

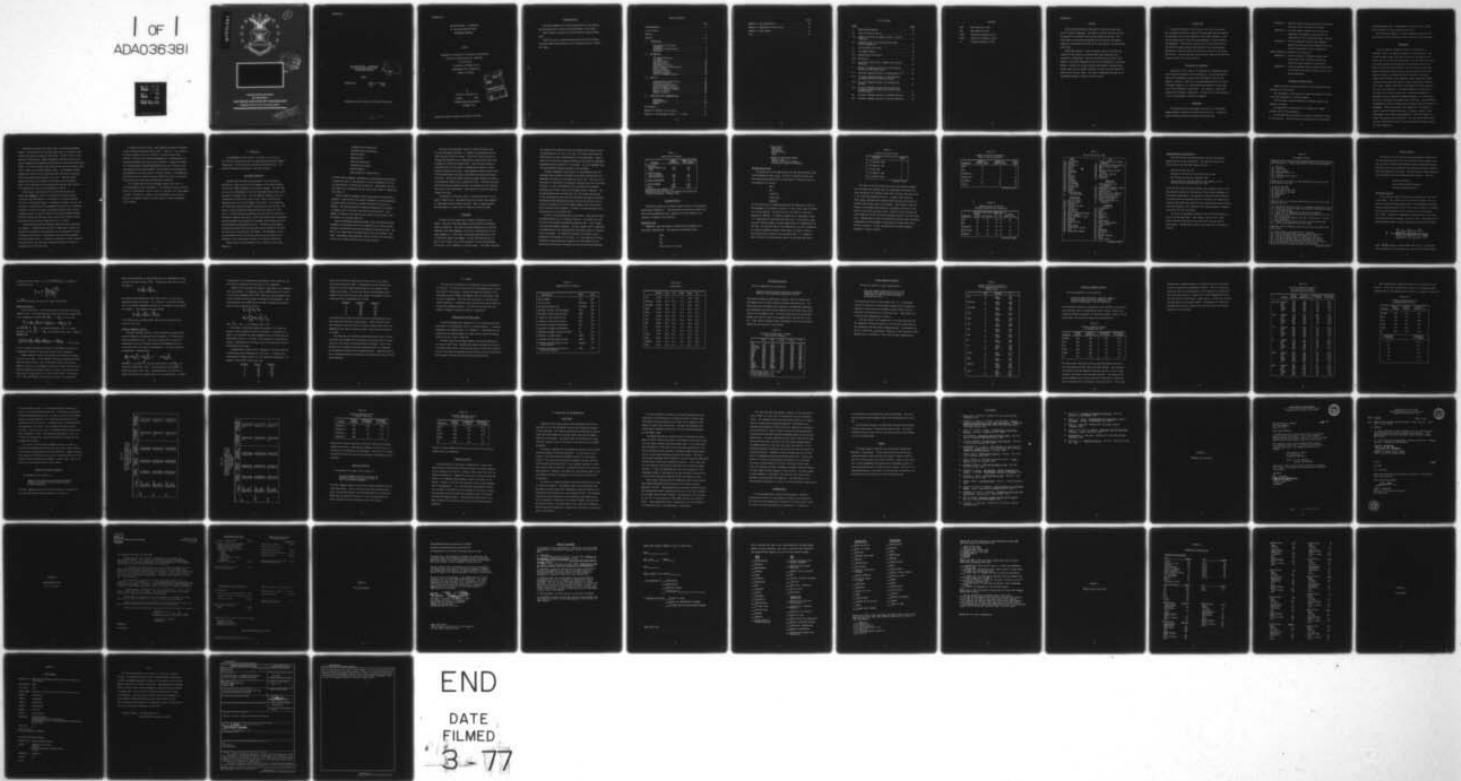
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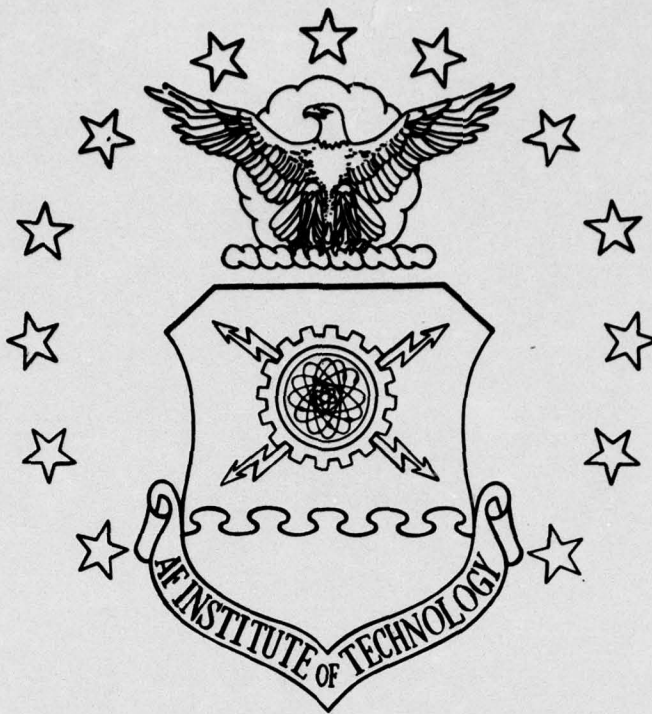


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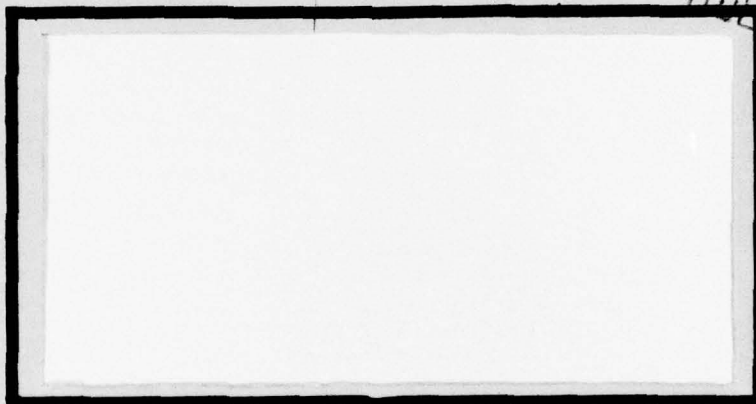
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JOB SATISFACTION: A COMPARISON  
OF THE JOB DESCRIPTIVE INDEX  
AND HOPPOCK MEASURES

