persons who report to the same supervisor that you do.

-- Organization: The School of Systems and Logistics

INSTRUCTIONS

1. All statements may be answered by filling in the appropriate spaces on the response sheet provided. If you do not find a response that fits your case exactly, use the one that is the closest to the way you feel.

2. Be sure that you have completed Section 1 of the response sheet, as instructed by the survey administrator, before beginning Section 2.

3. Please use the pencil provided, and observe the following:

   --Make heavy black marks that fill the spaces.

   --Erase cleanly any responses you wish to change.

   --Make no stray markings of any kind on the response sheet.

   --Do not staple, fold or tear the response sheet.

   --Do not make any markings on the survey booklet.

4. The response sheet has a 0-7 scale. The survey statements normally require a 1-7 response. Use the zero (0) response only if the statement truly does not apply to your situation. Statements are responded to by marking the appropriate space on the response sheet as in the following example:

   Using the scale below, evaluate the sample statement.

   1 = Strongly disagree
   2 = Moderately disagree
   3 = Slightly disagree
   4 = Neither agree nor disagree
   5 = Slightly agree
   6 = Moderately agree
   7 = Strongly agree

Sample Statement. The information your work group receives from other work groups is helpful.

If you moderately agree with the sample statement, you would blacken the oval (6) on the response sheet.

	NA						
Sample Response:	(0)	(1)	(2)	(3)	(4)	(5)	(6)	(7)

5. When you have completed the survey, please turn in the survey materials as instructed in the introduction.

BACKGROUND INFORMATION

This section of the survey concerns your background. The information requested is to insure that the groups you belong to are accurately represented and not to identify you as an individual. Please use the separate response sheet and darken the oval which corresponds to your response to each question.

1. Total years in the Air Force:

    1. Less than 1 year.
    2. More than 1 year, less than 2 years.
    3. More than 2 years, less than 3 years.
    4. More than 3 years, less than 4 years.
    5. More than 4 years, less than 8 years.
    6. More than 8 years.

2. Total months in present career field:

    1. Less than 1 month.
    2. More than 1 month, less than 6 months.
    3. More than 6 months, less than 12 months.
    4. More than 12 months, less than 18 months.
    5. More than 18 months, less than 24 months.
    6. More than 24 months, less than 36 months.
    7. More than 36 months.

3. Total months at this station:

    1. Less than 1 month.
    2. More than 1 month, less than 6 months.
    3. More than 6 months, less than 12 months.
    4. More than 12 months, less than 18 months.
    5. More than 18 months, less than 24 months.
    6. More than 24 months, less than 36 months.
    7. More than 36 months.

4. Total months in present position:

    1. Less than 1 month.
    2. More than 1 month, less than 6 months.
    3. More than 6 months, less than 12 months.
    4. More than 12 months, less than 18 months.
    5. More than 18 months, less than 24 months.
    6. More than 24 months, less than 36 months.
    7. More than 36 months.

5. Your Ethnic Group is:

1. American Indian or Alaskan Native
2. Asian or Pacific Islander
3. Black, not of Hispanic Origin
4. Hispanic
5. White, not of Hispanic Origin
6. Other

6. Your highest education level obtained is:

1. Non-high school graduate
2. High school graduate or GED
3. Less than two years college
4. Two years or more college
5. Bachelors Degree
6. Masters Degree
7. Doctoral Degree

7. Highest level of professional military education (residence or correspondence):

0. None or not applicable
1. NCO Orientation Course or USAF Supervisor Course (NCO Phase 1 or 2)
2. NCO Leadership School (NCO Phase 3)
3. NCO Academy (NCO Phase 4)
4. Senior NCO Academy (NCO Phase 5)
5. Squadron Officer School
6. Intermediate Service School (i.e., ACSC, AFSC)
7. Senior Service School (i.e., AWC, ICAF, NWC)

8. How many people do you directly supervise?

1. None
2. 1
3. 2
4. 3
5. 4 to 5
6. 6 to 8
7. 9 or more

9. For how many people do you write performance reports?

1. None
2. 1
3. 2
4. 3
5. 4 to 5
6. 6 to 8
7. 9 or more

10. Does your supervisor actually write your performance reports?

1. yes
2. no
3. not sure

11. Which of the following "best" describes your marital status?

0. Not Married
1. Married: Spouse is a civilian employed outside home.
2. Married: Spouse is a civilian employed outside home-geographically separated.
3. Married: Spouse not employed outside home.
4. Married: Spouse not employed outside home-geographically separated.
5. Married: Spouse is a military member.
6. Married: Spouse is a military member-geographically separated.
7. Single Parent.

12. What is your usual work schedule?

1. Day shift, normally stable hours.
2. Swing shift (about 1600-2400)
3. Mid shift (about 2400-0800)
4. Rotating shift schedule
5. Day or shift work with irregular/unstable hours.
6. Frequent TDY/travel or frequently on-call to report to work.
7. Crew schedule.

13. How often does your supervisor hold group meetings?

1. Never
2. Occasionally
3. Monthly
4. Weekly
5. Daily
6. Continuously

14. How often are group meetings used to solve problems and establish goals?

1. Never
2. Occasionally
3. About half the time
4. All of the time

15. What is your aeronautical rating and current status?

1. Nonrated, not on aircrew
2. Nonrated, now on aircrew
3. Rated, in crew/operations job
4. Rated, in support job

16. Which of the following best describes your career or employment intentions?

1. Planning to retire in the next 12 months
2. Will continue in/with the Air Force as a career
3. Will most likely continue in/with the Air Force as a career
4. May continue in/with the Air Force
5. Will most likely not make the Air Force a career
6. Will separate/terminate from the Air Force as soon as possible

JOB INVENTORY

Below are items which relate to your job. Read each statement carefully and then decide to what extent the statement is true of your job. Indicate the extent to which the statement is true for your job by choosing the phrase which best represents your job.

1 = Not at all
2 = To a very little extent
3 = To a little extent
4 = To a moderate extent
5 = To a fairly large extent
6 = To a great extent
7 = To a very great extent

Select the corresponding number for each question and enter it on the separate response sheet.

17. To what extent does your job require you to do many different things, using a variety of your talents and skills?

18. To what extent does your job involve doing a <u>whole</u> task or unit of work?

19. To what extent is your job significant, in that it affects others in some important way?

20. To what extent does your job provide a great deal of freedom and independence in scheduling your work?

21. To what extent does your job provide a great deal of freedom and independence in selecting your own procedures to accomplish it?

22. To what extent are you able to determine how well you are doing your job without feedback from anyone else?

23. To what extent do <u>additional duties</u> interfere with the performance of your primary job?

24. To what extent do you have adequate tools and equipment to accomplish your job?

25. To what extent is the amount of work space provided adequate?

26. To what extent does your job provide the chance to know for yourself when you do a good job, and to be responsible for your own work?

27. To what extent does doing your job well affect a lot of people?

28. To what extent does your job provide you with the chance to finish completely the piece of work you have begun?

1 = Not at all
2 = To a very little extent
3 = To a little extent
4 = To a moderate extent
5 = To a fairly large extent
6 = To a great extent
7 = To a very great extent

29. To what extent does your job require you to use a number of complex skills?

30. To what extent does your job give you freedom to do your work as you see fit?

31. To what extent are you allowed to make the major decisions required to perform your job well?

32. To what extent are you proud of your job?

33. To what extent do you feel accountable to your supervisor in accomplishing your job?

34. To what extent do you know exactly what is expected of you in performing your job?

35. To what extent are your job performance goals difficult to accomplish?

36. To what extent are your job performance goals clear?

37. To what extent are your job performance goals specific?

38. To what extent are your job performance goals realistic?

39. To what extent do you perform the same tasks repeatedly within a short period of time?

40. To what extent are you faced with the same type of problem on a weekly basis?

41. To what extent are you aware of promotion/advancement opportunities that affect you?

42. To what extent do co-workers in your work group maintain high standards of performance?

43. To what extent do you have the opportunity to progress up your career ladder?

44. To what extent are you being prepared to accept increased responsibility?

45. To what extent do people who perform well receive recognition?

46. To what extent does your work give you a feeling of pride?

1 = Not at all
2 = To a very little extent
3 = To a little extent
4 = To a moderate extent
5 = To a fairly large extent
6 = To a great extent
7 = To a very great extent

47. To what extent do you have the opportunity to learn skills which will improve your promotion potential?

48. To what extent do you have the necessary supplies to accomplish your job?

49. To what extent do details (tasks not covered by primary or additional duty descriptions) interfere with the performance of your primary job?

50. To what extent does a bottleneck in your organization seriously affect the flow of work either to or from your group?

JOB DESIRES

The statements below deal with job related characteristics. Read each statement and choose the response which best represents how much you would like to have each characteristic in your job.

In my job, I would like to have the characteristics described:

1 = not at all
2 = A slight amount
3 = A moderate amount
4 = A fairly large amount
5 = A large amount
6 = A very large amount
7 - An extremely large amount

51. Opportunities to have independence in my work.

52. A job that is meaningful.

53. An opportunity for personal growth in my job.

54. Opportunities in my work to use my skills.

55. Opportunities to perform a variety of tasks.

56. A job in which tasks are repetitive.

57. A job in which tasks are relatively easy to accomplish.

SUPERVISION

The statements below describe characteristics of managers or supervisors. Indicate your agreement by choosing the phrase which best represents your attitude concerning your supervisor.

1 = Strongly disagree
2 = Moderately disagree
3 = Slightly disagree
4 = Neither agree nor disagree
5 = Slightly agree
6 = Moderately agree
7 = Strongly agree

Select the coresponding number for each statement and enter it on the separate response sheet.

58. My supervisor is a good planner.

59. My supervisor sets high performance standards.

60. My supervisor encourages teamwork.

61. My supervisor represents the group at all times.

62. My supervisor establishes good work procedures.

63. My supervisor has made his responsibilities clear to the group.

64. My supervisor fully explains procedures to each group member.

65. My supervisor performs well under pressure.

66. My supervisor takes time to help me when needed.

67. My supervisor asks members for their ideas on task improvements.

68. My supervisor explains how my job contributes to the overall mission.

69. My supervisor helps me set specific goals.

70. My supervisor lets me know when I am doing a good job.

71. My supervisor lets me know when I am doing a poor job.

72. My supervisor always helps me improve my performance.

73. My supervisor insures that I get job related training when needed.

74. My job performance has improved due to feedback received from my supervisor.

75. When I need technical advice, I usually go to my supervisor.

76. My supervisor frequently gives me feedback on how well I am doing my job.

WORK GROUP PRODUCTIVITY

The statements below deal with the output of your work group. The term "your work group" refers to you and your co-workers who work for the same supervisor. Indicate your agreement with the statement by selecting the phrase which best expresses your opinion.

1 = Strongly disagree
2 = Moderately disagree
3 = Slightly disagree
4 = Neither agree nor disagree
5 = Slightly agree
6 = Moderately agree
7 = Strongly agree

Select the corresponding number for each statement and enter it on the separate response sheet.

77. The quantity of output of your work group is very high.

78. The quality of output of your work group is very high.

79. When high priority work arises, such as short suspenses, crash programs, and schedule changes, the people in my work group do an outstanding job in handling these situations.

80. Your work group always gets maximum output from available resources (e.g., personnel and material).

81. Your work group's performance in comparison to similar work groups is very high.

ORGANIZATION CLIMATE

Below are items which describe characteristics of your organization. The term "your organization" refers to your squadron or staff agency. Indicate your agreement by choosing the phrase which best represents your opinion concerning your organization.

1 = Strongly disagree
2 = Moderately disagree
3 = Slightly disagree
4 = Neither agree nor disagree
5 = Slightly agree
6 = Moderately agree
7 = Strongly agree

Select the corresponding number for each item and enter it on the separate response sheet.

1 = Strongly disagree
2 = Moderately disagree
3 = Slightly disagree
4 = Neither agree or disagree
5 = Slightly agree
6 = Moderately agree
7 = Strongly agree

82. Ideas developed by my work group are readily accepted by management personnel above my supervisor.

83. My organization provides all the necessary information for me to do my job effectively.

84. My organization provides adequate information to my work group.

85. My work group is usually aware of important events and situations.

86. My complaints are aired satisfactorily.

87. My organization is very interested in the attitudes of the group members toward their jobs.

88. My organization has a very strong interest in the welfare of its people.

89. I am very proud to work for this organization.

90. I feel responsible to my organization in accomplishing its mission.

91. The information in my organization is widely shared so that those needing it have it available.

92. Personnel in my unit are recognized for outstanding performance.

93. I am usually given the opportunity to show or demonstrate my work to others.

94. There is a high spirit of teamwork among my co-workers.

95. There is outstanding cooperation between work groups of my organization.

96. My organization has clear-cut goals.

97. I feel motivated to contribute my best efforts to the mission of my organization.

98. My organization rewards individuals based on performance.

99. The goals of my organization are reasonable.

100. My organization provides accurate information to my work group.

JOB RELATED ISSUES

The items below are used to determine how satisfied you are with specific job related issues. Indicate your degree of satisfaction or dissatisfaction with each issue by choosing the most appropriate phrase.

1 = Extremely dissatisfied
2 = Moderately dissatisfied
3 = Slightly dissatisfied
4 = Neither satisfied nor dissatisfied
5 - Slightly satisfied
6 = Moderately satisfied
7 = Extremely satisfied

Select the corresponding number for each question and enter it on the separate response sheet.

101. Feeling of Helpfulness
The chance to help people and improve their welfare through the performance of my job. The importance of my job performance to the welfare of others.

102. Co-Worker Relationship
My amount of effort compared to the effort of my co-workers, the extent to which my co-workers share the load, and the spirit of teamwork which exists among my co-workers.

103. Family Attitude Toward Job
The recognition and the pride my family has in the work I do.

104. On-the-Job Training (OJT)
The OJT instructional methods and instructors' competence.

105. Technical Training (Other than OJT)
The technical training I have received to perform my current job.

106. Work Schedule
My work schedule; flexibility and regularity of my work schedule; the number of hours I work per week.

107. Job Security

108. Acquired Valuable Skills
The chance to acquire valuable skills in my job which prepare me for future opportunities.

109. My Job as a Whole

APPENDIX B

LMDC ANALYSIS

LMDC ANALYSIS

STATEMENT #	VARIABLE	n	$\bar{X}_{CE}$	$\bar{S}_{CE}$	$\bar{X}_{AF}$	$\bar{S}_{AF}$	$S/\sqrt{n}$	z	SIGNIFICANCE
17	201	54	5.35	1.32	4.84	1.70	.18	2.83	.0023
18	202	54	5.06	1.38	4.95	1.65	.19	.58	.2810
19	203	54	5.52	1.46	5.68	1.55	.20	.80	.2119
23	206	54	4.11	1.67	3.58	1.84	.23	2.30	.0107
24	207	54	4.39	1.25	4.62	1.59	.17	1.35	.0885
25	208	54	4.70	1.60	4.71	1.65	.22	.05	.4801
26	209	53	4.91	1.32	5.02	1.58	.18	.61	.2709
27	210	54	5.28	1.48	5.51	1.58	.20	1.15	.1251
28	211	54	5.15	1.31	5.04	1.57	.18	.61	.2709
29	212	54	4.54	1.37	4.29	1.74	.19	1.32	.0934
30	213	54	4.44	1.14	3.96	1.72	.16	3.00	.0013
31	214	54	4.37	1.23	4.10	1.74	.17	1.59	.0559
32	215	54	5.15	1.58	5.03	1.82	.22	.55	.2912
33	216	53	5.40	1.15	5.03	1.69	.16	2.31	.0104
34	217	54	4.59	1.50	5.41	1.49	.20	4.1	.0001
35	218	54	3.87	1.33	3.63	1.58	.18	1.33	.0918
38	221	53	4.40	1.28	4.65	1.58	.17	1.47	.0708
39	226	54	3.57	1.47	4.97	1.67	.20	7.00	.0001
40	227	53	3.91	1.56	4.82	1.68	.21	4.33	.0001
41	234	53	4.53	1.62	4.66	1.82	.22	.59	.2776
42	238	54	4.93	1.13	4.78	1.48	.15	1.00	.1587
43	239	53	4.25	1.56	3.88	1.76	.21	1.76	.0392
44	240	54	4.24	1.76	4.34	1.83	.24	.42	.3372
45	241	54	4.04	1.58	3.71	1.71	.22	1.50	.0668

STATEMENT #	VARIABLE #	n	$\bar{X}_{CE}$	$\bar{S}_{CE}$	$\bar{X}_{AF}$	$\bar{S}_{AF}$	$S/\sqrt{n}$	z	SIGNIFICANCE
51	249	54	5.50	1.06	5.07	1.58	.14	3.07	.0011
52	250	53	6.38	.79	5.76	1.50	.11	5.64	.0001
53	251	53	6.28	.91	5.62	1.59	.12	5.50	.0001
54	252	53	6.25	.92	5.72	1.50	.13	4.10	.0001
55	253	53	5.85	1.18	5.42	1.60	.16	2.69	.0036
56	255	52	2.13	.97	3.07	1.69	.13	7.23	.0001
57	258	52	2.31	.94	4.78	1.48	.13	19.0	.0001
77	259	54	5.43	1.40	5.56	1.58	.19	.68	.2483
78	260	54	5.39	1.42	5.57	1.54	.19	.94	.1736
79	261	54	5.85	1.31	5.69	1.52	.18	.89	.1867
80	264	54	5.11	1.48	5.04	1.75	.20	.35	.3632
81	265	52	5.62	1.22	5.60	1.55	.17	.12	.4522
20	270	54	4.52	1.31	3.83	1.90	.18	3.83	.0001
21	271	54	4.54	1.46	3.94	1.83	.20	3.00	.0013
22	272	54	3.87	1.32	4.43	1.60	.18	3.11	.0009
36	273	54	4.46	1.44	4.93	1.50	.20	2.35	.0094
37	274	54	4.22	1.48	4.80	1.54	.20	2.90	.0019
46	275	54	4.96	1.52	4.71	1.85	.21	1.19	.1170
47	276	53	4.17	1.48	3.74	1.71	.20	2.15	.0158
48	277	54	4.78	1.24	4.57	1.51	.17	1.24	.1075
49	278	54	3.61	1.50	3.55	1.69	.20	.30	.3821
50	279	54	4.26	1.59	4.16	1.79	.22	.45	.3264
82	300	54	4.35	1.70	3.95	1.82	.23	1.74	.0409
83	301	53	4.11	1.51	4.36	1.80	.21	1.19	.1170
84	302	54	4.43	1.34	4.45	1.72	.18	.11	.4562
85	303	54	5.04	1.54	4.78	1.77	.21	1.24	.1075