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THESIS

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William T. Bolyard  
Capt USAF

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JOB SATISFACTION: A COMPARISON  
OF THE JOB DESCRIPTIVE INDEX  
AND HOPPOCK MEASURES

THESIS

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

by

William T. Bolyard, B.S.  
Captain USAF  
Graduate Operations Research  
December 1976

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NOTATION

Work      Work dimension of JDI.  
Pay        Pay dimension of JDI.  
Promo     Promotions dimension of JDI.  
Super     Supervision dimension of JDI.  
Co        Coworkers dimension of JDI.

ABSTRACT

Job satisfaction measures developed in recent years have taken one of two basic approaches: the measure of overall satisfaction, and the measure of satisfaction with various aspects of the job. This study shows the relationships between two such devices, the Hoppock measure of satisfaction and Smith, Hulin, and Kendall's Job Descriptive Index (JDI).

Correlation analysis, linear regression analysis, and principal component factor analysis techniques were used to determine the statistical relationships. Data for the analysis was from Air Force members of the 341st Strategic Missile Wing at Malmstrom Air Force Base, Montana. Analysis of the data revealed that Hoppock's measure encompasses several of the aspects studied by the JDI with the exception of satisfaction with pay levels. The author recommended continued use of the Hoppock measure in future Air Force surveys.

## I INTRODUCTION

Since the elimination of the military draft, the Air Force has had to compete with private industry for young people who are entering the job market, and for the retention of its senior personnel. Over the past decade the Air Force has placed emphasis in human relations and management. There exists a need for the Air Force to be able to satisfactorily measure the job satisfaction of its current members. Impressions of jobs can effect the decision of joining or not joining the military. The job attitudes also have major impact on the decision to make a career of Air Force service.

### The Purpose of this Study

The purpose of this study is to determine the relationships that exist between two measures of job satisfaction. The Job Descriptive Index (JDI), developed by Smith, Hulin, and Kendall (Ref 18), and Hoppock's Blank No. 5 (Ref 12) are the measurement devices of concern. The Hoppock measure, or a slight modification thereof, has been used in Air Force research in recent years. This measure is simple when compared to the complex, lengthy JDI. The JDI has had little exposure to Air Force personnel in contrast to Hoppock.

### Hypotheses

This research effort investigates the statistical relationship between Hoppock's measure of satisfaction and the JDI. To determine these relationships several hypotheses were formulated.

Hypothesis 1: Hoppock's measure displays significant correlation with each of the five factors of the JDI.

Hypothesis 2: The Least Squares regression of the five JDI dimensions onto Hoppock's measure results in coefficients of the variables different from zero.

Hypothesis 3: Principal component analysis shows Hoppock's measure displays high factor loadings on the five factors corresponding to the JDI dimensions.

Other hypotheses of interest to the study are:

Hypothesis 4: The four questions of Hoppock's measure each display high factor loadings on one factor called the overall measure of satisfaction.

Hypothesis 5: Principal component analysis shows each JDI dimension displays high factor loadings on one of five derived components.

#### Assumptions and Definitions

Hoppock's measure and the JDI measure are valid devices for the indexing of job satisfaction.

Each respondent to the survey will answer the questions in terms of his own perceptions in a truthful manner.

The individuals surveyed represent an unbiased sample of the population surveyed.

The population is representative of Strategic Air Command Strategic Missile Wing personnel.

Job satisfactions are feelings or affective responses to facets of the situation. Those feelings are associated with the perceived

difference between what is experienced, in relation to the alternatives available in a given situation (Ref 18:6).

Job satisfaction measure is a device designed to quantify the satisfaction or dissatisfaction related to the job of the individual.

### Background

A look at some of the general results of satisfaction is warranted. Work is an important element in job satisfaction. The painter who would rather paint than quit after a long day of work outside has a liking for the work he does. The taxi driver who rides a bus home from work may be showing his frustration with his work. There is little doubt that variety in the job creates satisfaction. Several researchers believe that pay and job security are the most important aspects of satisfaction (Ref 17:120-122): Many other studies have shown that, while important, these aspects more effect a worker being dissatisfied than on a worker being overly satisfied (Ref 11:82). General satisfaction with supervision tends to obscure the role of the supervisor. The worker thinks of his supervisor as the source of all that is good or bad. Dissatisfied workers are extremely likely to blame their immediate supervisor for things that are really the blame of the company (Ref 17:123-125). Job satisfaction improvement can result by changes that are usually under the control of management. There are, however, many aspects that are inherent in specific jobs that cannot be changed, for example: danger, travel requirements, late shifts, and extreme heat. Effecting change is a reason for measuring job satisfaction. The satisfaction measure must provide insight into the areas of the job that require change to make the effort worthwhile.

Satisfaction measures are either direct or indirect measurement devices. The Requisite Task Attribute Index (RTA) is a measure of how workers feel about six aspects of their jobs. The RTA is not a direct measure of satisfaction. Subject segregation and factor analysis are used to determine the underlying distributions of satisfaction (Ref 20:43, 49-68). Two of the simplest direct measures are the Job in General (JIG) Direct "Faces" scale and the Graphics scales. The respondent answers questions by choosing one of seven faces that artistically describes how he feels about various aspects of his job. These two simple methods have given valid measure of satisfaction and are commonly used in the validation of new job description measures (Ref 18:49-57). These methods were used in the development of the JDI.