STATEMENT #	VARIABLE	n	$\bar{X}_{CE}$	$\bar{S}_{CE}$	$\bar{X}_{AF}$	$\bar{S}_{AF}$	$S/\sqrt{n}$	z	SIGNIFICANCE
86	304	53	4.79	1.59	4.11	1.91	.22	3.10	.0010
87	305	54	4.54	1.79	4.04	2.01	.24	2.08	.0188
88	306	54	4.87	1.76	4.22	2.03	.24	2.71	.0034
39	307	54	5.41	1.74	4.69	2.01	.24	3.00	.0013
90	308	54	6.06	1.28	5.57	1.70	.17	2.88	.0021
91	309	53	4.38	1.70	4.38	1.80	.23	0	.5000
92	310	54	4.70	1.92	4.46	1.90	.26	.92	.1788
93	311	54	4.98	1.41	4.45	1.80	.19	2.80	.0026
94	312	54	4.78	1.93	4.48	1.95	.26	1.15	.1251
95	313	54	4.11	1.76	4.13	1.86	.24	.08	.4681
96	314	54	4.44	1.79	4.57	1.81	.24	.54	.2946
97	315	54	5.69	1.65	5.08	1.88	.22	2.77	.0028
98	316	54	4.52	1.68	4.01	1.95	.23	2.22	.0132
99	317	53	5.02	1.38	4.91	1.62	.19	.58	.2810
100	318	54	4.59	1.34	4.48	1.72	.18	.61	.2709
58	404	54	4.61	1.86	4.83	1.89	.25	.88	.1894
59	405	54	5.22	1.70	5.18	1.76	.23	.17	.4325
60	410	54	5.13	1.60	5.14	1.84	.22	.05	.4801
61	411	54	4.93	1.68	4.83	1.99	.23	.43	.3336
62	412	54	4.39	1.64	4.83	1.83	.22	2.00	.0228
63	413	54	4.69	1.74	5.00	1.86	.24	1.29	.0985
65	416	54	4.85	1.95	5.04	1.92	.27	.70	.2420
66	424	53	5.51	1.38	5.38	1.81	.19	.68	.2483
67	426	54	4.91	1.61	4.99	1.91	.22	.36	.3594
68	428	54	4.43	1.68	4.99	1.90	.23	2.43	.0075
69	431	54	4.17	1.79	4.23	1.89	.24	.25	.4013

STATEMENT #	VARIABLE	n	$\bar{X}_{CE}$	$\bar{S}_{CE}$	$\bar{X}_{AF}$	$\bar{S}_{AF}$	$S/\sqrt{n}$	z	SIGNIFICANCE
70	433	54	4.54	1.80	4.70	1.99	.25	.63	.2643
71	434	52	4.67	1.77	5.37	1.71	.24	2.92	.0018
72	435	53	4.17	1.72	4.47	1.85	.23	1.30	.0968
73	436	54	4.19	1.88	4.62	1.89	.26	1.65	.0495
74	437	54	4.46	1.83	4.36	1.97	.25	.40	.3446
75	439	54	4.22	1.98	4.50	2.10	.27	1.04	.1492
76	442	54	4.11	1.68	4.36	1.97	.23	1.09	.1379
64	445	54	4.37	1.80	4.66	1.90	.25	1.16	.1230
101	705	54	5.41	1.52	5.06	1.67	.21	1.67	.0475
102	709	54	5.46	1.50	4.94	1.76	.20	2.60	.0047
103	710	50	5.60	1.31	5.05	1.75	.18	3.05	.0011
104	711	44	4.05	1.61	4.36	1.82	.22	1.27	.1020
105	712	50	4.46	1.82	4.46	1.87	.25	0	.5000
106	717	53	5.62	1.50	5.02	1.95	.20	3.00	.0013
107	718	52	5.15	1.60	5.16	1.79	.22	.05	.4801
108	719	54	5.11	1.79	4.48	2.02	.24	2.63	.0043
109	723	54	5.28	1.71	4.89	1.96	.23	1.70	.0446
N/A	800	54	4.94	1.21	4.57	1.58	.16	2.30	.0107
N/A	801	54	5.10	1.15	5.00	1.35	.16	.63	.2643
N/A	802	54	5.40	1.39	5.60	1.42	.19	1.05	.1469
N/A	804	53	4.40	1.09	4.73	1.38	.15	2.20	.0139
N/A	805	54	4.33	1.09	4.58	1.15	.15	1.67	.0475
N/A	806	53	6.05	.76	5.53	1.30	.10	5.20	.0001
N/A	807	53	102.5	45.9	105.2	68.17	6.25	.43	.3336
N/A	808	53	66.2	10.2	65.5	13.20	1.39	.50	.3085
N/A	809	53	13.8	2.3	13.69	3.19	.31	.42	.3372

STATEMENT #	VARIABLE	n	$\bar{X}_{CE}$	$\bar{S}_{CE}$	$\bar{X}_{AF}$	$\bar{S}_{AF}$	$S/\sqrt{n}$	z	SIGNIFICANCE
N/A	810	53	4.36	.98	4.70	1.06	.13	2.62	.0044
N/A	811	54	5.06	1.49	4.87	1.74	.20	.95	.1711
N/A	812	53	4.96	.93	4.99	1.11	.13	.23	.4090
N/A	813	53	4.47	1.01	3.97	1.50	.14	3.57	.0001
N/A	814	53	3.75	1.29	4.89	1.47	.18	6.33	.0001
N/A	816	51	2.24	.88	3.08	1.42	.12	7.00	.0001
N/A	817	53	4.23	1.27	4.08	1.29	.17	.88	.1894
N/A	818	54	4.78	1.41	4.95	1.59	.19	.89	.1867
N/A	819	53	4.42	1.43	4.54	1.64	.19	.63	.2643
N/A	820	50	4.60	1.22	4.45	1.40	.17	.88	.1894
N/A	821	53	5.51	1.06	5.50	1.29	.14	.07	.4721
N/A	822	47	5.40	.97	4.95	1.31	.14	3.21	.0007
N/A	823	42	4.31	1.59	4.40	1.65	.22	.41	.3409
N/A	824	54	4.97	1.32	4.52	1.47	.18	2.50	.0062
N/A	825	53	107.2	49.5	108.6	72.04	6.74	.21	.4168

CALCULATION OF "800" VARIABLES

EQUATION #1 800 = (201 + 212)/ 2

EQUATION #2 801 = (202 + 211)/ 2

EQUATION #3 802 = (203 + 210)/ 2

EQUATION #4 804 = (272 + 209)/ 2

EQUATION #5 805 = (8 - 206 + 207 + 208)/ 3

EQUATION #6 806 = (249 + 250 + 251 + 252 + 253)/ 5

EQUATION #7 807 = ((800 + 801 + 802 + 805)/ 4) * 813 * 804

EQUATION #8 808 = (201 + 202 + 203 + 270 + 271 + 272 + 8 - 206 +
207 + 208 + 209 + 210 + 211 + 212 + 213)

EQUATION #9 809 = ((800 + 801 + 802 + 805)/ 4) + 813 + 804

EQUATION #10 810 = (217 + 218 + 273 + 274 + 221)/ 5

EQUATION #11 811 = (215 + 275)/ 2

EQUATION #12 812 = (201 + 202 + 203 + 272 + 209 + 210 + 211 + 212)/ 8

EQUATION #13 813 = (270 + 271 + 213 + 214)/ 4

EQUATION #14 814 = (226 + 227)/ 2

EQUATION #15 816 = (255 + 258)/ 2

EQUATION #16 817 = (234 + 239 + 240 + 241 + 276)/ 5

EQUATION #17 818 = (404 + 405 + 410 + 411 + 412 + 413 + 445 + 416)/ 8

EQUATION #18 819 = (426 + 428 + 431 + 433 + 435 + 436 + 437 + 442)/ 8

EQUATION #19 820 = (300 + 301 + 302 + 303 + 304 + 309 + 314 + 317 +
318)/ 9

EQUATION #20 821 = (259 + 260 + 261 + 264 + 265)/ 5

EQUATION #21 822 = (705 + 709 + 710 + 717 + 718 + 719 + 723)/ 7

EQUATION #22 823 = (711 + 712)/ 2

EQUATION #23 824 = (305 + 306 + 307 + 308 + 310 + 311 + 312 + 313 +
315 + 316)/ 10

EQUATION #24 825 = ((800 + 801 + 802)/ 3) * 813 * 804

APPENDIX C

JOB DIAGNOSTIC SURVEY

DEPARTMENT OF THE AIR FORCE
AIR FORCE INSTITUTE OF TECHNOLOGY (ATC)
WRIGHT-PATTERSON AIR FORCE BASE, OH 45433

REPLY TO ATTN OF: LSH (LSSR 71-81)/1Lt R. Barton/AUTOVON 785-6569

SUBJECT: Job Diagnostic Survey

TO

1. Attached are surveys prepared by researchers at the Air Force Institute of Technology, Wright-Patterson AFB OH and Yale University. The purpose of the survey is to acquire data concerning the perceptions and attitudes of company grade officers towards increased job scope.

2. Please distribute one survey to any company grade officer in Engineering and Environmental Planning, the Chief of Industrial Engineering and the Chief of Readiness and Logistics. They are requested to provide answers for each question. Headquarters USAF Survey Control Number 81-49 has been assigned to this survey. Officer participation in this survey is voluntary.

3. Their response to the questions will be held confidential. Their cooperation in providing this data will be appreciated and will be very beneficial in examining the attitudes of company grade officers towards increased job scope. Instruct the officers to return the completed surveys in the attached envelopes within one week after receipt.

CHARLES R. MARGENTHALER, Col, USAF
Dean
School of Systems and Logistics

2 Atch
1. 3 JDS Surveys
2. 3 Return Envelopes

PRIVACY STATEMENT

In accordance with paragraph 30, AFR 12-35, the following information is provided as required by the Privacy Act of 1974:

a. Authority:

(1) 5 U.S.C. 301, Departmental Regulations, and/or

(2) 10 U.S.C. 8012, Secretary of the Air Force, Powers, Duties, Delegation by Compensation; and/or

(3) DOD Instruction 1100.13, 17 Apr 68, Surveys of Department of Defense Personnel; and/or

(4) AFR 30-23, 22 Sep 76, Air Force Personnel Survey Program.

b. Principal Purposes. The survey is being conducted to collect information to be used in research aimed at illuminating and providing inputs to the solution of problems of interest to the Air Force and/or DOD.

c. Routine Uses. The survey data will be converted to information for use in research of management related problems. Results of the research, based on the data provided, will be included in written master's theses and may also be included in published articles, reports or texts. Distribution of the results of the research, based on the survey data, whether in written form or presented orally, will be unlimited.

d. Participation in this survey is entirely voluntary.

e. No adverse action of any kind may be taken against any individual who elects not to participate in any or all of this survey.

Please circle or enter the appropriate response(s) for each of the following questions/statements. Please do not consult any other individuals, texts, or regulations in answering the questions. They are designed to interpret your attitudes only.

1. What is your current rank?

   a. O-1 b. O-2 c. O-3 d. O-4

2. How many months of active duty military service do you have in Base Civil Engineering?

   a. 0-6 months b. 7-18 months c. 19 months-5 years d. over 5 years

3. What is your engineering degree area specialty?

   a. Architectural b. Civil c. Electrical d. General

   e. Industrial f. Mechanical g. Other

4. What is your current position in Base Civil Engineering?

a. Chief of Resources and Requirements
b. Chief of Readiness and Logistics
c. Chief of Industrial Engineering
d. Design Engineer in Engineering and Environmental Planning
e. Contract Monitor in Engineering and Environmental Planning
f. Environmental Planner in Engineering and Environmental Planning
g. Other (specify)

5. What positions have you worked in during your career in Base Civil Engineering (Circle all applicable)

a. Chief of Resources and Requirements
b. Chief of Readiness and Logistics
c. Chief of Industrial Engineering
d. Design Engineer in Engineering and Environmental Planning
e. Contract Monitor in Engineering and Environmental Planning
f. Environmental Planner in Engineering and Environmental Planning
g. Other (specify)

6. Are you now or have you ever been a Prime BEEF contingency force team chief?

a. Yes I have been a CF ___ chief for ___ months
b. No I have not been a CF team chief

7. How often does your contingency force team practice as a unit? (Include all Prime BEEF training exercises)

a. less than annually b. annually c. semi-annually
d. quarterly e. monthly f. more than monthly

8. Circle all the following training courses which you have successfully completed.

a. AFIT Contingency Engineering (ENG 485)
b. Field Training at Eglin AFB FLA
c. Other Prime BEEF training (specify)

The remainder of this survey is the Job Diagnostic Survey developed by J. Richard Hackman of Yale University and Greg R. Oldham of the University of Illinois.

J O B D I A G N O S T I C S U R V E Y:

SHORT FORM

This questionnaire was developed as part of a Yale University study of jobs and how people react to them. The questionnaire helps to determine how jobs can be better designed, by obtaining information about how people react to different kinds of jobs.

On the following pages you will find several different kinds of questions about your job. Specific instructions are given at the start of each section. Please read them carefully. It should take no more than 10 minutes to complete the entire questionnaire. Please move through it quickly.

The questions are designed to obtain <u>your</u> perceptions of your job and your <u>reactions</u> to it.

There are no "trick" questions. Your individual answers will be kept completely confidential. Please answer each item as honestly and frankly as possible.

Thank you for your cooperation.

For more information about this questionnaire and its use, please contact:

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SECTION ONE

This part of the questionnaire asks you to describe your job as objectively as you can.

Please do not use this part of the questionnaire to show how much you like or dislike your job. Questions about that will come later. Instead, try to make your descriptions as accurate and as objective as you possibly can.

A sample question is given below.

A. To what extent does your job require you to work with mechanical equipment?

1----------2---------3---------4---------5---------(6)---------7

Very little; the job requires almost no contact with mechanical equipment of any kind.

Moderately

Very much; the job requires almost constant work with mechanical equipment

You are to circle the number which is the most accurate description of your job.

If, for example, your job requires you to work with mechanical equipment a good deal of the time--but also requires some paperwork--you might circle the number six, as was done in the example above.

Turn the page and begin.

1. To what extent does your job require you to work <u>closely with other people</u> (either "clients" or people in related jobs in your own organization)?

1----------2----------3----------4----------5----------6----------7

Very little; dealing with other people is not at all necessary in doing the job.	Moderately; some dealing with others is necessary.	Very much; dealing with other people is an absolutely essential and crucial part of doing the job.

2. How much <u>autonomy</u> is there in your job? That is, to what extent does your job permit you to decide <u>on your own</u> how to go about doing the work?

1----------2----------3----------4----------5----------6----------7

Very little; the job gives me almost no personal "say" about how and when the work is done.	Moderate autonomy; many things are standardized and not under my control, but I can make some decisions about the work.	Very much; the job gives me almost complete responsibility for deciding how and when the work is done.

3. To what extent does your job involve doing a <u>"whole" and identifiable piece of work?</u> That is, is the job a complete piece of work that has an obvious beginning and end? Or is it only a small <u>part</u> of the overall piece of work, which is finished by other people or by automatic machines?

1----------2----------3----------4----------5----------6----------7

My job is only a tiny part of the overall piece of work; the results of my activities cannot be seen in the final product or service.	My job is a moderate-sized "chunk" of the overall piece of work; my own contribution can be seen in the final outcome.	My job involves doing the whole piece of work, from start to finish; the results of my activities are easily seen in the final product or service.

4. How much <u>variety</u> is there in your job? That is, to what extent does the job require you to do many different things at work, using a variety of your skills and talents?

1----------2----------3----------4----------5----------6----------7

Very little; the job requires me to do the same routine things over and over again.	Moderate variety	Very much; the job requires me to do many different things, using a number of different skills and talents.

5. In general, how <u>significant or important</u> is your job? That is, are the results of your work likely to significantly affect the lives or well-being of other people?

1----------2----------3----------4----------5----------6----------7

Not very significant; the outcomes of my work are <u>not</u> likely to have important effects on other people.	Moderately significant	Highly significant; the outcomes of my work can affect other people in very important ways.

6. To what extent do <u>managers or co-workers</u> let you know how well you are doing on your job?

1----------2----------3----------4----------5----------6----------7

Very little; people almost never let me know how well I am doing.	Moderately; sometimes people may give me "feedback;" other times they may not	Very much; managers or co-workers provide me with almost constant "feedback" about how well I am doing.

7. To what extent does <u>doing the job itself</u> provide you with information about your work performance? That is, does the actual <u>work itself</u> provide clues about how well you are doing--aside from any "feedback" co-workers or supervisors may provide?

1----------2----------3----------4----------5----------6----------7

Very little; the job itself is set up so I could work forever without finding out how well I am doing.	Moderately; sometimes doing the job provides "feedback" to me; sometimes it does not.	Very much; the job is set up so that I get almost constant "feedback" as I work about how well I am doing.

SECTION TWO

Listed below are a number of statements which could be used to describe a job.

You are to indicate whether each statement is an accurate or an inaccurate description of your job.

Once again, please try to be as objective as you can in deciding how accurately each statement describes your job--regardless of whether you like or dislike your job.

Write a number in the blank beside each statement, based on the following scale:

How accurate is the statement in describing your job?

1	2	3	4	5	6	7
Very Inaccurate	Mostly Inaccurate	Slightly Inaccurate	Uncertain	Slightly Accurate	Mostly Accurate	Very Accurate

____1. The job requires me to use a number of complex or high level skills.

____2. The job requires a lot of cooperative work with other people.

____3. The job is arranged so that I do not have the chance to do an entire piece of work from beginning to end.

____4. Just doing the work required by the job provides many chances for me to figure out how well I am doing.

____5. The job is quite simple and repetitive.

____6. The job can be done adequately by a person working alone--without talking or checking with other people.

____7. The supervisor and co-workers on this job almost never give me any "feedback" about how well I am doing in my work.

____8. This job is one where a lot of people can be affected by how well the work gets done.

____9. The job denies me any chance to use my personal initiative or judgment in carrying out the work.

___10. Supervisors often let me know how well they think I am performing on the job.

___11. The job provides me the chance to completely finish the pieces of work I begin.

___12. The job itself provides very few clues about whether or not I am performing well.

___13. The job gives me considerable opportunity for independence and freedom in how I do the work.

___14. The job itself is not very significant or important in the broader scheme of things.

SECTION THREE

Now please indicate how you personally feel about your job.

Each of the statements below is something that a person might say about his or her job. You are to indicate your own, personal feelings about your job by marking how much you agree with each of the statements.

Write a number in the blank for each statement, based on this scale:
How much do you agree with the statement?

1	2	3	4	5	6	7
Disagree Strongly	Disagree	Disagree Slightly	Neutral	Agree Slightly	Agree	Agree Strongly

____1. My opinion of myself goes up when I do this job well.

____2. Generally speaking, I am very satisfied with this job.

____3. I feel a great sense of personal satisfaction when I do this job well.

____4. I frequently think of quitting this job.

____5. I feel bad and unhappy when I discover that I have performed poorly on this job.

____6. I am generally satisfied with the kind of work I do in this job.

____7. My own feelings generally are not affected much one way or the other by how well I do on this job.

SECTION FOUR

Now please indicate how satisfied you are with each aspect of your job listed below. Once again, write the appropriate number in the blank beside each statement.

How satisfied are you with this aspect of your job?

1	2	3	4	5	6	7
Extremely Dissatisfied	Dissatisfied	Slightly Dissatisfied	Neutral	Slightly Satisfied	Satisfied	Extremely Satisfied

____1. The amount of job security I have.

____2. The amount of pay and fringe benefits I receive.

____3. The amount of personal growth and development I get in doing my job.

____4. The people I talk to and work with on my job.

____5. The degree of respect and fair treatment I receive from my boss.

____6. The feeling of worthwhile accomplishment I get from doing my job.

____7. The chance to get to know other people while on the job.

____8. The amount of support and guidance I receive from my supervisor.

____9. The degree to which I am fairly paid for what I contribute to this organizati

___10. The amount of independent thought and action I can exercise in my job.

___11. How secure things look for me in the future in this organization.

___12. The chance to help other people while at work.

___13. The amount of challenge in my job.

___14. The overall quality of the supervision I receive in my work.

SECTION FIVE

Listed below are a number of characteristics which could be present on any job. People differ about how much they would like to have each one present in their own jobs. We are interested in learning <u>how much you personally would like</u> to have each one present in your job.

Using the scale below, please indicate the <u>degree</u> to which you <u>would like</u> to have each characteristic present in your job.

NOTE: The numbers on this scale are different from those used in previous <u>scales</u>.

4	5	6	7	8	9	10
Would like having this only a moderate amount (or less)			Would like having this very much			Would like having this <u>extremely</u> much

_____1. High respect and fair treatment from my supervisor.

_____2. Stimulating and challenging work.

_____3. Chances to exercise independent thought and action in my job.

_____4. Great job security.

_____5. Very friendly co-workers.

_____6. Opportunities to learn new things from my work.

_____7. High salary and good fringe benefits.

_____8. Opportunities to be creative and imaginative in my work.

_____9. Quick promotions.

____10. Opportunities for personal growth and development in my job.

____11. A sense of worthwhile accomplishment in my work.

SCORING KEY FOR THE SHORT FORM OF THE JOB DIAGNOSTIC SURVEY

The short form of the Job Diagnostic Survey (JDS) measures several characteristics of jobs, the reactions of the respondents to their jobs, and the growth need strength of the respondents. Some of the scales tapped by the JDS are not included in the short form; others are measured with fewer items. The scales measuring the objective job dimensions are, however, identical with those in the JDS.

Each variable measured by the JDS short form is listed below, along with (a) a one or two sentence description of the variable, and (b) a list of the questionnaire items which are averaged to yield a summary score for the variable.

I. JOB DIMENSIONS: Objective characteristics of the job itself.

A. Skill Variety: The degree to which a job requires a variety of different activities in carrying out the work, which involve the use of a number of different skills and talents of the employee.

Average the following items:

Section One #4

Section Two #1

#5 (reversed scoring--i.e., subtract the number entered by the respondent from 8)

B. Task Identity: The degree to which the job requires the completion of a "whole" and identifiable piece of work--i.e., doing a job from beginning to end with a visible outcome.

Average the following items:

Section One #3

Section Two #11

#3 (reversed scoring)

C. Task Significance: The degree to which the job has a substantial impact on the lives or work of other people--whether in the immediate organization or in the external environment.

Average the following items:

Section One #5

Section Two #8

#14 (reversed scoring)

D. Autonomy: The degree to which the job provides substantial freedom, independence, discretion to the employees in scheduling his work and in determining the procedures to be used in carrying it out.

Average the following items:

Section One #7

Section Two #4

#12 (reversed scoring)

F. Feedback from Agents: The degree to which the employee receives information about his or her performance effectiveness from supervisors or from co-workers. (This construct is not a job characteristic per se, and is included only to provide information supplementary to construct (E) above.)

Average the following items:

Section One #6

Section Two #2

#7 (reversed scoring)

G. Dealing with Others: The degree to which the job requires the employee to work closely with other people (whether other organization members or organizational "clients").

Average the following items:

Section One #1

Section Two #2

#6 (reversed scoring)

II. AFFECTIVE RESPONSES TO THE JOB: The private, affective reactions or feelings an employee gets from working on his or her job.

A. General Satisfaction: An overall measure of the degree to which the employee is satisfied and happy in his or her work.

Average the following items from Section Three: #2

#6

#4 (reversed scoring)

B. Internal Work Motivation: The degree to which the employee is self-motivated to perform effectively on the job.

Average the following items from Section Three: #1

#3

#5

#7 (reversed scoring)

C. Specific Satisfactions: These short scales tap several specific aspects of the employees' job satisfaction.

C1. "Pay" satisfaction. Average items #2 and #9 of Section Four.

C2. "Security" satisfaction. Average items #1 and #11 of Section Four.

C3. "Social" satisfaction. Average items #4, #7, and #12 of Section Four.

C4. "Supervisory" satisfaction. Average items #5, #8, and #14 of Section Four.

C5. "Growth" satisfaction. Average items #3, #6, #10, and #13 of Section Four.

III. INDIVIDUAL GROWTH NEED STRENGTH: This scale taps the degree to which an employee has strong vs. weak desire to obtain "growth" satisfactions from his or her work.

Average the six items from Section Five listed below. Before averaging, subtract 3 from each item score; this will result in a summary scale ranging from one to seven. The items are:

#2, #3, #6, #8, #10, #11

IV. MOTIVATING POTENTIAL SCORE: A score reflecting the potential of a job for eliciting positive internal work motivation on the part of employees (especially those with high desire for growth need satisfaction) is given below.

$$\text{Motivating Potential Score} = \frac{\text{Skill Variety} + \text{Task Identity} + \text{Task Significance}}{3} \times \text{Autonomy} \times \text{Feedback from the Job}$$

APPENDIX D

ANOVA ANALYSIS

GUIDE TO APPENDIX D

This guide is intended as a reference to the tables shown in Appendix D. This appendix consists of two sections. The first section shows the ANOVA results for each dependent variable measures by the JDS. The second section lists the mean scores for each dependent variable according to each independent variable. The following is an index to the dependent variables and where they can br found in Appendix C, the JDS:

V201 to V204 represent the four questions in section one of the JDS on page 106 of this report.

V205 to V207 represent the three questions in section one of the JDS on page 107 of this report.

V301 to V314 represent the fourteen questions in section two of the JDS on page 108 of this report.

V401 to V407 represent the seven questions in section three of the JDS on page 109 of this report.

V501 to V514 represent the fourteen questions in section four of the JDS on page 110 of this report.

V601 to V611 represent the eleven questions in section five of the JDS on page 111 of this report.

V701 to V716 represent the sixteen major constructs calculated by the responses on the JDS. The formulas for calculating the scores for these variables are shown on pages 112 to 115 of this report.

JDS ANOVA RESULTS

VARIABLE 201: Section One, Question 1

SOURCE OF VARIATION		SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F	
MAIN EFFECTS		30.407	11	2.764	3.785	.001	
RANK		.757	2	.378	.518	.597	
CURPOS		10.198	3	3.399	4.654	.004	*
YRSRV		6.221	3	2.074	2.839	.041	*
DEGREE		3.654	3	1.218	1.667	.177	
2-WAY INTERACTIONS		21.355	38	.562	.769	.823	
RANK	CURPOS	2.433	6	.406	.555	.765	
RANK	YRSRV	.537	4	.134	.184	.946	
RANK	DEGREE	2.809	6	.468	.641	.697	
CURPOS	YRSRV	5.642	9	.627	.858	.564	
CURPOS	DEGREE	3.316	6	.553	.757	.605	
YRSRV	DEGREE	3.934	7	.562	.769	.614	
EXPLAINED		51.762	49	1.056	1.446	.052	
RESIDUAL		92.757	127	.730			
TOTAL		144.520	176	.821			

VARIABLE 202: Section Two, Question 2

SOURCE OF VARIATION		SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F	
MAIN EFFECTS		41.561	11	3.778	3.121	.001	
RANK		9.231	2	4.615	3.813	.025	*
CURPOS		12.817	3	4.272	3.529	.017	*
YRSRV		4.443	3	1.481	1.223	.304	
DEGREE		2.100	3	.700	.578	.630	
2-WAY INTERACTIONS		64.874	38	1.707	1.410	.081	
RANK	CURPOS	8.074	6	1.346	1.112	.359	
RANK	YRSRV	.803	4	.201	.165	.955	
RANK	DEGREE	4.031	6	.672	.555	.765	
CURPOS	YRSRV	8.138	9	.924	.763	.650	
CURPOS	DEGREE	16.650	6	2.775	2.292	.039	*
YRSRV	DEGREE	3.791	7	.542	.447	.870	
EXPLAINED		106.436	49	2.172	1.794	.005	
RESIDUAL		153.745	127	1.211			
TOTAL		260.181	176	1.478			

VARIABLE 203: Section One, Question 3

SOURCE OF VARIATION		SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F	
MAIN EFFECTS		51.405	11	4.673	2.180	.019	
RANK		3.557	2	1.778	.830	.439	
CURPOS		25.723	3	8.574	4.000	.009	*
YRSRV		6.003	3	2.001	.934	.427	
DEGREE		5.920	3	1.973	.921	.433	
2-WAY INTERACTIONS		101.241	38	2.664	1.243	.186	
RANK	CURPOS	19.718	6	3.286	1.533	.172	
RANK	YRSRV	8.194	4	2.049	.956	.434	
RANK	DEGREE	19.989	6	3.331	1.554	.166	
CURPOS	YRSRV	20.898	9	2.322	1.083	.380	
CURPOS	DEGREE	18.327	6	3.055	1.425	.210	
YRSRV	DEGREE	20.460	7	2.923	1.364	.226	
EXPLAINED		152.646	49	3.115	1.453	.050	
RESIDUAL		272.201	127	2.143			
TOTAL		424.847	176	2.414			

VARIABLE 204: Section One, Question 4

SOURCE OF VARIATION		SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F	
MAIN EFFECTS		27.625	11	2.511	1.203	.292	
RANK		1.858	2	.929	.445	.642	
CURPOS		17.512	3	5.837	2.796	.043	*
YRSRV		4.762	3	1.587	.760	.518	
DEGREE		4.001	3	1.334	.639	.591	
2-WAY INTERACTIONS		49.449	38	1.301	.623	.953	
RANK	CURPOS	4.312	6	.719	.344	.912	
RANK	YRSRV	6.812	4	1.703	.816	.517	
RANK	DEGREE	3.903	6	.650	.312	.930	
CURPOS	YRSRV	13.472	9	1.497	.717	.693	
CURPOS	DEGREE	15.586	6	2.598	1.244	.288	
YRSRV	DEGREE	9.006	7	1.287	.616	.742	
EXPLAINED		77.074	49	1.573	.753	.870	
RESIDUAL		265.174	127	2.088			
TOTAL		342.249	176	1.945			

VARIABLE 205: Section One, Question 5

SOURCE OF VARIATION		SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
MAIN EFFECTS		16.893	11	1.536	.886	.556
RANK		2.997	2	1.499	.865	.424
CURPOS		11.105	3	3.702	2.136	.099
YRSRV		2.695	3	.898	.518	.670
DEGREE		1.894	3	.631	.364	.779
2-WAY INTERACTIONS		62.885	38	1.655	.955	.551
RANK	CURPOS	8.381	6	1.397	.806	.567
RANK	YRSRV	2.030	4	.508	.293	.882
RANK	DEGREE	8.132	6	1.355	.782	.585
CURPOS	YRSRV	18.884	9	2.098	1.211	.294
CURPOS	DEGREE	25.374	6	4.229	2.441	.029*
YRSRV	DEGREE	10.725	7	1.532	.884	.521
EXPLAINED		79.778	49	1.628	.940	.589
RESIDUAL		220.063	127	1.733		
TOTAL		299.842	176	1.704		

VARIABLE 206: Section One, Question 6

SOURCE OF VARIATION		SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
MAIN EFFECTS		18.054	11	1.641	.674	.761
RANK		2.934	2	1.467	.603	.549
CURPOS		11.065	3	3.688	1.515	.214
YRSRV		2.069	3	.690	.283	.837
DEGREE		2.644	3	.881	.362	.781
2-WAY INTERACTIONS		78.983	38	2.078	.854	.708
RANK	CURPOS	12.448	6	2.075	.852	.532
RANK	YRSRV	10.252	4	2.563	1.053	.383
RANK	DEGREE	16.325	6	2.721	1.118	.356
CURPOS	YRSRV	9.292	9	1.032	.424	.920
CURPOS	DEGREE	12.247	6	2.041	.838	.543
YRSRV	DEGREE	14.345	7	2.049	.842	.555
EXPLAINED		97.037	49	1.980	.813	.793
RESIDUAL		309.211	127	2.435		
TOTAL		406.249	176	2.308		

VARIABLE 207: Section One, Question 7

SOURCE OF VARIATION		SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
MAIN EFFECTS		28.725	11	2.611	1.676	.086
RANK		12.270	2	6.135	3.939	.022 *
CURPOS		9.177	3	3.059	1.964	.123
YRSRV		6.685	3	2.228	1.431	.237
DEGREE		12.554	3	4.185	2.686	.049 *
2-WAY INTERACTIONS		75.859	38	1.995	1.282	.156
RANK	CURPOS	24.004	6	4.001	2.568	.022 *
RANK	YRSRV	1.143	4	.286	.183	.947
RANK	DEGREE	6.853	6	1.142	.733	.624
CURPOS	YRSRV	8.853	9	.984	.632	.768
CURPOS	DEGREE	23.630	6	3.938	2.528	.024 *
YRSRV	DEGREE	4.701	7	.672	.431	.881
EXPLAINED		104.583	49	2.134	1.370	.083
RESIDUAL		197.824	127	1.558		
TOTAL		302.407	176	1.718		

VARIABLE 301: Section Two, Statement 1

SOURCE OF VARIATION		SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
MAIN EFFECTS		36.911	11	3.365	1.307	.228
RANK		9.781	2	4.891	1.905	.153
CURPOS		11.993	3	3.998	1.557	.203
YRSRV		1.558	3	.519	.202	.895
DEGREE		9.692	3	3.231	1.258	.292
2-WAY INTERACTIONS		146.427	38	3.853	1.501	.050
RANK	CURPOS	30.051	6	5.009	1.951	.078
RANK	YRSRV	8.614	4	2.154	.839	.503
RANK	DEGREE	20.552	6	3.425	1.334	.247
CURPOS	YRSRV	11.977	9	1.331	.518	.859
CURPOS	DEGREE	32.972	6	5.495	2.140	.053
YRSRV	DEGREE	17.493	7	2.499	.973	.454
EXPLAINED		183.338	49	3.742	1.457	.049
RESIDUAL		326.097	127	2.568		
TOTAL		509.435	176	2.895		

VARIABLE 302: Section Two, Statement 2

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F	
MAIN EFFECTS	25.908	11	2.355	5.098	.001	
RANK	4.695	2	2.347	5.081	.008	*
CURPOS	12.409	3	4.136	8.953	.001	*
YRSRV	1.491	3	.497	1.076	.362	
DEGREE	1.819	3	.606	1.313	.273	
2-WAY INTERACTIONS	34.483	38	.907	1.964	.003	
RANK CURPOS	5.175	6	.863	1.867	.091	
RANK YRSRV	1.202	4	.300	.650	.628	
RANK DEGREE	10.333	6	1.722	3.728	.002	*
CURPOS YRSRV	4.352	9	.484	1.047	.407	
CURPOS DEGREE	5.461	6	.910	1.970	.075	
YRSRV DEGREE	.364	7	.052	.113	.997	
EXPLAINED	60.390	49	1.232	2.668	.001	
RESIDUAL	58.672	127	.462			
TOTAL	119.062	176	.676			

VARIABLE 303: Section Two, Statement 3

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F	
MAIN EFFECTS	87.962	11	7.997	2.358	.011	
RANK	2.462	2	1.221	.363	.696	
CURPOS	30.267	3	10.089	2.975	.034	*
YRSRV	2.010	3	.670	.198	.898	
DEGREE	28.597	3	9.532	2.811	.042	*
2-WAY INTERACTIONS	156.867	38	4.128	1.217	.209	
RANK CURPOS	26.816	6	4.469	1.318	.254	
RANK YRSRV	30.509	4	7.627	2.249	.067	
RANK DEGREE	41.540	6	6.923	2.042	.065	
CURPOS YRSRV	40.114	9	4.457	1.314	.236	
CURPOS DEGREE	32.730	6	5.455	1.609	.150	
YRSRV DEGREE	39.894	7	5.699	1.681	.119	
EXPLAINED	244.829	49	4.997	1.472	.044	
RESIDUAL	430.674	127	3.391			
TOTAL	675.503	176	3.838			

VARIABLE 304: Section Two, Statement 4

SOURCE OF VARIATION		SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
MAIN EFFECTS		10.106	11	.919	.398	.955
RANK		6.633	2	3.317	1.437	.241
CURPOS		1.589	3	.530	.230	.876
YRSRV		1.481	3	.494	.214	.887
DEGREE		2.378	3	.793	.344	.794
2-WAY INTERACTIONS		111.705	38	2.940	1.274	.161
RANK	CURPOS	25.564	6	4.261	1.845	.095
RANK	YRSRV	4.557	4	1.139	.494	.740
RANK	DEGREE	5.715	6	.953	.413	.869
CURPOS	YRSRV	24.420	9	2.713	1.176	.316
CURPOS	DEGREE	24.571	6	4.095	1.775	.109
YRSRV	DEGREE	13.311	7	1.902	.824	.569
EXPLAINED		121.811	49	2.486	1.077	.363
RESIDUAL		293.048	127	2.307		
TOTAL		414.859	176	2.357		

VARIABLE 305: Section Two, Statement 5

SOURCE OF VARIATION		SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
MAIN EFFECTS		25.652	11	2.332	.910	.533
RANK		1.182	2	.591	.231	.794
CURPOS		11.556	3	3.852	1.503	.217
YRSRV		4.751	3	1.584	.618	.605
DEGREE		2.277	3	.759	.296	.828
2-WAY INTERACTIONS		69.636	38	1.833	.715	.883
RANK	CURPOS	11.346	6	1.891	.738	.620
RANK	YRSRV	6.701	4	1.675	.654	.625
RANK	DEGREE	7.888	6	1.315	.513	.798
CURPOS	YRSRV	21.873	9	2.430	.948	.486
CURPOS	DEGREE	16.376	6	2.729	1.065	.387
YRSRV	DEGREE	10.286	7	1.469	.573	.776
EXPLAINED		95.288	49	1.945	.759	.864
RESIDUAL		325.424	127	2.562		
TOTAL		420.712	176	2.390		