Smith, et al. state that usually satisfaction measures have merely been assumed to be valid, on the basis that their content "obviously" taps satisfaction. In addition it is casually assumed that such a satisfaction measure is comparable to others, and that the necessity of demonstrating this comparability empirically is neglected. Validation of the JDI is based on correlation analysis and principal component analysis of the JDI items with the JIG and Graphics methods. The JDI initially had 148 items, which, after several years of study were reduced to the final 72 items (Ref 18:5, 41, 44-53).

They believe that multiple measures should be used in psychological studies. A researcher must be able to understand in advance the factors that influence a given measure or he can confound his results by making conclusions on a single measure when multiple measurement would have added clarity. In addition, the measure is able to separate the priorities of the individual and determine where he places his importance to the job (Ref 18:8).

In contrast to Smith, et al., Robert Hoppock developed two measures of job satisfaction during the early 1930's. Blank No. 1 was a measure of various aspects of the job situation. It had 98 scored items. Blank No. 5 used for this study was developed as an alternate means of measuring satisfaction by means of four questions. Through the comparison of both measures, Hoppock determined that the main difficulty with item measures is the scoring method. The reliability of both measures was determined to be nearly equal in empirical studies. He assumed that satisfaction may be a function of many variables but that the variables from individual to individual differed (Ref 12:273-274).

It is assumed that the JDI and Hoppock measures both result in valid measurement of job satisfaction. The usefulness of each to future studies of satisfaction in the Air Force is a question this study attempts to answer. By means of a sample of Air Force members and an analytic study of this sample, insight into the validity of these two measures will be gained.

## II METHODOLOGY

The methodology of this study is presented in four sections. The first two sections deal with the sample population and the sample, respectively. The third section describes the questionnaire. The analytical methods are discussed in the final section.

### The Sample Population

The data used for testing the hypotheses of the study were obtained by a sample of the Air Force members of the 341st Strategic Missile Wing (SMW), Malmstrom Air Force Base, Montana. The 341st SMW was chosen as representative of the six Minuteman missile wings in the Strategic Air Command (SAC). The 341st SMW was selected as the Outstanding Missile Wing of 1975 and, in April 1976, the SAC Missile Competition was won by select members of the 341st. All evaluations and inspections met with successful results during 1975 and 1976. The physical plant at Malmstrom changed considerably during this time period. All base housing was painted, new facilities for the Missile Maintenance squadrons were built, several new barracks were constructed, the base gymnasium was substantially expanded, and buildings for use of Boeing Corporation employees were built. In addition, major weapon system modifications took place and modifications planned for the next two years add to the activity at Malmstrom. The replacement of the single warhead F-missile by the new G-missile and the conversion of equipment in the Launch Control Centers are of major significance.

Several areas of job performance are of interest to this study. These are:



Minuteman Missile Operations  
Minuteman Missile Maintenance  
Security Police  
Administration  
Personnel Specialists  
Accounting and Finance  
Missile Feeding  
Base and Missile Transportation

The 341st SMW has manpower requirements of approximately 660 personnel in operations (Ref 1), 400 personnel in Missile Maintenance (Ref 19), and 700 personnel in Security Police (Ref 16). Approximately 350 military members are categorized into the other career fields in supporting roles (Ref 21).

Missile Combat Crew members make up 60 percent of the Operations personnel. These officers are usually lieutenants or captains who work at Launch Control Facilities at remote locations on the plains of Montana. The remaining portion of Operations personnel are assigned to support jobs in wing level staff and training positions. Crew members who complete four years of duty either leave the career field or progress to an on-base staff job.

Missile Maintenance Squadron personnel repair and replace missile components at the Launch Facilities, located as far as 180 miles from the base, and perform various shop maintenance activities on base. The work is very repetitious and requires much travel over Montana's dirt roads. Maintenance teams spend much time on stand-by alert with trips to the missile complex lasting up to 30 hours and more.

Security Police personnel function in three different roles. The Law Enforcement contingent is composed of approximately 220 personnel who work primarily on base. The Missile Security section is assigned the responsibility of guarding the Launch Control Facilities in support of the Missile Combat Crews. They also must respond to Launch Facilities in the event of unauthorized intruders on these remotely located missile sites. These personnel spend four-day shifts at the Launch Control Facilities and perform very boring and repetitious work. The missile Support section provides personnel as escorts for maintenance teams going to Launch Facilities. These personnel perform duties that are extremely boring, are performed at very irregular hours, and are not appreciated. These escorts are usually airmen and airmen first class.

The personnel in the other areas of concern work mainly on the base in support roles. They generally work on regular work schedules as contrasted to those already discussed. Many of these personnel provide support for tenant units in addition to the 341st SMW.

#### The Sample

The data for this research was of necessity gathered in two phases. Initially, 1000 questionnaires were mailed to Capt Michael Knorre at Malmstrom. Capt Knorre had been designated by Col William Brooksher, 341st SMW Commander, as the local representative for the study (Appendix A). Capt Knorre distributed questionnaires to each of 370 Missile Combat Crew members. He gave 300 questionnaires to each of two officers, one a field supervisor in Missile Maintenance; the second, a shift commander in Law Enforcement. The former individual

was unaware of the need for survey distribution and ultimately placed the questionnaires in a box in his home. The latter distributed the questionnaires to each of 220 personnel in Law Enforcement. Approximately 30 of these were promptly returned to Capt Knorre; 80 completed questionnaires were placed in a file cabinet. As of 15 September 1976, 142 questionnaires had been returned to the researcher.

To obtain meaningful study results, it was determined that the researcher must personally distribute and collect questionnaires and determine the cause of the extremely low return rate. Upon arrival at Malmstrom Air Force Base, the researcher discovered the facts previously discussed. It was also determined that a minimum of 60 completed questionnaires had been lost by the Strategic Missile squadrons. The 80 questionnaires were recovered from the file cabinet and 380 additional questionnaires were collected during the time spent at Malmstrom. An additional 405 questionnaires were left with two officers for distribution to members of the 341st Combat Support Group and the 341st Missile Security Police Squadron. Of these, 140 were returned to the researcher prior to 25 October 1976.

As total of 702 questionnaires were returned. Questionnaires were considered useable only if properly filled out. The sample size used for analytical purposes was therefore reduced to 628. Table I summarizes the questionnaire responses. An exact response rate is impossible to determine due to lost questionnaires and inexact control of questionnaire distribution. The researcher estimates the response rate as approximately 50 percent for the survey. It is believed that the questionnaires returned adequately represent the sample population and provide data satisfactory to compare the two job satisfaction measures.

Table I  
Questionnaire Response

| PERSONNEL           | NUMBER<br>DISTRIBUTED | NUMBER COLLECTED<br>AND USEABLE |
|---------------------|-----------------------|---------------------------------|
| OPERATIONS:         |                       |                                 |
| Missile Combat Crew | 370                   | 120                             |
| Other               | 110                   | 66                              |
| SECURITY POLICE:    |                       |                                 |
| Law Enforcement     | 220                   | 110                             |
| Missile Security    | 250                   | 105                             |
| MISSILE MAINTENANCE | 250                   | 118                             |
| OTHER PERSONNEL     | <u>260</u>            | <u>109</u>                      |
| TOTALS              | 1,460                 | 628                             |

Returned but not useable: 74.

Completed by Missile Combat Crew members and assumed lost in base distribution: minimum of 60.

### The Questionnaire

The empirical data was collected by means of an Air Force approved questionnaire (Appendix C). The questionnaire consisted of three parts which gathered demographic data, responses to the JDI measure, and responses to Hoppock's four questions.

#### Demographic Data

Demographic data was needed to categorize the respondent into applicable subpopulations. The questions provided data about:

Rank

Sex

Age

Total Years in Air Force

Type of Duties:  
Operations  
Maintenance  
Security Police  
Other

Location of Job Accomplishment:  
Mainly on base  
Mainly in the missile complex  
On base and in the missile complex

### Job Descriptive Index

The second part of the questionnaire was the Job Descriptive Index (JDI) developed by Smith, et al. The JDI is claimed to measure the satisfaction/dissatisfaction of the individual in relation to each of five dimensions of the job:

Work

Pay

Promotions

Supervision

Coworkers

The JDI consists of 72 items which describe the dimensions of the job. The respondent is instructed to place a "Y" next to each item as related to his job situation. He places an "N" by the item if it does not describe his feelings. If unable to decide, he is instructed to place a "?" signifying his indecision (Ref 18:69, 83). If he felt his supervisor was "hard to please," he would answer with a "Y" response next to the item. The score for each of the dimensions of the job is determined by using the weighting system of Smith, et al. as shown in Table II. The scoring design is based on the conclusion that a "?" response is more indicative of dissatisfaction than of satisfaction (Ref 18:79).

Table II  
Direct Scoring of the JDI

| RESPONSE           | SCORE |
|--------------------|-------|
| Y to positive item | 3     |
| N to negative item | 3     |
| ? to any item      | 1     |
| Y to negative item | 0     |
| N to positive item | 0     |

(from Ref 18:79)

The items of the JDI are both positively and negatively worded. The two directional wording causes the respondents to consider each item individually and therefore answer more truthfully than they would if all items were phrased positively. A study of mean scores by Smith, et al. indicates that average workers are more satisfied with certain areas and much less so with others. Data reflects actual differences in attitudes which cannot be discounted as artifacts of the nature of the scales used (Ref 18:82). Tables III and IV display the final composition of the JDI and the expected scores for the five dimensions. Equated neutral points are empirically derived scores indicating indifference by the respondent to the aspect of concern (Ref 18:81). The final version of the JDI, including the associated favorable responses, is shown in Table V.

Table III

Number of Positive and Negative  
Items in the JDI Dimension

| DIMENSION   | NUMBER OF<br>POSITIVE ITEMS | NUMBER OF<br>NEGATIVE ITEMS | TOTAL<br>ITEMS |
|-------------|-----------------------------|-----------------------------|----------------|
| Work        | 10                          | 8                           | 18             |
| Pay         | 4                           | 5                           | 9              |
| Promotions  | 5                           | 4                           | 9              |
| Supervision | 10                          | 8                           | 18             |
| Coworkers   | <u>8</u>                    | <u>10</u>                   | <u>18</u>      |
| Totals      | 37                          | 35                          | 72             |

(from Ref 18:73)

Table IV

Expected Scores of the JDI  
Dimensions under Various Assumptions

| DIMENSION   | EXPECTED SCORE UNDER ASSUMPTIONS OF: |              |            |            |                          |
|-------------|--------------------------------------|--------------|------------|------------|--------------------------|
|             | Maximum<br>Score                     | Indifference | A11<br>"Y" | A11<br>"N" | Equated<br>Neutral Point |
| Work        | 54                                   | 18           | 30         | 24         | 26                       |
| Pay         | 27                                   | 9            | 12         | 15         | 11                       |
| Promotions  | 27                                   | 9            | 15         | 12         | 10                       |
| Supervision | 54                                   | 18           | 30         | 24         | 33                       |
| Coworkers   | 54                                   | 18           | 24         | 30         | 32                       |

(from Ref 18:80)