VARIABLE 306: Section Two, Statement 6

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
MAIN EFFECTS	30.678	11	2.789	3.481	.001
RANK	1.502	2	.751	.937	.394
CURPOS	21.672	3	7.224	9.017	.001*
YRSRV	5.157	3	1.719	2.146	.098
DEGREE	.791	3	.264	.329	.804
2-WAY INTERACTIONS	27.797	38	.731	.913	.617
RANK CURPOS	9.792	6	1.632	2.037	.065
RANK YRSRV	1.295	4	.324	.404	.805
RANK DEGREE	.300	6	.050	.062	.999
CURPOS YRSRV	14.232	9	1.581	1.974	.048*
CURPOS DEGREE	.759	6	.127	.158	.987
YRSRV DEGREE	2.125	7	.304	.379	.913
EXPLAINED	58.474	49	1.193	1.490	.040
RESIDUAL	101.740	127	.801		
TOTAL	160.215	176	.910		

VARIABLE 307: Section Two, Statement 7

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
MAIN EFFECTS	28.253	11	2.568	.796	.643
RANK	12.494	2	6.242	1.936	.149
CURPOS	10.199	3	3.400	1.054	.371
YRSRV	3.467	3	1.156	.358	.783
DEGREE	4.296	3	1.432	.444	.722
2-WAY INTERACTIONS	116.077	38	3.055	.947	.563
RANK CURPOS	19.777	6	3.296	1.022	.414
RANK YRSRV	17.483	4	4.371	1.355	.253
RANK DEGREE	26.991	6	4.498	1.395	.222
CURPOS YRSRV	18.076	9	2.008	.623	.776
CURPOS DEGREE	24.072	6	4.012	1.244	.288
YRSRV DEGREE	18.373	7	2.625	.814	.577
EXPLAINED	144.330	49	2.946	.913	.634
RESIDUAL	409.545	127	3.225		
TOTAL	553.876	176	3.147		

VARIABLE 308: Section Two, Statement 8

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
MAIN EFFECTS	18.541	11	1.686	.837	.603
RANK	2.713	2	1.357	.674	.512
CURPOS	11.694	3	3.898	1.936	.127
YRSRV	4.332	3	1.444	.717	.544
DEGREE	.741	3	.247	.123	.947
2-WAY INTERACTIONS	69.571	38	1.831	.909	.623
RANK CURPOS	21.933	6	3.655	1.815	.101
RANK YRSRV	.611	4	.153	.075	.989
RANK DEGREE	9.914	6	1.652	.821	.556
CURPOS YRSRV	16.917	9	1.880	.933	.499
CURPOS DEGREE	23.967	6	3.994	1.984	.073
YRSRV DEGREE	6.609	7	.944	.469	.856
EXPLAINED	88.112	49	1.798	.893	.668
RESIDUAL	255.730	127	2.014		
TOTAL	343.842	176	1.954		

VARIABLE 309: Section Two, Statement 9

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
MAIN EFFECTS	32.334	11	2.939	1.523	.131
RANK	.562	2	.281	.146	.865
CURPOS	23.449	3	7.833	4.058	.009 *
YRSRV	1.481	3	.494	.256	.857
DEGREE	2.698	3	.899	.466	.707
2-WAY INTERACTIONS	79.241	38	2.085	1.080	.366
RANK CURPOS	6.834	6	1.139	.590	.738
RANK YRSRV	3.735	4	.934	.484	.748
RANK DEGREE	4.887	6	.814	.422	.863
CURPOS YRSRV	23.731	9	2.637	1.366	.210
CURPOS DEGREE	22.435	6	3.739	1.937	.080
YRSRV DEGREE	7.910	7	1.130	.585	.767
EXPLAINED	111.576	49	2.277	1.180	.231
RESIDUAL	245.136	127	1.930		
TOTAL	356.712	176	2.027		

VARIABLE 310: Section Two, Statement 10

SOURCE OF VARIATION		SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
MAIN EFFECTS		25.600	11	2.327	.726	.711
RANK		5.155	2	2.577	.804	.450
CURPOS		8.713	3	2.904	.907	.440
YRSRV		4.548	3	1.516	.473	.702
DEGREE		2.522	3	.841	.262	.852
2-WAY INTERACTIONS		103.713	38	2.729	.852	.710
RANK	CURPOS	30.948	6	5.158	1.610	.150
RANK	YRSRV	12.455	4	3.114	.972	.425
RANK	DEGREE	12.984	6	2.164	.675	.670
CURPOS	YRSRV	9.372	9	1.041	.325	.965
CURPOS	DEGREE	15.905	6	2.651	.827	.551
YRSRV	DEGREE	10.892	7	1.556	.486	.844
EXPLAINED		129.313	49	2.639	.824	.778
RESIDUAL		406.868	127	3.204		
TOTAL		536.181	176	3.046		

VARIABLE 311: Section Two, Statement 11

SOURCE OF VARIATION		SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
MAIN EFFECTS		53.875	11	4.898	1.831	.055
RANK		2.257	2	1.128	.422	.657
CURPOS		19.781	3	6.594	2.465	.065
YRSRV		3.928	3	1.309	.489	.690
DEGREE		5.248	3	1.749	.654	.582
2-WAY INTERACTIONS		187.314	38	4.929	1.843	.006
RANK	CURPOS	32.211	6	5.369	2.007	.069
RANK	YRSRV	16.286	4	4.072	1.522	.200
RANK	DEGREE	24.513	6	4.086	1.527	.174
CURPOS	YRSRV	35.064	9	3.896	1.456	.171
CURPOS	DEGREE	44.360	6	7.393	2.764	.015 *
YRSRV	DEGREE	18.194	7	2.599	.972	.455
EXPLAINED		241.192	49	4.922	1.840	.004
RESIDUAL		339.768	127	2.675		
TOTAL		580.960	176	3.301		

VARIABLE 312: Section Two, Statement 12

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
MAIN EFFECTS	21.128	11	1.921	.790	.649
RANK	3.460	2	1.730	.712	.493
CURPOS	10.167	3	3.389	1.394	.248
YRSRV	4.760	3	1.587	.653	.583
DEGREE	12.313	3	4.104	1.689	.173
2-WAY INTERACTIONS	81.450	38	2.143	.882	.665
RANK CURPOS	14.566	6	2.428	.999	.429
RANK YRSRV	5.665	4	1.416	.583	.676
RANK DEGREE	17.073	6	2.845	1.171	.326
CURPOS YRSRV	25.133	9	2.793	1.149	.334
CURPOS DEGREE	21.041	6	3.507	1.443	.203
YRSRV DEGREE	12.434	7	1.776	.731	.646
EXPLAINED	102.578	49	2.093	.861	.720
RESIDUAL	308.688	127	2.431		
TOTAL	411.266	176	2.337		

VARIABLE 313: Section Two, Statement 13

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
MAIN EFFECTS	29.701	11	2.700	1.280	.243
RANK	2.995	2	1.497	.710	.494
CURPOS	15.429	3	5.143	2.437	.068
YRSRV	5.432	3	1.811	.858	.465
DEGREE	1.346	3	.449	.213	.887
2-WAY INTERACTIONS	94.987	38	2.500	1.185	.241
RANK CURPOS	30.207	6	5.035	2.386	.032*
RANK YRSRV	3.095	4	.774	.367	.832
RANK DEGREE	5.497	6	.916	.434	.855
CURPOS YRSRV	19.135	9	2.216	1.008	.438
CURPOS DEGREE	7.985	6	1.331	.631	.705
YRSRV DEGREE	17.749	7	2.536	1.202	.307
EXPLAINED	124.688	49	2.545	1.206	.203
RESIDUAL	267.990	127	2.110		
TOTAL	392.678	176	2.231		

VARIABLE 314: Section Two, Statement 14

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
MAIN EFFECTS	41.502	11	3.773	1.395	.183
RANK	.338	2	.169	.063	.939
CURPOS	23.765	3	7.922	2.929	.036 *
YRSRV	9.665	3	3.222	1.191	.316
DEGREE	3.349	3	1.116	.413	.744
2-WAY INTERACTIONS	87.560	38	2.304	.852	.710
RANK CURPOS	29.977	6	4.996	1.847	.095
RANK YRSRV	10.311	4	2.578	.953	.436
RANK DEGREE	8.661	6	1.444	.534	.782
CURPOS YRSRV	21.170	9	2.352	.870	.554
CURPOS DEGREE	6.273	6	1.045	.387	.887
YRSRV DEGREE	22.527	7	3.218	1.190	.313
EXPLAINED	129.062	49	2.634	.974	.530
RESIDUAL	343.457	127	2.704		
TOTAL	472.520	176	2.685		

VARIABLE 401: Section Three, Statement 1

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
MAIN EFFECTS	7.091	11	.645	.415	.917
RANK	1.180	2	.590	.380	.685
CURPOS	2.059	3	.686	.442	.724
YRSRV	2.801	3	.934	.601	.616
DEGREE	1.372	3	.457	.294	.829
2-WAY INTERACTIONS	37.803	38	.995	.640	.943
RANK CURPOS	1.919	6	.320	.206	.974
RANK YRSRV	1.195	4	.299	.192	.942
RANK DEGREE	2.357	6	.393	.253	.957
CURPOS YRSRV	5.050	9	.561	.361	.951
CURPOS DEGREE	17.239	6	2.873	1.848	.095
YRSRV DEGREE	1.935	7	.276	.178	.989
EXPLAINED	44.894	49	.916	.589	.982
RESIDUAL	197.423	127	1.555		
TOTAL	242.316	176	1.377		

VARIABLE: Section Three, Statement Two

SOURCE OF VARIATION		SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
MAIN EFFECTS		38.351	11	3.486	.865	.576
RANK		2.294	2	1.147	.285	.753
CURPOS		21.277	3	7.092	1.760	.158
YRSRV		10.210	3	3.403	.845	.472
DEGREE		6.811	3	2.270	.563	.640
2-WAY INTERACTIONS		161.033	38	4.238	1.052	.405
RANK	CURPOS	40.994	6	6.832	1.696	.127
RANK	YRSRV	1.840	4	.460	.114	.977
RANK	DEGREE	3.093	6	.516	.128	.993
CURPOS	YRSRV	29.542	9	3.282	.815	.604
CURPOS	DEGREE	28.498	6	4.750	1.179	.322
YRSRV	DEGREE	41.522	7	5.932	1.472	.183
EXPLAINED		199.384	49	4.069	1.010	.469
RESIDUAL		511.678	127	4.029		
TOTAL		711.062	176	4.040		

VARIABLE 403: Section Three, Statement Three

SOURCE OF VARIATION		SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
MAIN EFFECTS		15.672	11	1.425	1.059	.399
RANK		2.910	2	1.455	1.082	.342
CURPOS		5.849	3	1.950	1.450	.232
YRSRV		3.477	3	1.159	.862	.463
DEGREE		7.364	3	2.455	1.825	.146
2-WAY INTERACTIONS		63.152	38	1.662	1.236	.193
RANK	CURPOS	10.094	6	1.682	1.251	.285
RANK	YRSRV	5.695	4	1.424	1.059	.380
RANK	DEGREE	7.370	6	1.228	.913	.488
CURPOS	YRSRV	1.664	9	.185	.137	.999
CURPOS	DEGREE	20.678	6	3.446	2.562	.022 *
YRSRV	DEGREE	9.481	7	1.354	1.007	.430
EXPLAINED		78.824	49	1.609	1.196	.213
RESIDUAL		170.815	127	1.345		
TOTAL		249.638	176	1.418		

VARIABLE 404: Section Three, Statement 4

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
MAIN EFFECTS	63.657	11	5.787	1.468	.152
RANK	4.617	2	2.309	.586	.558
CURPOS	35.362	3	11.787	2.990	.034 *
YRSRV	21.288	3	7.096	1.800	.151
DEGREE	1.474	3	.491	.125	.945
2-WAY INTERACTIONS	185.671	38	4.886	1.239	.189
RANK CURPOS	53.884	6	8.981	2.278	.040 *
RANK YRSRV	13.211	4	3.303	.838	.504
RANK DEGREE	9.309	6	1.552	.394	.882
CURPOS YRSRV	30.093	9	3.344	.848	.573
CURPOS DEGREE	11.477	6	1.913	.485	.818
YRSRV DEGREE	43.531	7	6.219	1.577	.148
EXPLAINED	249.328	49	5.088	1.291	.131
RESIDUAL	500.718	127	3.943		
TOTAL	750.045	176	4.262		

VARIABLE 405: Section Three, Statement 5

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
MAIN EFFECTS	33.487	11	3.044	1.248	.263
RANK	5.570	2	2.785	1.141	.323
CURPOS	3.520	3	1.173	.481	.696
YRSRV	3.569	3	1.190	.488	.692
DEGREE	7.889	3	2.630	1.078	.361
2-WAY INTERACTIONS	79.462	38	2.091	.857	.703
RANK CURPOS	10.111	6	1.685	.691	.658
RANK YRSRV	5.967	4	1.492	.611	.655
RANK DEGREE	28.009	6	4.668	1.913	.084
CURPOS YRSRV	8.021	9	.891	.365	.950
CURPOS DEGREE	4.546	6	.758	.310	.931
YRSRV DEGREE	25.237	7	3.605	1.477	.181
EXPLAINED	112.949	49	2.305	.945	.580
RESIDUAL	309.910	127	2.440		
TOTAL	422.859	176	2.403		

VARIABLE 501: Section Four, Statement 1

SOURCE OF VARIATION		SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
MAIN EFFECTS		25.578	11	2.325	.888	.554
RANK		9.214	2	4.607	1.760	.176
CURPOS		1.792	3	.597	.228	.877
YRSRV		1.608	3	.536	.205	.893
DEGREE		4.432	3	1.477	.564	.640
2-WAY INTERACTIONS		100.930	38	2.656	1.015	.459
RANK	CURPOS	11.726	6	1.954	.746	.613
RANK	YRSRV	8.312	4	2.078	.794	.531
RANK	DEGREE	7.810	6	1.302	.497	.810
CURPOS	YRSRV	21.915	9	2.435	.930	.502
CURPOS	DEGREE	19.582	6	3.264	1.247	.287
YRSRV	DEGREE	6.158	7	.880	.336	.936
EXPLAINED		126.508	49	2.582	.986	.509
RESIDUAL		332.487	127	2.618		
TOTAL		458.994	176	2.608		

VARIABLE 502: Section Four, Statement 2

SOURCE OF VARIATION		SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
MAIN EFFECTS		93.919	11	8.538	2.710	.004
RANK		41.926	2	20.963	6.652	.002 *
CURPOS		11.818	3	3.939	1.250	.294
YRSRV		15.996	3	5.332	1.692	.172
DEGREE		12.137	3	4.046	1.284	.282
2-WAY INTERACTIONS		122.100	38	3.213	1.020	.452
RANK	CURPOS	15.722	6	2.620	.832	.544
RANK	YRSRV	3.488	4	.872	.277	.893
RANK	DEGREE	19.861	6	3.310	1.050	.396
CURPOS	YRSRV	17.432	9	1.937	.615	.783
CURPOS	DEGREE	17.451	6	2.908	.923	.481
YRSRV	DEGREE	17.755	7	2.536	.805	.585
EXPLAINED		216.019	49	4.409	1.399	.070
RESIDUAL		400.196	127	3.151		
TOTAL		616.215	176	3.501		

VARIABLE 503: Section Four, Statement 3

SOURCE OF VARIATION		SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
MAIN EFFECTS		98.103	11	8.918	2.738	.003
RANK		21.503	2	10.752	3.301	.040 *
CURPOS		65.316	3	21.772	6.685	.001 *
YRSRV		7.077	3	2.359	.724	.539
DEGREE		6.216	3	2.072	.636	.593
2-WAY INTERACTIONS		97.925	38	2.577	.791	.796
RANK	CURPOS	18.962	6	3.160	.970	.448
RANK	YRSRV	8.164	4	2.041	.627	.644
RANK	DEGREE	4.138	6	.690	.212	.973
CURPOS	YRSRV	31.054	9	3.450	1.059	.397
CURPOS	DEGREE	16.641	6	2.772	.852	.533
YRSRV	DEGREE	18.778	7	2.683	.824	.569
EXPLAINED		196.028	49	4.001	1.228	.181
RESIDUAL		413.610	127	3.257		
TOTAL		609.638	176	3.464		

VARIABLE 504: Section Four, Statement 4

SOURCE OF VARIATION		SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
MAIN EFFECTS		23.269	11	2.115	1.261	.255
RANK		5.433	2	2.717	1.620	.202
CURPOS		10.793	3	3.598	2.145	.098
YRSRV		4.546	3	1.515	.903	.442
DEGREE		4.990	3	1.663	.992	.399
2-WAY INTERACTIONS		71.626	38	1.885	1.124	.310
RANK	CURPOS	14.763	6	2.460	1.467	.195
RANK	YRSRV	5.303	4	1.326	.790	.533
RANK	DEGREE	12.091	6	2.015	1.201	.310
CURPOS	YRSRV	13.741	9	1.527	.910	.519
CURPOS	DEGREE	18.711	6	3.118	1.859	.093
YRSRV	DEGREE	13.012	7	1.859	1.108	.362
EXPLAINED		94.895	49	1.937	1.155	.260
RESIDUAL		213.037	127	1.677		
TOTAL		307.932	176	1.750		

VARIABLE 505: Section Four, Statement 5

SOURCE OF VARIATION		SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
MAIN EFFECTS		55.182	11	5.017	2.023	.031
RANK		17.760	2	8.880	3.581	.031 *
CURPOS		12.147	3	4.049	1.633	.185
YRSRV		18.139	3	6.046	2.438	.068
DEGREE		5.328	3	1.776	.716	.544
2-WAY INTERACTIONS		98.927	38	2.603	1.050	.408
RANK	CURPOS	19.071	6	3.178	1.282	.270
RANK	YRSRV	7.072	4	1.768	.713	.585
RANK	DEGREE	21.510	6	3.585	1.446	.202
CURPOS	YRSRV	12.730	9	1.414	.570	.819
CURPOS	DEGREE	20.178	6	3.363	1.356	.237
YRSRV	DEGREE	14.451	7	2.064	.832	.562
EXPLAINED		154.110	49	3.145	1.268	.147
RESIDUAL		314.953	127	2.480		
TOTAL		469.062	176	2.665		

VARIABLE 506: Section Four, Statement 6

SOURCE OF VARIATION		SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
MAIN EFFECTS		52.233	11	4.839	1.725	.075
RANK		9.867	2	4.934	1.759	.176
CURPOS		26.444	3	8.816	3.142	.028 *
YRSRV		23.218	3	7.739	2.759	.045 *
DEGREE		8.733	3	2.911	1.038	.378
2-WAY INTERACTIONS		90.988	38	2.394	.854	.708
RANK	CURPOS	18.526	6	3.088	1.101	.366
RANK	YRSRV	3.961	4	.990	.353	.842
RANK	DEGREE	4.494	6	.749	.267	.951
CURPOS	YRSRV	20.757	9	2.306	.822	.597
CURPOS	DEGREE	22.944	6	3.824	1.363	.235
YRSRV	DEGREE	22.125	7	3.161	1.127	.351
EXPLAINED		144.222	49	2.943	1.049	.406
RESIDUAL		356.287	127	2.805		
TOTAL		500.508	176	2.844		