Table V

The Job Descriptive Index

| <u>WORK</u> |                               | <u>PAY</u> |                                     |
|-------------|-------------------------------|------------|-------------------------------------|
| <u>Y</u>    | Fascinating                   |            | Income adequate for normal expenses |
| <u>N</u>    | Routine                       | <u>Y</u>   | Satisfactory fringe benefits        |
| <u>Y</u>    | Satisfying                    | <u>N</u>   | Barely live on income               |
| <u>N</u>    | Boring                        | <u>N</u>   | Bad                                 |
| <u>Y</u>    | Good                          | <u>Y</u>   | Income provides luxuries            |
| <u>Y</u>    | Creative                      | <u>N</u>   | Insecure                            |
| <u>Y</u>    | Respected                     | <u>N</u>   | Less than I deserve                 |
| <u>N</u>    | Hot                           | <u>Y</u>   | Highly paid                         |
| <u>Y</u>    | Pleasant                      | <u>N</u>   | Underpaid                           |
| <u>Y</u>    | Useful                        |            |                                     |
| <u>N</u>    | Tiresome                      |            | <u>PROMOTIONS</u>                   |
| <u>Y</u>    | Healthful                     |            | Good opportunity for advancement    |
| <u>Y</u>    | Challenging                   | <u>Y</u>   | Opportunity somewhat limited        |
| <u>N</u>    | On your feet                  | <u>N</u>   | Promotion on ability                |
| <u>N</u>    | Frustrating                   | <u>Y</u>   | Dead-end job                        |
| <u>N</u>    | Simple                        | <u>N</u>   | Good chance for promotion           |
| <u>N</u>    | Endless                       | <u>Y</u>   | Unfair promotion policy             |
| <u>Y</u>    | Gives sense of accomplishment | <u>N</u>   | Infrequent promotions               |
|             |                               | <u>Y</u>   | Regular promotions                  |
|             | <u>SUPERVISION</u>            | <u>Y</u>   | Fairly good chance for promotion    |
| <u>Y</u>    | Asks my advice                |            |                                     |
| <u>N</u>    | Hard to please                |            | <u>CO-WORKERS</u>                   |
| <u>N</u>    | Impolite                      | <u>Y</u>   | Stimulating                         |
| <u>Y</u>    | Praises good work             | <u>N</u>   | Boring                              |
| <u>Y</u>    | Tactful                       | <u>N</u>   | Slow                                |
| <u>Y</u>    | Influential                   | <u>Y</u>   | Ambitious                           |
| <u>Y</u>    | Up-to-date                    | <u>N</u>   | Stupid                              |
| <u>N</u>    | Doesn't supervise enough      | <u>Y</u>   | Responsible                         |
| <u>N</u>    | Quick tempered                | <u>Y</u>   | Fast                                |
| <u>Y</u>    | Tells me where I stand        | <u>Y</u>   | Intelligent                         |
| <u>N</u>    | Annoying                      | <u>N</u>   | Easy to make enemies                |
| <u>N</u>    | Stubborn                      | <u>N</u>   | Talk too much                       |
| <u>Y</u>    | Knows job well                | <u>Y</u>   | Smart                               |
| <u>N</u>    | Bad                           | <u>N</u>   | Lazy                                |
| <u>Y</u>    | Intelligent                   | <u>N</u>   | Unpleasant                          |
| <u>Y</u>    | Leaves me on my own           | <u>N</u>   | No privacy                          |
| <u>N</u>    | Lazy                          | <u>Y</u>   | Active                              |
| <u>Y</u>    | Around when needed            | <u>N</u>   | Narrow interests                    |
|             |                               | <u>Y</u>   | Loyal                               |
|             |                               | <u>N</u>   | Hard to meet                        |

(from Ref 18:83)



### Hoppock Measure of Satisfaction

The final portion of the questionnaire was the four-question Hoppock measure of job satisfaction. The questions address four impressions of the individual towards his job:

How well he likes his job

How much of the time he is satisfied with his job

How willing he would be to change his job

How he thinks his feelings about his job compare with the feelings of other people about their jobs

Unlike the JDI which used items regarding the different aspects of the job, Hoppock's measure was the second of the two direct approaches to satisfaction measurement. The approach of measuring job satisfaction as a whole bases its assumption that the individual will summarize his feelings with appropriate weights and that these weights more accurately relay the feelings of the individual than assigned weights of measures such as the JDI (Ref 12:271-273).

The score for the Hoppock measure is the sum of the responses to each of the four questions. Total range is from 4 to 28. Lower scores indicate dissatisfaction and high scores indicate overall satisfaction. The questions, answers, and values are as indicated in Table VI.

Table VI

The Hoppock Measure

Choose the ONE of the following statements which best tells how well you like your job. Place a check mark in front of that statement:

- 1 I hate it
- 2 I dislike it
- 3 I don't like it
- 4 I am indifferent to it
- 5 I like it
- 6 I am enthusiastic about it
- 7 I love it

Check one of the following to show HOW MUCH OF THE TIME you feel satisfied with your job:

- 7 All of the time
- 6 Most of the time
- 5 A good deal of the time
- 4 About half of the time
- 3 Occasionally
- 2 Seldom
- 1 Never

Check the ONE of the following which best tells how you feel about changing your job:

- 1 I would quit this job at one if I could get anything else to do.
- 2 I would take almost any other job in which I could earn as much as I am earning now.
- 3 I would like to change both my job and my occupation.
- 4 I would like to exchange my present job for another job in the same line of work.
- 5 I am not eager to change my job, but I would do so if I could get a better job.
- 6 I cannot think of any jobs for which I would exchange mine.
- 7 I would not exchange my job for any other.

Check one of the following to show how you think you compare with other people:

- 7 No one likes his job better than I like mine.
- 6 I like my job much better than most people like theirs.
- 5 I like my job better than most people like theirs.
- 4 I like my job about as well as most people like theirs.
- 3 I dislike my job more than most people dislike theirs.
- 2 I dislike my job much more than most people dislike theirs.
- 1 No one dislikes his job more than I dislike mine.

(from Ref 12:242)

## Analytic Methods

The analysis of data required complex mathematical manipulations. The Statistical Package for the Social Sciences (SPSS) computer package, available on the CDC-6600 computer system at Wright-Patterson Air Force Base, was used to accomplish the analytical procedures needed to test the hypotheses of the study. Three methods were used to determine the relationships that exist between the two measures. They were:

Correlation Analysis

Least Squares Regression Analysis

Principal Component Analysis

### Correlation Analysis

In correlation analysis two measures are made on each data point in the sample. This compares with the regression method, where the sample is chosen with preassigned values of the independent variables. Pearson correlation analysis used in this study is based on the assumption that the distribution of the variables is bi-variate normal (Ref 3:202). Testing for independence is equivalent to testing that the correlation coefficient,  $\rho$ , is equal to zero. The maximum likelihood estimation of  $\rho$  is given by the sample correlation coefficient

$$r = \frac{\sum (X_i - \bar{X})(Y_i - \bar{Y})}{\sqrt{\sum (X_i - \bar{X})^2 \sum (Y_i - \bar{Y})^2}}$$

where  $(X_i, Y_i)$  denotes a random sample (Ref 14:421). Significance tests reported for each coefficient are derived by the SPSS computer

package using the student's t test with  $N-2$  degrees of freedom for the computer value

$$t = r \left[ \frac{N-2}{1-r^2} \right]^{1/2}$$

where  $N$  represents the size of the sample (Ref 15:281).