VARIABLE 507: Section Four, Statement 7

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
MAIN EFFECTS	32.783	11	2.980	2.952	.002
RANK	6.255	2	3.128	3.097	.049 *
CURPOS	17.038	3	5.679	5.625	.001 *
YRSRV	.447	3	.149	.148	.931
DEGREE	4.861	3	1.620	1.605	.192
2-WAY INTERACTIONS	24.896	38	.655	.649	.938
RANK CURPOS	5.334	6	.889	.881	.511
RANK YRSRV	.110	4	.028	.027	.999
RANK DEGREE	4.033	6	.672	.666	.677
CURPOS YRSRV	1.852	9	.206	.204	.993
CURPOS DEGREE	5.028	6	.838	.830	.548
YRSRV DEGREE	2.262	7	.323	.320	.944
EXPLAINED	57.679	49	1.177	1.166	.247
RESIDUAL	128.230	127	1.010		
TOTAL	185.910	176	1.056		

VARIABLE 508: Section Four, Statement 8

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
MAIN EFFECTS	58.406	11	5.310	1.830	.055
RANK	6.712	2	3.356	1.157	.318
CURPOS	11.005	3	3.668	1.265	.289
YRSRV	31.910	3	10.637	3.667	.014*
DEGREE	12.660	3	4.220	1 455	.230
2-WAY INTERACTIONS	128.016	38	3.369	1.161	.266
RANK CURPOS	14.205	6	2.368	.816	.559
RANK YRSRV	5.247	4	1.312	.452	.771
RANK DEGREE	13.489	6	2.248	.775	.591
CURPOS YRSRV	33.062	9	3.674	1.266	.262
CURPOS DEGREE	35.830	6	5.972	2.059	.063
YRSRV DEGREE	27.562	7	3.937	1.357	.229
EXPLAINED	186.422	49	3.805	1.311	.116
RESIDUAL	368.426	127	2.901		
TOTAL	554.847	176	3.153		

VARIABLE 509: Section Four, Statement 9

SOURCE OF VARIATION		SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
MAIN EFFECTS		70.737	11	6.431	2.208	.018
RANK		28.596	2	14.298	4.908	.009*
CURPOS		6.815	3	2.272	.780	.507
YRSRV		23.426	3	7.809	2.681	.050*
DEGREE		14.955	3	4.985	1.711	.168
2-WAY INTERACTIONS		110.960	38	2.920	1.002	.478
RANK	CURPOS	26.990	6	4.498	1.544	.169
RANK	YRSRV	17.254	4	4.313	1.481	.212
RANK	DEGREE	7.008	6	1.168	.401	.877
CURPOS	YRSRV	30.886	9	3.432	1.178	.315
CURPOS	DEGREE	9.471	6	1.579	.542	.776
YRSRV	DEGREE	17.320	7	2.474	.849	.549
EXPLAINED		181.698	49	3.708	1.273	.144
RESIDUAL		369.963	127	2.913		
TOTAL		551.661	176	3.134		

VARIABLE 510: Section Four, Statement 10

SOURCE OF VARIATION		SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
MAIN EFFECTS		30.911	11	2.810	1.326	.217
RANK		8.156	2	4.078	1.925	.150
CURPOS		17.730	3	5.910	2.789	.043*
YRSRV		2.100	3	.700	.330	.803
DEGREE		3.888	3	1.296	.612	.609
2-WAY INTERACTIONS		100.230	38	2.638	1.245	.185
RANK	CURPOS	23.029	6	3.838	1.811	.102
RANK	YRSRV	3.297	4	.824	.389	.816
RANK	DEGREE	7.618	6	1.270	.599	.73[illegible]
CURPOS	YRSRV	9.076	9	1.008	.476	.889
CURPOS	DEGREE	21.094	6	3.516	1.659	.136
YRSRV	DEGREE	14.168	7	2.024	.955	.467
EXPLAINED		131.142	49	2.676	1.263	.151
RESIDUAL		269.107	127	2.119		
TOTAL		400.249	176	2.274		

VARIABLE 511: Section Four, Statement 11

SOURCE OF VARIATION		SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
MAIN EFFECTS		73.021	11	6.638	2.189	.019
RANK		1.616	2	.808	.266	.767
CURPOS		30.266	3	10.089	3.327	.022*
YRSRV		9.629	3	3.210	1.058	.369
DEGREE		13.630	3	4.543	1.498	.218
2-WAY INTERACTIONS		113.852	38	2.996	.988	.500
RANK	CURPOS	16.743	6	2.791	.920	.483
RANK	YRSRV	18.705	4	4.676	1.542	.194
RANK	DEGREE	9.576	6	1.596	.526	.788
CURPOS	YRSRV	9.947	9	1.105	.364	.950
CURPOS	DEGREE	19.471	6	3.245	1.070	.384
YRSRV	DEGREE	19.975	7	2.854	.941	.478
EXPLAINED		186.873	49	3.814	1.258	.156
RESIDUAL		385.139	127	3.033		
TOTAL		572.011	176	3.250		

VARIABLE 512: Section Four, Statement 12

SOURCE OF VARIATION		SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
MAIN EFFECTS		25.158	11	2.287	1.654	.092
RANK		2.314	2	1.157	.837	.435
CURPOS		7.948	3	2.649	1.916	.130
YRSRV		7.635	3	2.545	1.840	.143
DEGREE		4.575	3	1.525	1.103	.351
2-WAY INTERACTIONS		43.402	38	1.142	.826	.748
RANK	CURPOS	4.300	6	.717	.518	.794
RANK	YRSRV	2.836	4	.709	.513	.726
RANK	DEGREE	6.295	6	1.049	.759	.604
CURPOS	YRSRV	3.526	9	.392	.283	.978
CURPOS	DEGREE	4.227	6	.705	.509	.800
YRSRV	DEGREE	11.791	7	1.684	1.218	.298
EXPLAINED		68.560	49	1.399	1.012	.466
RESIDUAL		175.621	127	1.383		
TOTAL		244.181	176	1.387		

VARIABLE 513: Section Four, Statement 13

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
MAIN EFFECTS	50.007	11	4.546	1.553	.121
RANK	11.227	2	5.614	1.917	.151
CURPOS	37.571	3	12.524	4.278	.007 *
YRSRV	4.673	3	1.558	.532	.661
DEGREE	2.040	3	.680	.232	.874
2-WAY INTERACTIONS	111.087	38	2.923	.998	.483
RANK CURPOS	19.561	6	3.260	1.114	.358
RANK YRSRV	7.836	4	1.959	.669	.615
RANK DEGREE	10.192	6	1.699	.580	.746
CURPOS YRSRV	23.274	9	2.586	.883	.542
CURPOS DEGREE	28.020	6	4.670	1.595	.154
YRSRV DEGREE	9.548	7	1.364	.466	.858
EXPLAINED	161.093	49	3.288	1.123	.300
RESIDUAL	371.822	127	2.928		
TOTAL	532.915	176	3.028		

VARIABLE 514: Section Four, Statement 14

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
MAIN EFFECTS	53.328	11	4.848	1.589	.110
RANK	8.046	2	4.023	1.319	.271
CURPOS	13.784	3	4.595	1.506	.216
YRSRV	24.129	3	8.043	2.636	.053
DEGREE	6.367	3	2.122	.696	.556
2-WAY INTERACTIONS	120.255	38	3.165	1.037	.426
RANK CURPOS	7.593	6	1.265	.415	.868
RANK YRSRV	3.750	4	.937	.307	.873
RANK DEGREE	9.969	6	1.661	.545	.773
CURPOS YRSRV	22.414	9	2.490	.816	.602
CURPOS DEGREE	35.456	6	5.909	1.937	.080
YRSRV DEGREE	16.853	7	2.408	.789	.598
EXPLAINED	173.583	49	3.543	1.161	.252
RESIDUAL	387.479	127	3.051		
TOTAL	561.062	176	3.188		

VARIABLE 601: Section Five, Statement 1

SOURCE OF VARIATION		SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
MAIN EFFECTS		7.994	11	.727	.402	.953
RANK		.699	2	.350	.193	.824
CURPOS		3.780	3	1.260	.697	.555
YRSRV		2.073	3	.691	.382	.766
DEGREE		1.635	3	.545	.301	.824
2-WAY INTERACTIONS		55.330	38	1.456	.806	.777
RANK	CURPOS	2.981	6	.497	.275	.948
RANK	YRSRV	1.134	4	.284	.157	.960
RANK	DEGREE	5.491	6	.915	.506	.803
CURPOS	YRSRV	12.013	9	1.335	.738	.673
CURPOS	DEGREE	11.551	6	1.925	1.065	.387
YRSRV	DEGREE	3.776	7	.539	.298	.953
EXPLAINED		63.325	49	1.292	.715	.909
RESIDUAL		229.568	127	1.803		
TOTAL		292.893	176	1.664		

VARIABLE 602: Section Five, Statement 2

SOURCE OF VARIATION		SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
MAIN EFFECTS		8.233	11	.748	.797	.643
RANK		1.307	2	.653	.696	.501
CURPOS		2.733	3	.911	.970	.409
YRSRV		1.490	3	.497	.529	.663
DEGREE		2.888	3	.963	1.025	.384
2-WAY INTERACTIONS		38.331	38	1.009	1.074	.375
RANK	CURPOS	3.258	6	.543	.578	.747
RANK	YRSRV	.835	4	.209	.222	.926
RANK	DEGREE	5.160	6	.860	.915	.486
CURPOS	YRSRV	3.402	9	.378	.402	.932
CURPOS	DEGREE	4.079	6	.680	.724	.631
YRSRV	DEGREE	5.549	7	.793	.844	.553
EXPLAINED		46.565	49	.950	1.012	.467
RESIDUAL		119.311	127	.939		
TOTAL		165.876	176	.943		

VARIABLE 603: Section Five, Statement 3

SOURCE OF VARIATION		SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
MAIN EFFECTS		3.002	11	.273	.241	.994
RANK		.638	2	.319	.282	.755
CURPOS		1.181	3	.394	.348	.791
YRSRV		.048	3	.016	.014	.998
DEGREE		.075	3	.025	.022	.996
2-WAY INTERACTIONS		46.263	38	1.217	1.076	.371
RANK	CURPOS	4.851	6	.808	.715	.639
RANK	YRSRV	2.714	4	.678	.600	.664
RANK	DEGREE	12.475	6	2.079	1.838	.097
CURPOS	YRSRV	12.093	9	1.344	1.188	.308
CURPOS	DEGREE	2.116	6	.353	.312	.930
YRSRV	DEGREE	8.676	7	1.239	1.095	.370
EXPLAINED		49.265	49	1.005	.889	.676
RESIDUAL		143.696	127	1.131		
TOTAL		192.960	176	1.095		

VARIABLE 604: Section Five, Statement 4

SOURCE OF VARIATION		SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
MAIN EFFECTS		67.341	11	6.122	1.853	.052
RANK		6.939	2	3.469	1.049	.353
CURPOS		1.363	3	.454	.137	.938
YRSRV		20.223	3	6.741	2.039	.112
DEGREE		16.596	3	5.532	1.673	.176
2-WAY INTERACTIONS		127.520	38	3.356	1.015	.459
RANK	CURPOS	20.163	6	3.361	1.016	.418
RANK	YRSRV	14.127	4	3.532	1.068	.375
RANK	DEGREE	17.689	6	2.948	.892	.503
CURPOS	YRSRV	14.110	9	1.568	.474	.890
CURPOS	DEGREE	12.664	6	2.111	.638	.699
YRSRV	DEGREE	19.742	7	2.820	.853	.546
EXPLAINED		194.861	49	3.977	1.203	.206
RESIDUAL		419.885	127	3.306		
TOTAL		614.746	176	3.493		

VARIABLE 605: Section Five, Statement 5

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
MAIN EFFECTS	56.554	11	5.141	2.293	.014
RANK	12.680	2	6.340	2.827	.063
CURPOS	11.539	3	3.846	1.715	.166
YRSRV	11.981	3	3.994	1.781	.154
DEGREE	20.818	3	6.939	3.094	.029 *
2-WAY INTERACTIONS	94.540	38	2.488	1.109	.328
RANK CURPOS	6.772	6	1.129	.503	.805
RANK YRSRV	16.098	4	4.025	1.795	.134
RANK DEGREE	14.721	6	2.454	1.094	.370
CURPOS YRSRV	14.196	9	1.577	.703	.705
CURPOS DEGREE	6.581	6	1.097	.489	.816
YRSRV DEGREE	23.810	7	3.401	1.517	.167
EXPLAINED	151.094	49	3.084	1.375	.081
RESIDUAL	284.816	127	2.243		
TOTAL	435.910	176	2.477		

VARIABLE 606: Section Five, Statement 6

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
MAIN EFFECTS	19.009	11	1.728	1.968	.037
RANK	.458	2	.229	.261	.771
CURPOS	.497	3	.165	.189	.904
YRSRV	8.357	3	2.786	3.172	.027 *
DEGREE	6.893	3	2.298	2.617	.054
2-WAY INTERACTIONS	59.990	38	1.579	1.798	.008
RANK CURPOS	4.444	6	.741	.843	.539
RANK YRSRV	1.964	4	.491	.559	.693
RANK DEGREE	4.046	6	.674	.768	.596
CURPOS YRSRV	5.921	9	.658	.749	.663
CURPOS DEGREE	6.331	6	1.055	1.202	.310
YRSRV DEGREE	11.900	7	1.700	1.936	.069
EXPLAINED	78.999	49	1.612	1.836	.004
RESIDUAL	111.521	127	.878		
TOTAL	190.520	176	1.082		

VARIABLE 607: Section Five, Statement 7

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
MAIN EFFECTS	24.648	11	2.241	1.110	.359
RANK	4.741	2	2.371	1.174	.312
CURPOS	.410	3	.137	.068	.977
YRSRV	6.186	3	2.062	1.022	.385
DEGREE	13.107	3	4.369	2.165	.095
2-WAY INTERACTIONS	83.908	38	2.208	1.094	.347
RANK CURPOS	5.792	6	.965	.478	.823
RANK YRSRV	1.368	4	.342	.169	.954
RANK DEGREE	3.655	6	.609	.302	.935
CURPOS YRSRV	8.482	9	.942	.467	.894
CURPOS DEGREE	22.768	6	3.795	1.880	.089
YRSRV DEGREE	25.811	7	3.687	1.827	.088
EXPLAINED	108.555	49	2.215	1.098	.334
RESIDUAL	256.337	127	2.018		
TOTAL	364.893	176	2.073		

VARIABLE 608: Section Five, Statement 8

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
MAIN EFFECTS	3.511	11	.319	.238	.994
RANK	1.657	2	.829	.618	.541
CURPOS	1.275	3	.425	.317	.813
YRSRV	.504	3	.168	.125	.945
DEGREE	.224	3	.075	.056	.983
2-WAY INTERACTIONS	57.589	38	1.516	1.130	.302
RANK CURPOS	1.289	6	.215	.160	.987
RANK YRSRV	.542	4	.135	.101	.982
RANK DEGREE	8.400	6	1.400	1.044	.400
CURPOS YRSRV	10.230	9	1.137	.848	.574
CURPOS DEGREE	6.897	6	1.150	.857	.528
YRSRV DEGREE	9.372	7	1.339	.999	.435
EXPLAINED	61.100	49	1.247	.930	.605
RESIDUAL	170.267	127	1.341		
TOTAL	231.367	176	1.315		

VARIABLE 609: Section Five, Statement 9

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
MAIN EFFECTS	49.387	11	4.490	1.960	.038
RANK	10.665	2	5.333	2.329	.102
CURPOS	21.232	3	7.077	3.090	.030 *
YRSRV	10.666	3	3.555	1.552	.204
DEGREE	6.593	3	2.198	.960	.414
2-WAY INTERACTIONS	125.905	38	3.313	1.447	.067
RANK CURPOS	3.313	6	.552	.241	.962
RANK YRSRV	8.962	4	2.240	.978	.422
RANK DEGREE	7.747	6	1.291	.564	.758
CURPOS YRSRV	42.014	9	4.668	2.038	.040 *
CURPOS DEGREE	17.529	6	2.922	1.276	.273
YRSRV DEGREE	27.451	7	3.922	1.712	.112
EXPLAINED	175.292	49	3.577	1.562	.025
RESIDUAL	290.844	127	2.290		
TOTAL	466.136	176	2.643		

VARIABLE 610: Section Five, Statement 10

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
MAIN EFFECTS	10.093	11	1.736	1.425	.169
RANK	3.945	2	1.972	1.619	.202
CURPOS	7.791	3	2.597	2.132	.099
YRSRV	2.717	3	.906	.744	.528
DEGREE	2.566	3	.855	.702	.552
2-WAY INTERACTIONS	46.874	38	1.234	1.013	.462
RANK CURPOS	1.998	6	.333	.273	.949
RANK YRSRV	3.482	4	.870	.715	.583
RANK DEGREE	1.054	6	.176	.144	.990
CURPOS YRSRV	6.314	9	.702	.576	.815
CURPOS DEGREE	9.843	6	1.641	1.347	.241
YRSRV DEGREE	9.158	7	1.308	1.074	.384
EXPLAINED	65.967	49	1.346	1.105	.324
RESIDUAL	154.711	127	1.218		
TOTAL	220.678	176	1.254		

VARIABLE 611: Section Five, Statement 11

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
MAIN EFFECTS	8.491	11	.772	.839	.602
RANK	1.151	2	.576	.625	.537
CURPOS	3.358	3	1.119	1.216	.307
YRSRV	.917	3	.306	.332	.802
DEGREE	2.806	3	.935	1.016	.388
2-WAY INTERACTIONS	32.224	38	.848	.921	.604
RANK CURPOS	2.384	6	.397	.432	.857
RANK YRSRV	1.386	4	.346	.376	.825
RANK DEGREE	2.473	6	.412	.448	.845
CURPOS YRSRV	4.171	9	.463	.503	.870
CURPOS DEGREE	4.362	6	.727	.790	.580
YRSRV DEGREE	8.534	7	1.219	1.324	.244
EXPLAINED	40.715	49	.831	.903	.652
RESIDUAL	116.912	127	.921		
TOTAL	157.627	176	.896		