### Regression Analysis

Linear regression is an alternate method of analyzing the JDI and Hoppock scores. The linear statistical model relating the response,  $Y$ , to the independent variables,  $X_1, X_2, \dots, X_K$ , is of the form

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_K X_K + \epsilon$$

where  $\beta_0, \beta_1, \dots, \beta_K$  are unknown parameters,  $\epsilon$  is a random variable, and  $X_1, X_2, \dots, X_K$  are recorded without error. Assuming  $E(\epsilon) = 0$ ,

$$E(Y) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_K X_K \quad (\text{Ref 14:378}).$$

For this research the response variable is the Hoppock score and the independent variables are the scores of the five JDI dimensions.

Forward stepwise inclusion was chosen as the regression strategy for use in this study. In this method, variables are entered in single steps from best to worst. The variable that explains the greatest amount of variance in the dependent variable will enter first; the variable that explains the greatest amount of variance in conjunction with the first will enter second, and so forth (Ref 15:345). For example, if  $Y$ ,  $X_1$ , and  $X_2$  are the variables of concern, the regression

method first determines the linear model using the independent variable explaining the most variance of  $Y$ . Suppose that after the first step the model is

$$Y = \hat{\beta}_0 + \hat{\beta}_2 X_2 .$$

The procedure then determines whether  $X_1$  explains a statistically significant amount of variance. An F statistic is calculated to determine if the second independent variable will be entered into the regression equation. The regression equation becomes

$$Y = \hat{\beta}'_0 + \hat{\beta}'_1 X_1 + \hat{\beta}'_2 X_2$$

if the second step is accomplished, otherwise the regression stops after the first step.

#### Principal Component Analysis

Principal component analysis is the third analytic method used to study the Hoppock and JDI measures of satisfaction. This method has a complex mathematical basis. The analysis method shows a pattern of relationships that exist between variables and components that will allow conclusions to be made by the researcher. The factor pattern to be determined is represented by

$$Z_j = a_{j1} F_1 + a_{j2} F_2 + \dots + a_{jn} F_n$$

where  $Z_j$  is a variate,  $F_i$  are the common factors, and  $a_{ji}$  are regression weights (Ref 7:155). The derivation of the procedure is beyond the scope of this study. Interested readers are referred to Modern Factor Analysis by Harman (Ref 7) for the derivation. It should

be noted that in the procedure the eigenvalues of the correlation are calculated to determine the significance of the components.

Results of the procedure are weights or loadings for the components onto the variables. For example, a study of  $N$  variables will result in a principal component matrix,  $W$ , where the rows correspond to the initial variables and the columns correspond to the components. Once the eigenvalues and the  $W$  matrix are found, component and variable scores can be calculated if desired

$$X_i = \sum_j w_{ij} z_j$$

$$z_j = \left[ \sum_i w_{ij} X_i \right] / \lambda_j$$

where  $\lambda_j$ , the  $j$  th eigenvalue (Ref 13:51).

The intent of principal component procedures is to reduce the number of factors needed to explain the variable. The method used herein is to consider only those components which are associated with eigenvalues valued at 1.0 or more. After reduction in the number of factors, interpretation of the factors and conclusions about variable relationships can be made.

Interpretation of the principal components is difficult when two or more factors have eigenvalues of 1.0 or more. To simplify the interpretation dilemma, rotation of axes methods were developed. For example, if the initial factor matrix was

| <u>Variable</u> | <u>Factor 1</u> | <u>Factor 2</u> |
|-----------------|-----------------|-----------------|
| 1               | .78             | -.35            |
| 2               | .68             | -.20            |
| 3               | .69             | .22             |
| 4               | .76             | -.28            |
| 5               | .35             | .48             |
| 6               | .42             | .72             |

where only two factors explained the values of the six variables, conclusions were hard to make. Interpretation of the principal components is difficult under these conditions since negative factor loadings are present. By use of the Varimax rotation method, which centers on the simplification of the columns of the matrix, results can be more easily interpreted (Ref 15:485).

| <u>Variable</u> | <u>Factor 1'</u> | <u>Factor 2'</u> |
|-----------------|------------------|------------------|
| 1               | .86              | .05              |
| 2               | .70              | .14              |
| 3               | .51              | .51              |
| 4               | .80              | .10              |
| 5               | .09              | .59              |
| 6               | .03              | .83              |

The rotated matrix allows the analyst to easily determine which variables have high loadings on common factors. Those variables having high loadings on the same factor are highly related to each other, and depending on the type of variables studies, allow certain conclusions to be made.

The researcher will be able to determine the statistical relationships that exist between the two measure of job satisfaction by consideration of the results of the three analytical methods. Each of the methods used is expected to provide information that will complement the information displayed by the alternate methods. Contrasting results will be presented should such contrasts exist between the results of the three techniques.

### III RESULTS

The results of the analysis of the empirical data are presented in six sections. The first section deals with the subpopulations and the mean scores of the samples. Section two studies the results of the correlation analysis between the Hoppock score and the scores of each of the JDI dimensions. The third section analysis is from the least squares regression. The fourth section discusses the results obtained by principal component analysis. The final two sections deal with studies of Hoppock's measure and the JDI, respectively.

#### Subpopulations and Mean Scores

The 628 respondents were categorized into 14 subpopulations which were based on the demographic section of the questionnaire. A detailed breakdown of the subpopulations is in Appendix D. Designations of the groups which are used throughout the study and the respective subpopulation sizes are listed in Table VII.

The mean scores for the Hoppock measure and the JDI dimensions, as listed in Table VIII, indicated that younger personnel are less satisfied than their seniors, those who work mainly in the missile complex are less satisfied than personnel working on base, and that the Security Police career field does not provide much job satisfaction.



Table VII  
Subpopulations of Analysis

| DESCRIPTION   | NAME     | SIZE |
|---|----------|------|
| Entire sample   | A11      | 628  |
| Officers only   | Officers | 166  |
| Enlisted personnel only                               | Enlisted | 462  |
| Personnel 24 years old and younger                    | LE24     | 349  |
| Personnel 25 years old and older                      | GE25     | 279  |
| 4 years or less active service                        | LE4      | 381  |
| 5 years or more active service                        | GE5      | 247  |
| Personnel assigned to Operations                      | Ops      | 186  |
| Personnel assigned to Maintenance                     | Mx       | 118  |
| Personnel assigned to Security Police                 | SP       | 215  |
| Personnel in other duties                             | Other    | 109  |
| Personnel who work mainly on base                     | Base     | 296  |
| Personnel who work mainly in the missile complex      | Complex  | 227  |
| Personnel who work on base and in the missile complex | Both     | 105  |

Table VIII

Mean Scores

|          | Hoppock | Work | Pay  | Promo | Super | Co   |
|----------|---------|------|------|-------|-------|------|
| All      | 15.87   | 21.2 | 11.1 | 9.7   | 39.6  | 38.3 |
| Officers | 15.90   | 22.3 | 16.8 | 11.0  | 40.5  | 42.4 |
| Enlisted | 15.86   | 20.8 | 9.0  | 9.3   | 39.2  | 36.9 |
| LE24     | 15.38   | 18.6 | 9.1  | 9.0   | 38.9  | 36.0 |
| GE25     | 16.48   | 24.5 | 13.5 | 10.7  | 40.4  | 41.3 |
| LE4      | 15.44   | 18.8 | 9.6  | 9.4   | 39.2  | 36.3 |
| GE5      | 16.53   | 24.9 | 13.4 | 10.3  | 40.2  | 41.4 |
| Ops      | 15.88   | 22.7 | 15.6 | 11.3  | 40.8  | 42.0 |
| Mx       | 16.64   | 23.4 | 8.6  | 8.7   | 39.3  | 37.8 |
| SP       | 14.66   | 15.1 | 9.0  | 8.6   | 38.0  | 34.2 |
| Other    | 17.41   | 28.3 | 10.2 | 10.4  | 41.0  | 40.9 |
| Base     | 16.52   | 23.8 | 10.4 | 9.7   | 40.1  | 39.0 |
| Complex  | 14.53   | 16.5 | 11.4 | 9.3   | 37.3  | 36.9 |
| Both     | 16.92   | 23.9 | 12.6 | 11.0  | 40.7  | 39.7 |

### Correlation Analysis

The first hypothesis to be tested was:

Hoppock's measure displays significant correlation with each of the dimensions measured by the JDI.

The Pearson correlation coefficients listed in Table IX indicate that the Hoppock score is highly related to the Work dimension score. The coefficients with the Supervision, Promotions, and Coworkers dimensions were moderately high while the Pay dimension did not display high correlation with the Hoppock score. The latter coefficient was statistically greater than zero for three of the subpopulations, for the rest it was not. These results prompted further investigation into the relationship between the two measures of satisfaction.

Table IX  
Correlation Coefficients: Hoppock  
with each JDI Dimension

|          | Work | Pay    | Promo | Super | Co    |
|----------|------|--------|-------|-------|-------|
| All      | .732 | .158   | .395  | .457  | .336  |
| Officers | .816 | .058** | .462  | .488  | .254  |
| Enlisted | .706 | .209   | .373  | .448  | .367  |
| LE24     | .683 | .142*  | .366  | .445  | .309  |
| GE25     | .786 | .122*  | .412  | .471  | .346  |
| LE4      | .707 | .140*  | .405  | .468  | .303  |
| GE5      | .769 | .133*  | .374  | .437  | .362  |
| Ops      | .800 | .101** | .483  | .498  | .250  |
| Mx       | .741 | .253*  | .417  | .451  | .281  |
| SP       | .627 | .108** | .333  | .403  | .314  |
| Other    | .757 | .272*  | .342  | .488  | .460  |
| Base     | .769 | .254   | .378  | .437  | .419  |
| Complex  | .607 | .068** | .418  | .419  | .155* |
| Both     | .759 | .093** | .399  | .543  | .371  |

Significance level: .01 or less.  
\* Not significant at .01.  
\*\* Not significant at .05.

### Linear Regression Analysis

The analysis tested by linear regression was:

The Least Squares regression of the five JDI dimensions onto Hoppock's measure results in coefficients of the variables significantly different from zero.

The significance level for this analysis was .01. The pertinent results for analysis are the variables entered into the regression equation on each step of the procedure and the values of the coefficient of determination,  $R^2$ , after each step. These results are listed for each subpopulation in Table X.

From the results of the regressions, it can be stated that the JDI dimensions of Work and Supervision are the major contributors to the information obtained from the Hoppock measure. The importance of the Pay, Promotions, and Coworkers dimensions to the prediction of the Hoppock score is negligible in ten of the fourteen subpopulations.