VARIABLE 701: Skill Variety

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
MAIN EFFECTS	21.026	11	1.911	1.199	.294
RANK	2.720	2	1.360	.853	.429
CURPOS	9.950	3	3.317	2.081	.106
YRSRV	.923	3	.308	.193	.901
DEGREE	3.098	3	1.033	.648	.586
2-WAY INTERACTIONS	50.759	38	1.335	.838	.731
RANK CURPOS	9.504	6	1.584	.994	.433
RANK YRSRV	4.424	4	1.106	.694	.598
RANK DEGREE	3.294	6	.549	.344	.912
CURPOS YRSRV	12.097	9	1.344	.843	.578
CURPOS DEGREE	15.806	6	2.634	1.652	.138
YRSRV DEGREE	8.656	7	1.237	.776	.609
EXPLAINED	71.785	49	1.465	.919	.624
RESIDUAL	202.461	127	1.594		
TOTAL	274.246	176	1.558		

VARIABLE 702: Task Identity

SOURCE OF VARIATION		SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
MAIN EFFECTS		55.826	11	5.075	2.759	.003
RANK		.419	2	.210	.114	.892
CURPOS		24.367	3	8.122	4.416	.005*
YRSRV		1.921	3	.640	.348	.791
DEGREE		9.393	3	3.131	1.702	.170
2-WAY INTERACTIONS		110.914	38	2.919	1.587	.030
RANK	CURPOS	19.431	6	3.239	1.761	.112
RANK	YRSRV	16.004	4	4.001	2.175	.075
RANK	DEGREE	17.873	6	2.979	1.620	.147
CURPOS	YRSRV	22.744	9	2.527	1.374	.207
CURPOS	DEGREE	27.406	6	4.568	2.483	.026*
YRSRV	DEGREE	19.709	7	2.816	1.531	.163
EXPLAINED		166.740	49	3.403	1.850	.003
RESIDUAL		233.580	127	1.839		
TOTAL		400.320	176	2.275		

VARIABLE 703: Task Significance

SOURCE OF VARIATION		SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
MAIN EFFECTS		19.158	11	1.742	1.185	.304
RANK		1.504	2	.753	.512	.601
CURPOS		13.497	3	4.499	3.062	.031
YRSRV		3.709	3	1.236	.841	.474
DEGREE		.528	3	.176	.120	.948
2-WAY INTERACTIONS		43.130	38	1.135	.772	.820
RANK	CURPOS	13.429	6	2.238	1.523	.176
RANK	YRSRV	1.330	4	.333	.226	.923
RANK	DEGREE	5.086	6	.848	.577	.748
CURPOS	YRSRV	12.863	9	1.429	.973	.466
CURPOS	DEGREE	11.133	6	1.856	1.263	.279
YRSRV	DEGREE	8.787	7	1.255	.854	.545
EXPLAINED		62.288	49	1.271	.865	.714
RESIDUAL		186.629	127	1.470		
TOTAL		248.917	176	1.414		

VARIABLE 704: Autonomy

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
MAIN EFFECTS	23.469	11	2.134	1.690	.083
RANK	3.255	2	1.623	1.289	.279
CURPOS	10.189	3	3.396	2.690	.049 *
YRSRV	1.449	3	.483	.382	.766
DEGREE	.925	3	.308	.244	.865
2-WAY INTERACTIONS	58.115	38	1.529	1.211	.215
RANK CURPOS	12.132	6	2.022	1.601	.152
RANK YRSRV	.826	4	.207	.164	.956
RANK DEGREE	2.678	6	.446	.354	.907
CURPOS YRSRV	13.435	9	1.493	1.182	.312
CURPOS DEGREE	9.751	6	1.625	1.287	.268
YRSRV DEGREE	7.265	7	1.038	.822	.571
EXPLAINED	81.584	49	1.665	1.319	.112
RESIDUAL	160.353	127	1.263		
TOTAL	241.937	176	1.375		

VARIABLE 705: Feedback from the Job Itself

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
MAIN EFFECTS	15.891	11	1.445	1.005	.445
RANK	6.643	2	3.321	2.310	.103
CURPOS	5.492	3	1.831	1.273	.286
YRSRV	3.378	3	1.126	.783	.505
DEGREE	8.040	3	2.680	1.864	.139
2-WAY INTERACTIONS	65.014	38	1.711	1.190	.236
RANK CURPOS	16.556	6	2.759	1.919	.083
RANK YRSRV	1.733	4	.433	.301	.877
RANK DEGREE	4.759	6	.793	.552	.768
CURPOS YRSRV	13.167	9	1.463	1.018	.430
CURPOS DEGREE	20.212	6	3.369	2.343	.035 *
YRSRV DEGREE	6.398	7	.914	.636	.726
EXPLAINED	80.904	49	1.651	1.149	.267
RESIDUAL	182.569	127	1.438		
TOTAL	263.474	176	1.497		

VARIABLE 706: Feedback from Agents

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
MAIN EFFECTS	21.288	11	1.935	.810	.630
RANK	6.102	2	3.051	1.278	.282
CURPOS	9.585	3	3.195	1.338	.265
YRSRV	2.965	3	.988	.414	.743
DEGREE	2.607	3	.869	.364	.779
2-WAY INTERACTIONS	75.780	38	1.994	.835	.735
RANK CURPOS	17.829	6	2.971	1.244	.288
RANK YRSRV	10.826	4	2.707	1.133	.344
RANK DEGREE	14.331	6	2.289	1.000	.428
CURPOS YRSRV	7.840	9	.871	.365	.950
CURPOS DEGREE	14.710	6	2.452	1.027	.411
YRSRV DEGREE	11.249	7	1.607	.673	.695
EXPLAINED	97.068	49	1.981	.830	.769
RESIDUAL	303.250	127	2.388		
TOTAL	400.318	176	2.275		

VARIABLE 707: Dealing With Others

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
MAIN EFFECTS	24.393	11	2.213	6.011	.001
RANK	1.552	2	.776	2.103	.126
CURPOS	14.226	3	4.742	12.853	.001*
YRSRV	2.626	3	.875	2.373	.073
DEGREE	.842	3	.281	.760	.518
2-WAY INTERACTIONS	18.011	38	.474	1.285	.153
RANK CURPOS	4.527	6	.754	2.045	.064
RANK YRSRV	.251	4	.063	.170	.953
RANK DEGREE	2.548	6	.425	1.151	.337
CURPOS YRSRV	5.115	9	.568	1.540	.141
CURPOS DEGREE	1.734	6	.289	.783	.585
YRSRV DEGREE	.751	7	.107	.291	.956
EXPLAINED	42.404	49	.865	2.346	.001
RESIDUAL	46.855	127	.369		
TOTAL	89.259	176	.507		

VARIABLE 708: General Satisfaction

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
MAIN EFFECTS	34.710	11	3.155	1.072	.389
RANK	3.140	2	1.570	.534	.588
CURPOS	22.428	3	7.476	2.541	.059
YRSRV	7.446	3	2.482	.843	.473
DEGREE	2.720	3	.907	.308	.819
2-WAY INTERACTIONS	111.116	38	2.924	.994	.491
RANK CURPOS	27.600	6	4.600	1.563	.163
RANK YRSRV	1.987	4	.497	.169	.954
RANK DEGREE	4.710	6	.785	.267	.951
CURPOS YRSRV	18.495	9	2.055	.698	.709
CURPOS DEGREE	11.347	6	1.891	.643	.696
YRSRV DEGREE	30.721	7	4.389	1.492	.176
EXPLAINED	145.826	49	2.976	1.011	.467
RESIDUAL	373.689	127	2.942		
TOTAL	519.515	176	2.952		

VARIABLE 709: Internal Work Motivation

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
MAIN EFFECTS	6.634	11	.603	.745	.694
RANK	2.378	2	1.189	1.469	.234
CURPOS	1.306	3	.435	.538	.657
YRSRV	2.351	3	.784	.968	.410
DEGREE	.221	3	.074	.091	.965
2-WAY INTERACTIONS	33.086	38	.871	1.075	.372
RANK CURPOS	4.764	6	.794	.981	.441
RANK YRSRV	2.729	4	.682	.843	.501
RANK DEGREE	7.644	6	1.274	1.573	.160
CURPOS YRSRV	1.011	9	.112	.139	.998
CURPOS DEGREE	6.736	6	1.123	1.386	.225
YRSRV DEGREE	6.195	7	.885	1.093	.372
EXPLAINED	39.720	49	.811	1.001	.484
RESIDUAL	102.833	127	.810		
TOTAL	142.553	176	.810		

VARIABLE 710: Pay Satisfaction

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
MAIN EFFECTS	76.819	11	6.984	2.608	.005
RANK	34.317	2	17.158	6.407	.002 *
CURPOS	7.623	3	2.541	.949	.419
YRSRV	18.200	3	6.067	2.265	.084
DEGREE	12.745	3	4.248	1.586	.196
2-WAY INTERACTIONS	97.454	38	2.565	.958	.547
RANK CURPOS	18.759	6	3.126	1.167	.328
RANK YRSRV	5.664	4	1.416	.529	.715
RANK DEGREE	11.311	6	1.885	.704	.647
CURPOS YRSRV	21.341	9	2.371	.885	.540
CURPOS DEGREE	9.951	6	1.659	.619	.715
YRSRV DEGREE	16.315	7	2.331	.870	.532
EXPLAINED	174.272	49	3.557	1.328	.106
RESIDUAL	340.120	127	2.687		
TOTAL	514.393	176	2.923		

VARIABLE 711: Security Satisfaction

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
MAIN EFFECTS	33.407	11	3.037	1.435	.165
RANK	1.526	2	.763	.361	.698
CURPOS	10.748	3	3.583	1.693	.172
YRSRV	4.551	3	1.517	.717	.544
DEGREE	5.549	3	1.850	.874	.456
2-WAY INTERACTIONS	83.571	38	2.199	1.039	.423
RANK CURPOS	13.137	6	2.190	1.035	.406
RANK YRSRV	10.280	4	2.570	1.216	.308
RANK DEGREE	7.014	6	1.169	.553	.767
CURPOS YRSRV	9.718	9	1.080	.510	.865
CURPOS DEGREE	10.241	6	1.707	.807	.567
YRSRV DEGREE	9.707	7	1.387	.655	.709
EXPLAINED	116.978	49	2.387	1.128	.293
RESIDUAL	268.708	127	2.116		
TOTAL	385.686	176	2.191		

VARIABLE 712: Social Satisfaction

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
MAIN EFFECTS	20.745	11	1.886	2.586	.005
RANK	4.288	2	2.144	2.940	.056
CURPOS	11.202	3	3.734	5.121	.002 *
YRSRV	2.297	3	.765	1.050	.373
DEGREE	2.106	3	.702	.963	.413
2-WAY INTERACTIONS	25.687	38	.676	.927	.595
RANK CURPOS	5.775	6	.962	1.320	.253
RANK YRSRV	.607	4	.152	.208	.934
RANK DEGREE	4.332	6	.722	.990	.435
CURPOS YRSRV	3.492	9	.388	.532	.849
CURPOS DEGREE	4.677	6	.780	1.069	.385
YRSRV DEGREE	4.399	7	.628	.862	.539
EXPLAINED	46.432	49	.948	1.299	.124
RESIDUAL	92.612	127	.729		
TOTAL	139.043	176	.790		

VARIABLE 713: Supervisory Satisfaction

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
MAIN EFFECTS	50.288	11	4.572	2.057	.028
RANK	10.033	2	5.016	2.257	.109
CURPOS	11.181	3	3.727	1.677	.175
YRSRV	23.701	3	7.900	3.555	.016 *
DEGREE	6.927	3	2.309	1.039	.378
2-WAY INTERACTIONS	96.459	38	2.538	1.142	.288
RANK CURPOS	11.305	6	1.884	.848	.536
RANK YRSRV	3.450	4	.863	.388	.817
RANK DEGREE	13.166	6	2.194	.987	.437
CURPOS YRSRV	18.480	9	2.053	.924	.507
CURPOS DEGREE	27.180	6	4.530	2.038	.065
YRSRV DEGREE	17.913	7	2.559	1.151	.336
EXPLAINED	146.747	49	2.995	1.348	.095
RESIDUAL	282.247	127	2.222		
TOTAL	428.994	176	2.437		

VARIABLE 714: Growth Satisfaction

SOURCE OF VARIATION		SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
MAIN EFFECTS		35.381	11	3.216	1.680	.085
RANK		12.113	2	6.056	3.163	.046 *
CURPOS		24.582	3	8.194	4.279	.006 *
YRSRV		4.527	3	1.509	.788	.503
DEGREE		3.771	3	1.257	.656	.580
2-WAY INTERACTIONS		75.797	38	1.995	1.042	.420
RANK	CURPOS	16.940	6	2.823	1.474	.192
RANK	YRSRV	3.933	4	.983	.513	.726
RANK	DEGREE	2.054	6	.342	.179	.982
CURPOS	YRSRV	16.464	9	1.829	.955	.480
CURPOS	DEGREE	18.234	6	3.039	1.587	.156
YRSRV	DEGREE	11.981	7	1.712	.894	.514
EXPLAINED		111.178	49	2.269	1.185	.225
RESIDUAL		243.200	127	1.915		
TOTAL		354.378	176	2.014		

VARIABLE 715: Individual Growth Need Strength

SOURCE OF VARIATION		SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
MAIN EFFECTS		4.871	11	.443	.640	.792
RANK		1.133	2	.567	.819	.443
CURPOS		1.864	3	.621	.898	.444
YRSRV		.795	3	.265	.383	.765
DEGREE		.891	3	.297	.429	.732
2-WAY INTERACTIONS		32.926	38	.865	1.252	.178
RANK	CURPOS	.805	6	.134	.194	.978
RANK	YRSRV	1.175	4	.294	.425	.791
RANK	DEGREE	3.012	6	.502	.726	.630
CURPOS	YRSRV	4.487	9	.499	.721	.689
CURPOS	DEGREE	3.660	6	.610	.882	.510
YRSRV	DEGREE	5.292	7	.756	1.093	.372
EXPLAINED		37.797	49	.771	1.115	.310
RESIDUAL		87.867	127	.692		
TOTAL		125.663	176	.714		

VARIABLE 716: Motivating Potential Score

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
MAIN EFFECTS	30874.803	11	2806.800	.610	.818
RANK	5909.415	2	2954.707	.642	.528
CURPOS	18304.062	3	6101.354	1.325	.269
YRSRV	6868.561	3	2289.520	.497	.685
DEGREE	7846.938	3	2615.646	.568	.637
2-WAY INTERACTIONS	214447.283	38	5643.350	1.226	.201
RANK CURPOS	41593.554	6	6932.259	1.506	.181
RANK YRSRV	10469.950	4	2617.487	.568	.686
RANK DEGREE	12153.510	6	2025.585	.440	.851
CURPOS YRSRV	41292.626	9	4588.070	.996	.446
CURPOS DEGREE	52555.671	6	8759.279	1.902	.085
YRSRV DEGREE	18654.034	7	2664.862	.579	.772
EXPLAINED	245322.086	49	5006.573	1.087	.349
RESIDUAL	584757.965	127	4604.393		
TOTAL	830080.050	176	4716.364		

* - Significant Variables

CELL MEANS FOR RESPONDENT'S RANK

	2nd Lt	1st Lt	Capt	
# in Each Cell	99	29	49	
VARIABLES				
201	6.40	6.45	6.37	
202	5.34	4.97	4.86	
203	4.89	4.55	4.82	
204	5.57	5.24	5.53	
205	5.49	5.45	5.37	
206	4.23	4.14	4.04	
207	4.88	4.38	4.82	*
301	4.75	4.21	4.98	
302	6.47	6.07	6.51	*
303	3.31	3.34	3.73	
304	4.70	4.24	4.76	
305	2.34	2.69	2.37	
306	1.47	1.76	1.35	
307	3.07	3.41	3.63	
308	5.87	5.62	5.71	
309	2.35	2.59	2.41	
310	4.31	3.86	3.98	
311	4.97	4.66	4.45	
312	3.27	3.34	3.00	
313	5.29	5.03	5.12	
314	2.40	2.31	2.45	
401	5.99	6.03	6.22	
402	4.53	4.41	4.80	

	2nd Lt	1st Lt	Capt	
403	6.02	5.72	5.96	
404	3.15	3.72	3.20	
405	5.60	4.72	5.27	
406	5.03	4.90	5.20	
407	2.22	2.45	1.98	
501	5.30	5.83	5.08	
502	3.17	3.31	4.33	*
503	4.92	4.21	4.27	*
504	5.60	5.24	5.31	
505	5.71	4.93	5.12	*
506	5.15	5.03	5.10	
507	5.80	5.45	5.61	*
508	4.91	4.76	4.65	
509	3.47	3.34	4.22	*
510	5.33	4.90	4.98	
511	4.69	4.28	4.39	
512	5.54	5.38	5.43	
513	5.28	4.93	5.08	
514	4.86	4.72	4.55	
601	9.05	8.97	9.20	
602	9.40	9.17	9.47	
603	9.18	9.14	9.37	
604	8.29	7.62	8.12	
605	8.59	7.79	8.06	
606	9.39	9.21	9.04	
607	9.05	8.76	8.76	

	2nd Lt	1st Lt	Capt	
608	9.15	8.90	9.10	
609	8.76	8.31	8.18	
610	2.27	8.86	9.27	
611	9.44	9.31	9.51	
701	5.32	4.92	5.38	
702	4.85	4.62	4.51	
703	5.65	5.59	5.54	
704	5.43	5.14	5.19	
705	4.77	4.43	4.86	
706	4.49	4.20	4.13	
707	6.47	6.25	6.51	
708	4.80	4.53	4.93	
709	5.85	5.51	5.87	
710	3.32	3.33	4.28	*
711	4.99	5.05	4.73	
712	5.64	5.36	5.45	
713	5.16	4.80	4.78	
714	5.17	4.77	4.86	
715	6.31	6.10	6.29	
716	142.99	131.35	140.04	

CELL MEANS FOR RESPONDENT'S CURRENT POSITION (CURPOS)

	R&R & OTHER	R&L	IE	EEP	
# in Each Cell	39	36	39	63	
VARIABLE					
201	6.56	6.61	6.77	5.95	*
202	4.92	5.14	5.87	4.84	*
203	4.18	4.53	5.36	5.03	*
204	5.87	5.50	5.69	5.16	*
205	5.59	5.89	5.26	5.24	*
206	4.38	4.50	3.92	3.98	
207	4.92	4.94	4.64	4.68	
301	4.92	4.22	5.08	4.67	
302	6.67	6.58	6.72	5.98	*
303	4.21	3.72	2.59	3.32	*
304	4.62	4.61	4.62	4.68	
305	2.03	2.61	2.13	2.70	
306	1.10	1.22	1.36	1.95	
307	3.10	3.08	3.44	3.41	
308	6.13	5.86	5.79	5.52	
309	2.05	2.31	2.05	2.90	*
310	4.36	4.42	3.82	4.06	
311	4.05	4.56	5.44	4.94	
312	2.92	3.25	3.31	3.30	
313	4.87	4.97	5.85	5.14	
314	2.08	1.81	2.77	2.71	*
401	6.28	6.06	6.00	5.97	

	R&R & OTHER	R&L	IE	EEP	
402	5.18	4.61	4.49	4.25	
403	6.13	6.06	5.92	5.81	
404	2.54	3.33	3.41	3.57	*
405	5.10	5.22	5.64	5.43	
406	5.56	5.03	5.05	4.76	
407	1.77	2.22	2.28	2.38	
501	5.13	5.47	5.69	5.14	
502	3.85	3.86	3.08	3.38	
503	5.23	5.19	4.38	4.06	*
504	5.72	5.53	5.49	5.24	
505	5.72	5.42	5.21	5.37	
506	5.72	5.11	4.85	4.92	*
507	6.15	5.56	5.92	5.33	*
508	5.13	4.64	4.44	4.95	
509	4.03	3.72	3.46	3.52	
510	5.08	4.94	5.77	4.97	*
511	4.67	5.06	4.90	3.94	*
512	5.72	5.39	5.79	5.19	
513	5.77	5.56	4.90	4.75	*
514	5.21	4.75	4.31	4.75	
601	9.26	9.03	9.21	8.92	
602	9.51	9.53	9.36	9.24	
603	9.36	9.33	9.13	9.14	
604	8.28	8.31	7.49	8.35	
605	8.03	8.58	8.23	8.38	

	R&R & OTHER	R&L	IE	EEP	
606	9.08	9.44	9.26	9.29	
607	8.85	8.97	8.97	8.90	
608	9.10	9.25	9.08	9.02	
609	8.74	8.61	8.74	8.21	*
610	9.38	9.42	9.31	8.90	
611	9.56	9.67	9.38	9.27	
701	5.59	5.04	5.55	5.04	
702	4.01	4.45	5.40	4.88	*
703	5.88	5.98	5.43	5.35	*
704	5.25	5.27	5.89	5.03	*
705	4.87	4.77	4.65	4.69	
706	4.55	4.61	4.10	4.21	
707	6.71	6.66	6.71	5.99	*
708	5.40	4.77	4.71	4.48	
709	5.94	5.78	5.82	5.71	
710	3.94	3.79	3.27	3.45	
711	4.90	5.26	5.29	4.54	
712	5.86	5.49	5.74	5.25	*
713	5.35	4.94	4.65	5.02	
714	5.45	5.20	4.97	4.67	*
715	6.33	6.44	6.25	6.14	
716	143.02	139.58	152.76	131.23	

CELL MEANS FOR RESPONDENT'S YEARS OF SERVICE (YRSRV)

	0-6 MOS	7-18 MOS	19 MOS-5 YRS	OVER 5 YRS
# in Each Cell	15	58	78	26
VARIABLES				
201	5.87	6.50	6.45	6.35
202	5.00	5.34	5.06	5.04
203	4.60	4.74	4.81	5.12
204	5.27	5.79	5.33	5.50
205	5.40	5.33	5.54	5.50
206	4.00	4.28	4.10	4.19
207	4.27	4.84	4.82	4.81
301	4.67	4.76	4.65	4.88
302	6.27	6.48	6.37	6.50
303	3.47	3.26	3.54	3.50
304	4.40	4.74	4.60	4.65
305	2.33	2.17	2.50	2.69
306	1.67	1.34	1.65	1.19
307	3.07	3.14	3.41	3.35
308	6.13	5.71	5.86	5.54
309	2.20	2.28	2.51	2.50
310	4.33	4.36	3.96	4.12
311	4.73	4.98	4.62	4.81
312	3.47	3.33	3.13	3.04
313	5.07	5.24	5.14	5.38
314	2.20	2.64	2.17	2.69
401	6.33	5.95	6.08	6.12
402	5.13	4.34	4.60	4.73

	0-6 MOS	7-18 MOS	19 MOS-5 YRS	OVER 5 YRS	
403	6.13	5.98	5.99	5.69	
404	2.07	3.33	3.44	3.27	
405	6.00	5.59	5.10	5.27	
406	5.07	4.90	5.06	5.38	
407	1.87	2.22	2.19	2.31	
501	5.53	5.29	5.40	5.08	
502	4.00	3.47	3.37	3.77	
503	5.33	4.64	4.59	4.27	
504	5.87	5.45	5.51	5.08	
505	6.40	5.36	5.45	4.88	
506	5.60	4.71	5.26	5.35	*
507	5.93	5.76	5.67	5.46	
508	5.80	4.43	4.99	4.58	*
509	4.33	3.66	3.63	3.38	*
510	5.13	5.29	5.12	5.04	
511	5.47	4.64	4.41	4.15	
512	5.20	5.53	5.60	5.15	
513	5.13	5.07	5.31	5.00	
514	5.60	4.41	4.92	4.50	
601	9.20	9.21	8.96	9.08	
602	9.40	9.50	9.31	9.35	
603	9.13	9.22	9.21	9.35	
604	9.13	8.12	7.99	8.04	
605	8.87	8.45	8.35	7.58	
606	9.40	9.38	9.35	8.69	*
607	8.73	8.86	9.09	8.65	

	0-6 MOS	7-18 MOS	19 MOS-5 YRS	OVER 5 YRS	
608	9.13	9.07	9.09	9.15	
609	8.40	8.76	8.65	7.69	
610	9.27	9.36	9.17	8.92	
611	9.33	9.43	9.49	9.38	
701	5.20	5.46	5.16	5.23	
702	4.62	4.82	4.63	4.81	
703	5.78	5.47	5.74	5.45	
704	5.29	5.44	5.23	5.31	
705	4.40	4.75	4.76	4.81	
706	4.42	4.50	4.22	4.32	
707	6.16	6.55	6.39	6.55	
708	5.38	4.64	4.74	4.95	
709	6.15	5.82	5.74	5.69	
710	4.17	3.56	3.50	3.58	
711	5.50	4.97	4.90	4.62	
712	5.67	5.58	5.59	5.23	
713	5.93	4.74	5.12	4.65	*
714	5.30	4.93	5.07	4.91	
715	6.28	6.33	6.27	6.14	
716	123.56	145.09	139.37	141.85	

CELL MEANS FOR RESPONDENT'S DEGREE

	ARCHITECTURE AND CIVIL ENGINEERING	GENERAL ENGINEERING AND OTHER	ELECTRICAL AND MECHANICAL ENGINEERING	INDUSTRIAL ENGINEERING	
# in Each Cell	84	12	33	48	
VARIABLES					
201	6.40	6.08	6.00	6.75	
202	4.92	5.00	5.06	5.65	
203	4.68	3.83	5.00	5.17	
204	5.39	5.58	5.64	5.58	
205	5.52	5.58	5.45	5.29	
206	4.26	4.00	4.30	3.94	
207	4.92	4.67	4.91	4.48	*
301	4.43	4.75	5.15	4.94	
302	6.40	6.25	6.09	6.71	
303	3.85	4.33	2.79	2.94	*
304	4.68	4.58	4.73	4.52	
305	2.54	2.58	2.42	2.13	
306	1.56	1.33	1.58	1.33	
307	3.13	3.75	3.27	3.44	
308	5.74	5.75	5.76	5.90	
309	2.50	2.75	2.45	2.13	
310	4.25	4.17	4.30	3.85	
311	4.62	3.75	4.91	5.21	
312	3.13	2.92	3.12	3.48	
313	5.05	4.92	5.15	5.58	
314	2.24	2.58	2.33	2.69	

	ARCHITECTURE AND CIVIL ENGINEERING	GENERAL ENGINEERING AND OTHER	ELECTRICAL AND MECHANICAL ENGINEERING	INDUSTRIAL ENGINEERING
401	6.10	6.08	6.09	5.98
402	4.73	4.42	4.36	4.52
403	6.02	5.58	6.09	5.83
404	3.31	3.08	3.30	3.19
405	5.14	5.50	5.33	5.73
406	5.20	5.00	4.61	5.13
407	2.15	2.00	2.39	2.17
501	5.37	4.75	5.00	5.63
502	3.67	4.75	3.36	3.04
503	4.82	4.08	4.39	4.56
504	5.58	5.33	5.24	5.42
505	5.44	5.42	5.67	5.21
506	5.30	4.83	5.09	4.90
507	5.60	6.17	5.33	5.98
508	5.00	4.92	4.97	4.35
509	3.69	4.75	3.73	3.29
510	5.04	4.92	5.12	5.48
511	4.68	4.75	3.70	4.81
512	5.49	5.17	5.15	5.77
513	5.30	5.00	5.12	5.02
514	4.82	5.08	5.03	4.35
601	9.06	9.08	9.09	9.10
602	9.44	9.00	9.36	9.40
[illegible]	9.26	9.25	9.21	9.17

	ARCHITECTURE AND CIVIL ENGINEERING	GENERAL ENGINEERING AND OTHER	ELECTRICAL AND MECHANICAL ENGINEERING	INDUSTRIAL ENGINEERING
604	8.30	8.42	8.61	7.46
605	8.40	8.33	8.61	7.94 *
606	9.37	8.58	9.36	9.19
607	8.69	8.83	9.45	8.98
608	9.08	9.00	9.15	9.10
609	8.52	8.58	8.52	8.52
610	9.29	9.17	8.94	9.25
611	9.52	9.42	9.18	9.48
701	5.10	5.25	5.45	5.47
702	4.48	3.75	5.04	5.15
703	5.67	5.58	5.63	5.50
704	5.15	5.06	5.25	5.70
705	4.82	4.78	4.84	4.51
706	4.46	4.14	4.44	4.12
707	6.42	6.33	6.17	6.71
708	4.87	4.78	4.56	4.82
709	5.78	5.79	5.78	5.84
710	3.68	4.75	3.55	3.17
711	5.02	4.75	4.35	5.22
712	5.56	5.56	5.24	5.72
713	5.09	5.14	5.22	4.64
714	5.11	4.71	4.93	4.99
715	6.33	6.07	6.20	6.26
716	139.67	124.85	140.69	144.88

APPENDIX E

CROSSTABULATION OF SAMPLE

RANK	DEGREE	1. ARCHITECTURE	2. CIVIL	3. ELECTRICAL	4. GENERAL	5. INDUSTRIAL	6. MECHANICAL	7. OTHER	ROW TOTAL
1. 2LT	COUNT	8	39	9	2	30	10	1	99
	ROW PCT	8.1	39.4	9.1	2.0	30.3	10.1	1.0	55.3
	COL PCT	61.5	53.4	56.3	22.2	62.5	58.8	33.3	
	TOT PCT	4.5	21.8	5.0	1.1	16.8	5.6	.6	
2. 1LT	COUNT	1	16	3	2	5	2	0	29
	ROW PCT	3.4	55.2	10.3	6.9	17.2	6.9	0	16.2
	COL PCT	7.7	21.9	18.8	22.2	10.4	11.8	0	
	TOT PCT	.6	8.9	1.7	1.1	2.8	1.1	0	
3. CAPT	COUNT	4	16	4	5	13	5	2	49
	ROW PCT	8.2	32.7	8.2	10.2	26.5	10.2	4.1	27.4
	COL PCT	30.8	21.9	25.0	55.6	27.1	29.4	66.7	
	TOT PCT	2.2	8.9	2.2	2.8	7.3	2.8	1.1	
COLUMN TOTAL		13	73	16	9	48	17	3	179
		7.3	40.8	8.9	5.0	26.8	9.5	1.7	100.0

Crosstabulation of Rank by Degree

RANK	YRSRV	0-6MOS	7-18MOS	19MOS-5YRS	OVER 5YRS	ROW TOTAL
1. 2LT	COUNT	14	47	35	3	99
	ROW PCT	14.1	47.5	35.4	3.0	55.3
	COL PCT	93.3	81.0	44.3	11.1	
	TOT PCT	7.8	26.3	19.6	1.7	
2. 1LT	COUNT	0	0	27	2	29
	ROW PCT	0	0	93.1	6.9	16.2
	COL PCT	0	0	34.2	7.4	
	TOT PCT	0	0	15.1	1.1	
3. CAPT	COUNT	1	11	16	21	49
	ROW PCT	2.0	22.4	32.7	42.9	27.4
	COL PCT	6.7	19.0	20.3	77.8	
	TOT PCT	.6	6.1	8.9	11.7	
COLUMN TOTAL		15	58	79	27	179
		8.4	32.4	44.1	15.1	100.0

Crosstabulation of Rank by YRSRV

CURPOS	COUNT / ROW PCT / COL PCT / TOT PCT	DEGREE: 1. ARCHITECTURE	2. CIVIL	3. ELECTRICAL	4. GENERAL	5. INDUSTRIAL	6. MECHANICAL	7. OTHER	ROW TOTAL
1. R AND R		1	7	2	6	3	2	0	21
		4.8	33.3	9.5	28.6	14.3	9.5	0	11.7
		7.7	9.6	12.5	66.7	6.3	11.8	0	
		.6	3.9	1.1	3.4	1.7	1.1	0	
2. R AND L		3	24	2	0	4	3	0	36
		8.3	66.7	5.6	0	11.1	8.3	0	20.1
		23.1	32.9	12.5	0	8.3	17.6	0	
		1.7	13.4	1.1	0	2.2	1.7	0	
3. IE		0	2	0	0	37	0	0	39
		0	5.1	0	0	94.9	0	0	21.8
		0	2.7	0	0	77.1	0	0	
		0	1.1	0	0	20.7	0	0	
4. DEEP		6	16	11	0	0	8	1	42
		14.3	38.1	26.2	0	0	19.0	2.4	23.5
		46.2	21.9	68.8	0	0	47.1	33.3	
		3.4	8.9	6.1	0	0	4.5	.6	
5. CMEEP		0	8	0	1	0	1	0	10
		0	80.0	0	10.0	0	10.0	0	5.6
		0	11.0	0	11.1	0	5.9	0	
		0	4.5	0	.6	0	.6	0	
6. EPREEP		2	6	0	2	1	0	1	12
		16.7	50.0	0	16.7	8.3	0	8.3	6.7
		15.4	8.2	0	22.2	2.1	0	33.3	
		1.1	3.4	0	1.1	.6	0	.6	
7. OTHER		1	10	1	0	3	3	1	19
		5.3	52.6	5.3	0	15.8	15.8	5.3	10.6
		7.7	13.7	6.3	0	6.3	17.6	33.3	
		.6	5.6	.6	0	1.7	1.7	.6	
COLUMN TOTAL		13	73	16	9	48	17	3	179
		7.3	40.8	8.9	5.0	26.8	9.5	1.7	100.0

Crosstabulation of Current Position by Degree

CURPOS	YRSRV	1. 0-6MOS	2. 7-18MOS	3. 19MOS-5YRS	4. OVER 5YR	ROW TOTAL
1. R AND R	COUNT	0	6	12	3	21
	ROW PCT	0	28.6	57.1	14.3	11.7
	COL PCT	0	10.3	15.2	11.1	
	TOT PCT	0	3.4	6.7	1.7	
2. R AND L	COUNT	1	10	21	4	36
	ROW PCT	2.8	27.8	58.3	11.1	20.1
	COL PCT	6.7	17.2	26.6	14.8	
	TOT PCT	.6	5.6	11.7	2.2	
3. IE	COUNT	6	16	13	4	39
	ROW PCT	15.4	41.0	33.3	10.3	21.8
	COL PCT	40.0	27.6	16.5	14.8	
	TOT PCT	3.4	8.9	7.3	2.2	
4. DEEP	COUNT	2	16	21	3	42
	ROW PCT	4.8	38.1	50.0	7.1	23.5
	COL PCT	13.3	27.6	26.6	11.1	
	TOT PCT	1.1	8.9	11.7	1.7	
5. CMEEP	COUNT	1	4	3	2	10
	ROW PCT	10.0	40.0	30.0	20.0	5.6
	COL PCT	6.7	6.9	3.8	7.4	
	TOT PCT	.6	2.2	1.7	1.1	
6. EPREEP	COUNT	3	1	4	4	12
	ROW PCT	25.0	8.3	33.3	33.3	6.7
	COL PCT	20.0	1.7	5.1	14.8	
	TOT PCT	1.7	.6	2.2	2.2	
7. OTHER	COUNT	2	5	5	7	19
	ROW PCT	10.5	26.3	26.3	36.8	10.6
	COL PCT	13.3	8.6	6.3	25.9	
	TOT PCT	1.1	2.8	2.8	3.9	
COLUMN TOTAL		15 8.4	58 32.4	79 44.1	27 15.1	179 100.0

Crosstabulation of Current Position by YRSRV

DEGREE		YRSRV 1. 0-6MOS	2. 7-18MOS	3. 19MOS-5YRS	4. OVER 5YRS	ROW TOTAL
1. ARCHITECTURE	COUNT	1	3	7	2	13
	ROW PCT	7.7	23.1	53.8	15.4	7.3
	COL PCT	6.7	5.2	8.9	7.4	
	TOT PCT	.6	1.7	3.9	1.1	
2. CIVIL	COUNT	5	24	34	10	73
	ROW PCT	6.8	32.9	46.6	13.7	40.8
	COL PCT	33.3	41.4	43.0	37.0	
	TOT PCT	2.8	13.4	19.0	5.6	
3. ELECTRICAL	COUNT	0	6	7	3	16
	ROW PCT	0	37.5	43.8	18.8	8.9
	COL PCT	0	10.3	8.9	11.1	
	TOT PCT	0	3.4	3.9	1.7	
4. GENERAL	COUNT	0	4	5	0	9
	ROW PCT	0	44.4	55.6	0	5.0
	COL PCT	0	6.9	6.3	0	
	TOT PCT	0	2.2	2.8	0	
5. INDUSTRIAL	COUNT	7	16	17	8	48
	ROW PCT	14.6	33.3	35.4	16.7	26.8
	COL PCT	46.7	27.6	21.5	29.6	
	TOT PCT	3.9	8.9	9.5	4.5	
6. MECHANICAL	COUNT	0	5	9	3	17
	ROW PCT	0	29.4	52.9	17.6	9.5
	COL PCT	0	8.6	11.4	11.1	
	TOT PCT	0	2.8	5.0	1.7	
7. OTHER	COUNT	2	0	0	1	3
	ROW PCT	66.7	0	0	33.3	1.7
	COL PCT	13.3	0	0	3.7	
	TOT PCT	1.1	0	0	.6	
COLUMN TOTAL		15 8.4	58 32.4	79 44.1	27 15.1	179 100.0

Crosstabulation of Degree by YRSRV

RANK	CURPOS COUNT / ROW PCT / COL PCT / TOT PCT	IR AND R	R AND L	IE	DEEP	CMEEP	EPREEP	OTHER	ROW TOTAL
1.		4	24	25	29	5	6	6	99
2LT		4.0	24.2	25.3	29.3	5.1	6.1	6.1	55.3
		19.0	66.7	64.1	69.0	50.0	50.0	31.6	
		2.2	13.4	14.0	16.2	2.8	3.4	3.4	
2.		4	6	5	7	2	2	3	29
1LT		13.8	20.7	17.2	24.1	6.9	6.9	10.3	16.2
		19.0	16.7	12.8	16.7	20.0	16.7	15.8	
		2.2	3.4	2.8	3.9	1.1	1.1	1.7	
3.		13	6	9	5	3	4	9	49
CAPT		26.5	12.2	18.4	10.2	6.1	8.2	18.4	27.4
		61.9	16.7	23.1	11.9	30.0	33.3	47.4	
		7.3	3.4	5.0	2.8	1.7	2.2	5.0	
COLUMN TOTAL		21 11.7	36 20.1	39 21.8	42 23.5	10 5.6	12 6.7	19 10.6	179 100.0

Crosstabulation of Rank by Current Position

APPENDIX F

JOB CHARACTERISTICS MODEL RESEARCH

This Appendix is intended as a specific narrative on the research that has been conducted on the Job Characteristics Model since its introduction in 1974. The research is sometimes supportive and sometimes critical of the model and its constructs. Much of the research presented here focuses on the Growth Needs Strength as a moderator of the core job characteristics-expected work outcomes relationship. The research is summarized in chapter 2 of this text.

The Research

Irmtraud Streker Seeborg, under the U.S. Department of Labor, conducted research in 1976 to determine the effects of employee participation on job redesign efforts. The research was in the form of a laboratory experiment in which Seeborg created an organization that manufactured decision boxes. The created organization consisted of a plant manager, first level supervisors, and production workers. The sample was composed

of 8 female and 17 male participants divided into five work groups. The independent variables were conditions in which job changes were implemented. The supervisory condition was where the supervisor unilatterally designed the job characteristics and implemented the change. The participative condition was where the worker and the supervisor coordinated all facets of job redesign and implementation. The plant manager condition was where the plant manager unilaterally implemented a job change that had been developed by another group in the participative condition. The dependent variable was performance quality. The researcher hypothesized that job redesign efforts fail for reasons related to the way the changes are implemented. The Job Diagnostic Survey (JDS) was the data collection instrument used in the experiment. The length of the experiment was $2\frac{1}{2}$ days. On the first day, each group was given task instructions and then asked to complete the JDS for preconceptions about the job. After 6 hours of performing the task, the JDS was again administered to each group member. Each group was then subjected to one of the job redesign conditions on the second day and completed the JDS after 1 and 7 hours of performing the redesign task. The findings of this study showed that the supervisors tended to vertically load jobs while the employees were more concerned with social job changes. The perceived task significance measures showed significant increase in the participative job redesign condition and quality of performance increased in the supervisory condition. Satisfaction increased in the participative condition but actually decreased in the plant manager condition. Thus the study indicates that the way job redesign characteristics are implemented moderates the work outcomes. (29)

J. Richard Hackman, Greg R. Oldham, and Jane L. Pearce conducted a 1976 study in a large metropolitan bank on the conditions under which

employees respond favorably to enriched jobs. The sample consisted of 201 clerical employees. The independent variables were the employees growth need strength and satisfaction with the work context. The dependent variables were the job outcomes and job characteristics. The hypothesis of this study was that when employees are well satisfied with the work context and have a strong need for growth, the Motivating Potential Score and outcome relationships are strong and positive. These relationships are moderately weak for low growth needs and satisfaction, and zero for low growth needs and low satisfaction. The data collection device used for this study was the JDS. The research design consisted of a one shot researcher-administered questionnaire to the employees who were on the same organizational level and had little customer contact. The findings of this study indicated that those individuals with high levels of growth need strength and who were well satisfied with the work context experienced a strong positive relationship between Motivating Potential Score and work outcomes. The hypothesized relationship for low growth need strength and low satisfaction was only weakly supported. (23)

Under a grant from the National Science Foundation, Randall B. Dunham in 1976 conducted research on the measurement and dimensionality of job characteristics. Dunham used a large retail merchandizing firm as the organizational setting. The sample consisted of 3610 employees at all levels of the organization. The independent variables were the Job Characteristics Model's core job dimensions and job satisfaction. The dependent variables consisted of combinations of task variety and task significance. The hypothesis of this study stated the dimensions of task design cannot be separated into components of task variety and task significance as suggested in Hackman and Oldham's original model. The attitude scale

responses of the JDS were used as the analytical tools in this study. The research design involved researdher-administered surveys on company time and premises to employees exempt from the corporate structure who were guaranteed anonymity. The results of this study contradicted the Hackman and Oldham model in that it suggested that task variety and task significance actually form one factor and could not be measured separately. (15)

Terry A. Beehr, Jeffrey T. Walsh, and Thomas T. Taber conducted research supported by the Institute for Social Research in 1975 on the relationships between stresses and organizationally valued states. The setting for the study was a midwestern manufacturing company. The sample consisted of 79 male and 64 female employees with a mean age of 34. The independent variable was growth needs strength of each employee and the dependent variables were the stresses on the individual and the organizationally valued states. The researchers hypothesized that the relationships between high individual stresses and organizationally valued states would be stronger amoung employees with high levels of growth needs strength. The experimental design was a one shot questionnaire administered to small groups by the researchers. The data collection instrument was a researcher modified form of the JDS. The researchers found that the relationships between individual stresses and organizationally valued states were significantly moderated by the presence of high growth needs strength.(4)

Eugene F. Stone headed a research team consisting of Richard T. Mowday and Lyman F. Porter, under a grant from the U.S. Office of Naval Research in 1976. The purpose of the research was to investigate higher order need strengths as moderators of the job scope-job satisfaction relationship. The researchers administered an extensive questionnaire to 340 employees of a large manufacturing firm. The sample consisted of

a large cross section from all levels of production and supervision. The independent variables in this study were the job scopes and perceived levels of satisfaction of the employees. The dependent variables consisted of the need for achievement and the need for autonomy measured by the Personality Research Form developed by Jackson (1967). The experimental design divided the sample into two groups and each were administered questionnaires on two separate days to avoid fatigue. Group one received the first half of the questionnaire on day 1 while group two received the second half. The reverse occured on the second day. The hypothesis stated that the need for achievement and need for autonomy moderate the job scope-job satisfaction relationship. Job satisfaction was measured using the Brayfield-Rothe Job Satisfaction Index developed in 1951. The results of the research indicated that the need for autonomy was significant in moderating the job scope-job satisfaction relationship while the need for achievement proved not as significant. (27)

Richard M. Steers and David G. Spencer completed research in 1976, under the Office of Naval Research, on the role of achievement motivation in job design. The researchers administered questionnaires to 115 employees of a midwest manufacturing firm. The independent variables in the study included job scope, manager's commitment to the organization, and performance. The dependent variable was the employees' need for achievement (nAch). The questionnaires were administered to groups of 10-15 employees by the researchers who guaranteed confidentiality. Two hypotheses were tested in this research; the first was that nAch did not moderate the relationship between job scope and the commitment of managers to the organization; the second was that high nAch moderated the relationship between job scope and performance. The Manifest Needs Questionnaire measured nAch while the

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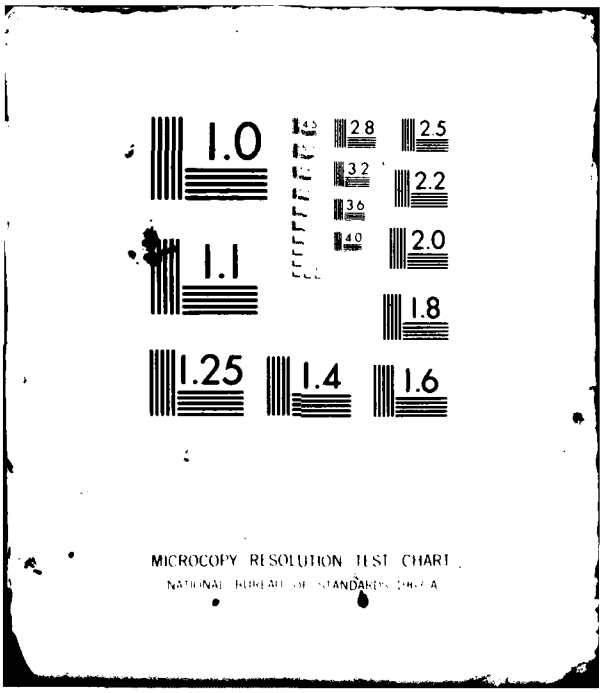
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Hackman and Lawler instrument developed in 1971 was used to measure task characteristics. The findings supported both hypotheses. nAch had significant influence on the job scope-performance relationship and no impact on the relationship between job scope and the manager's commitment to the organization. (30)

In 1979, David C. Gilmore and John J. Pokorney investigated job diagnostic survey dimensions as they measure the moderating effects of growth needs. The sample consisted of 102 male first level managers in a large insurance firm. The independent variables for this study were job characteristics and job satisfaction while the dependent variable was employee growth need strength. The JDS was administered to the sample through the insurance company, researchers did not directly administer the survey to the sample. The hypothesis of this study stated that high levels of growth need strength significantly moderates the relationship between job design characteristics and job satisfaction. The findings somewhat contradicted those of Hackman and Oldham. Growth need strength did not significantly moderate all the task characteristics. Only those of task significance and feedback were significantly affected by levels of growth need strength. (19)

Daniel C. Ganster performed a 1979 laboratory experiment on individuals and task design. The sample consisted of 190 college students attending a midwestern university. Ganster identified the independent variables as task variety, autonomy, feedback, and identity. The dependent variables were job satisfaction, growth need strength, nAch, the presence of a protestant work ethic, and a variable identified as an arousal seeking tendency. The two hypotheses tested were that the dependent variables will moderate the objective job scope-job satisfaction relationship

and that these variables will also moderate the perceived job scope-job satisfaction relationship. The experimental design consisted of a pretest given 1-3 weeks in advance and the division of the sample into groups of 12. Each group was assigned a task which was high or low in job scope. Miles and Garrett 1971 scale measured levels of the protestant work ethic, Jackson's 1967 scale measured nAch, Hackman and Oldham's JDA measured growth needs strength and the Sensation Seeking Tendency developed by Russell in 1974 measured the arousal seeking tendency. Ganster found that none of the above variables had any significant effect on the objective job scope-job satisfaction relationship. He also found that only nAch significantly moderated the perceived job scope-job satisfaction relationship. (18)

David J. Cherrington and J. Lynn England conducted research on the desire for an enriched job as a moderator of the enrichment-satisfaction relationship under a grant from the Erteszek Research Fund in 1979. Their data was obtained from 3053 employees of 53 manufacturing firms across the U.S. In this study, the dependent variables were identified as job scope, performance and satisfaction. The independent variables consisted of growth needs strength, the protestant work ethic, and background of each employee. The researchers administered a 19 question survey instrument, developed for this study, to no more than 80 employees in each of the 53 firms. The respondents were selected at random from a stratified sample developed at all levels of each firm. The hypothesis tested in this research was that the protestant work ethic, growth needs strength, and urban background were not significant moderators of the job scope-job satisfaction relationship. The findings support the hypothesis. In fact, the researchers investigated a fourth, previously unidentified moderating variable, an employee's

desire for an enriched job. The researchers concluded that the answer to the question, "Do you want an enriched job and if so, what would you like to see changed?" is the only predictor of the effects of job redesign on satisfaction. (7)

Under a grant from the Office of Naval Research, Sam E. White and Terence R. Mitchell compared job enrichment and social cues in 1978. The research was in the form of a laboratory experiment in which 41 part time student employees unknowlingly participated. The independent variables were the participants' perceptions of job enrichment, ambiguity, satisfaction, and performance. The dependent variables included social cues and levels of job enrichment. The students were asked to help the university's business research department in looking up stock information for class credit. The supervisor of each student work group was part of the research team and had identical briefing scripts except for the task description. The social cues were given off by student confederates of the researchers within the work groups. A control group of workers was included in the experiment. The hypothesis tested was that enrichment has more effect on satisfaction than does social cues about enriched jobs. The JDS and the Job Ambiguity Scale developed by Rizzo, House, and Lortzman in 1970 comprised the analytical tools. The findings in this experiment rejected the hypothesis. When positive social cues were emmitted by co-workers, the subjects perceived higher levels of job satisfaction than in the reverse case. Task design was found to have little to do with job satisfaction. Productivity of the subjects was affected in much the same way by social cues. This experiment replicated results reported by Charles A. O'Reilly and David F. Caldwell in 1978. The previous study was also a laboratory experiment with similar experimental design and characteristics. (26)

Eugene F. Stone conducted a laboratory experiment under a grant from the Office of Naval Research in 1978 on field independence and perceptions of task characteristics. The sample consisted of 133 volunteer subjects who were to work manufacturing a model replica of a molecule. The dependent variable in this study was task design, the independent variable was field independence. The subjects were aware of their status and were asked their immediate and long range perceptions of the task. The subjects were to construct as many replicas as possible of a model molecule which was placed in fron of them in the allotted time of 2 hrs. No control group was used in this experiment. The hypothesis stated that field independence, the independence of an individual from his surroundings, is related to the way in which individuals perceive and/or affectively respond to job characteristics. Stone used a questionnaire of task perceptions developed by him in 1974 and the Group Embedded Figures Test for Field Independence developed by Oltman, Raskin, and Karp in 1971. Stone found that field independence was directly correlated and possibly causal of perceptions of task design. The more field independent an individual, the less the perceptions of task design and the more dependent, the greater the perceptions. (31)

The Bureau of Employment and Training in the Michigan Department of Labor sponsored research by Brian W. Coyle, Neal Schmitt, John Rauschenberger, and J. Kenneth White on a causal model for background, needs, job perceptions, and job satisfaction. The 1977 study obtained data from 411 new workforce personnel entering all types of employment. The independent variables were background and growth needs, the dependent variables were the subject's perceptions and levels of satisfaction. The experiment took the form of a single group pretest/post-test design. The pretest was given prior to

the subjects' entering the workforce and consisted of the Existence, Relatedness, and Growth Needs Scale developed by Aldefer in 1972 and the socioeconomic scale developed by Reiss, Duncan, Hatt, and North in 1961. The post-test was administered after 10 months and consisted of the Minnesotta Satisfaction Questionnaire developed by Weiss, Davis, England, and Lofquist in 1967 and the JDS. The researchers' hypothesis was that sex and socioeconomic status affect growth needs which in turn affect job satisfaction and perceptions. The results of the study showed that growth needs and the variables affecting them explain a very small part of the job perceptions-satisfaction relationship. The researchers also suggested that growth needs may not be a moderator, but may be directly linearly related to job perceptions and satisfaction. (8)

Ahmed A. Abdel-Halim conducted a study in 1979 on individual and interpersonal moderators of employee reactions to job characteristics. The study was sponsored by and conducted in a large midwest manufacturing firm. The sample consisted of 87 managerial and professional personnel. The independent variable was growth need strength and the dependent variables were job characteristics and job satisfaction. Halim's hypothesis in this study was similar to Hackman and Oldham's 1974 model of growth need strength; the motivating potential of a job will result in higher levels of satisfaction if high growth need strength is present. The JDS was administered by the researcher to small groups of 10-15 subjects who were guaranteed confidentiality. The results of this study substantiated Hackman and Oldham's model of growth need strength. Growth need strength significantly moderated the job characteristics-job satisfaction relationship. (1)

Under the Manpower Administration, U.S. Department of Labor, Jon L. Pierce, Randall B. Dunham, and Richard S. Blackburn, tested a congruency

model of social system structure, job design, and growth need strength. They conducted their research in the home office of a large insurance firm in 1979. The sample of 398 employees were drawn from 19 different work units along vertical and horizontal organizational lines. The experiment was designed as a pretest/post-test control group. The independent variables in the study included the social system, job design, and growth need strength. The dependent variables were satisfaction and performance. Each subject was asked to complete the JDS, Index of Organizational Reactions (Smith 1976) and the Minnesotta Satisfaction Questionnaire (Weiss, Davis, England, and Lofquist 1967). The control group reaccomplished the questionnaire after 1 month, the experimental group after 14 weeks. The researcher hypothesized that there was a congruent effect of social system, growth need strength, and job design on satisfaction and performance. The findings indicated that growth need strength and social system must be considered together as they moderate satisfaction and performance. (16)

In 1978, Danial C. Feldman and Hugh J. Arnold compared the importance of organizational versus job factors in position choice. The sample in this study consisted of 62 American and Canadian graduate management students. The students were to assign weights to job descriptions containing different levels of six organizational and six job characteristics variables. The students had a total of 100 points to assign to all the job descriptions and they could assign these points as they judged their preference for the job. The independent variables for this study were the student's growth need strength and previous work experience. The dependent variables included job characteristics and organizational variables such as task variety and pay. The students completed the JDS to determine levels of growth need strength. The researchers hypothesized that individuals with

high levels of growth need strength and previous work experience would weigh the motivating potential of the job characteristics more fully than those with low growth need strength. The results of the study supported the research hypothesis. High growth need strength individuals preferred the task descriptions with more autonomy and feedback. Low growth need strength individuals preferred organizational factors such as pay and benefits. (2)

The U.S. Department of Labor sponsored the research of James G. Goodale, Douglas T. Hall, Mailyn Morgan, and Samuel Rabinowitz in 1977 on the effects of top-down departmental change and job change upon perceived employee behavior and attitudes. The researchers sampled 153 first line supervisors in the federal government. The researchers identified three dependent variables positive change, no change, and negative change. The independent variable was the empoyees' growth need strengths. The experimental design was a pretest and two longitudinal tests at five month intervals on each of the change modes. Each subject was administered the Hackman and Lawler 1971 questionnaire as a measure of job dimensions and part of the JDS as a measure of growth need strength. The researchers stated that no hypothesis would be set forth in this study as it was being treated in an exploratory manner. The results of the study showed that growth need strength did not vary with any of the changes. This result somewhat contradicted a 1972 Aldefer claim that increased growth followed growth experiences. (20)

M.G. Evans, M.N. Kiggundu, and R.J. House conducted a 1976 test and extension of Hackman and Oldham's Job Characteristics Model. The sample consisted of 343 supervisors in an automobile assembly plant. The JDS was administered to the subjects by the researchers on company time.

The independent variable was growth needs strength and the dependent variables were the Motivating Potential Score and E1, the expectancy that perfromance results from effort. The hypothesis to be tested stated that for high growth needs strength individuals, the relationship between Motivating Potential Score and E1 would be positive and for low growth need strength, the relatioship would be zero or negative. The results showed weak support for growth needs strength as a moderator of the Motivating Potential Score and E1 relationship. (17)

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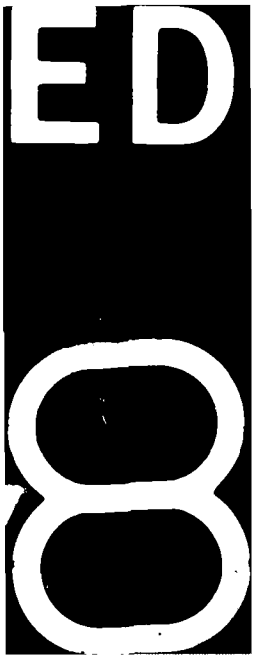
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