Table X  
 Results of Regression Analysis  
 of JDI Dimension Scores onto the  
 Hoppock Score

|          | STEP | VARIABLE | R <sup>2</sup> |
|----------|------|----------|----------------|
| All      | 1.   | Work     | .537           |
|          | 2.   | Super    | .573           |
| Officers | 1.   | Work     | .665           |
|          | 2.   | Super    | .689           |
| Enlisted | 1.   | Work     | .499           |
|          | 2.   | Super    | .540           |
| LE24     | 1.   | Work     | .466           |
|          | 2.   | Super    | .513           |
| GE25     | 1.   | Work     | .618           |
|          | 2.   | Super    | .642           |
| LE4      | 1.   | Work     | .500           |
|          | 2.   | Super    | .545           |
| GE5      | 1.   | Work     | .591           |
|          | 2.   | Super    | .615           |
| Ops      | 1.   | Work     | .640           |
|          | 2.   | Super    | .661           |
| Mx       | 1.   | Work     | .549           |
|          | 2.   | Promo    | .567           |
| SP       | 1.   | Work     | .393           |
|          | 2.   | Super    | .449           |
|          | 3.   | Co       | .463           |
| Other    | 1.   | Work     | .572           |
|          | 2.   | Super    | .623           |
| Base     | 1.   | Work     | .592           |
|          | 2.   | Super    | .618           |
| Complex  | 1.   | Work     | .368           |
|          | 2.   | Super    | .429           |
|          | 3.   | Promo    | .448           |
| Both     | 1.   | Work     | .576           |
|          | 2.   | Super    | .617           |
|          | 3.   | Pay      | .640           |

### Principal Component Analysis

The third hypothesis to be studied was:

Principal component analysis shows that Hoppock's measure displays high factor loadings on five factors corresponding to the JDI dimensions.

This technique indicates the importance of the variables on the factors that contribute most to accounting for total variance. Results discussed are based on the number of significant factors. Table XI is the factor matrix for the entire sample with associated data.

Table XI

#### Principal Component Analysis of Subpopulation All

| VARIABLE | FACTOR LOADINGS | VARIABLE COMMUNALITIES | EIGENVALUES OF FACTORS | PERCENTAGE OF VARIANCE |
|----------|-----------------|------------------------|------------------------|------------------------|
| Hoppock  | .807            | .652                   | 2.80                   | 46.6                   |
| Work     | .824            | .679                   | .95                    | 15.9                   |
| Pay      | .445            | .198                   | .81                    | 13.5                   |
| Promo    | .658            | .433                   | .66                    | 11.0                   |
| Super    | .679            | .462                   | .53                    | 8.9                    |
| Co       | .611            | .373                   | .25                    | 4.2                    |

For these results the factor will be called Satisfaction with Work since the Hoppock and Work scores have high loadings. The relatively low loading on the Pay dimension indicates that pay is not as highly related to the factor as are the other variables. The values of the variable communalities indicates the small percentage of variance of the Pay dimension that is explained by the single factor. These facts

indicate that a separate measure of satisfaction with pay could well be used in conjunction with Hoppock's measure. The use of these two scores may well be as representative of the aspects of satisfaction as the use of the entire JDI. Results of six other subpopulations show only one factor of significance. These results, in Table XII, coincide with the results of the entire sample. The necessity for additional consideration of the Pay dimension was verified by the low loadings obtained in these analyses.

Table XII

Principal Component Analysis of  
JDI Dimensions and Hoppock  
with One Significant Factor

|          | VARIABLE | FACTOR<br>LOADINGS | VARIABLE<br>COMMUNALITIES | EIGENVALUES<br>OF FACTORS | PERCENTAGE<br>OF VARIANCE |
|----------|----------|--------------------|---------------------------|---------------------------|---------------------------|
| Enlisted | Hoppock  | .805               | .649                      | 2.79                      | 46.6                      |
|          | Work     | .812               | .660                      | .97                       | 16.1                      |
|          | Pay      | .476               | .227                      | .77                       | 12.8                      |
|          | Promo    | .635               | .404                      | .64                       | 10.7                      |
|          | Super    | .681               | .464                      | .55                       | 9.2                       |
|          | Co       | .625               | .391                      | .28                       | 4.5                       |
| LE24     | Hoppock  | .796               | .633                      | 2.66                      | 44.3                      |
|          | Work     | .787               | .619                      | .98                       | 16.3                      |
|          | Pay      | .424               | .180                      | .90                       | 15.0                      |
|          | Promo    | .647               | .418                      | .63                       | 10.5                      |
|          | Super    | .691               | .477                      | .53                       | 8.9                       |
|          | Co       | .573               | .329                      | .30                       | 5.0                       |
| LE4      | Hoppock  | .808               | .653                      | 2.73                      | 45.5                      |
|          | Work     | .801               | .642                      | .99                       | 16.5                      |
|          | Pay      | .400               | .160                      | .88                       | 14.8                      |
|          | Promo    | .677               | .459                      | .60                       | 10.0                      |
|          | Super    | .702               | .494                      | .52                       | 8.6                       |
|          | Co       | .567               | .321                      | .28                       | 4.7                       |
| SP       | Hoppock  | .795               | .632                      | 2.45                      | 40.9                      |
|          | Work     | .765               | .585                      | .99                       | 16.4                      |
|          | Pay      | .384               | .147                      | .92                       | 15.4                      |
|          | Promo    | .619               | .384                      | .66                       | 11.1                      |
|          | Super    | .650               | .422                      | .63                       | 10.5                      |
|          | Co       | .533               | .284                      | .34                       | 5.7                       |
| Other    | Hoppock  | .840               | .706                      | 2.92                      | 48.6                      |
|          | Work     | .830               | .689                      | .95                       | 15.9                      |
|          | Pay      | .472               | .223                      | .74                       | 12.3                      |
|          | Promo    | .618               | .382                      | .61                       | 10.2                      |
|          | Super    | .676               | .457                      | .57                       | 9.4                       |
|          | Co       | .679               | .461                      | .22                       | 3.6                       |
| Base     | Hoppock  | .825               | .681                      | 2.91                      | 48.6                      |
|          | Work     | .850               | .722                      | .87                       | 14.6                      |
|          | Pay      | .517               | .267                      | .75                       | 12.4                      |
|          | Promo    | .641               | .411                      | .70                       | 11.6                      |
|          | Super    | .638               | .407                      | .55                       | 9.2                       |
|          | Co       | .652               | .425                      | .22                       | 3.6                       |



Seven subpopulations showed two factors to be significant to the analysis. The varimax rotated factor matrix and the eigenvalues and communalities for the subpopulation of officers is examined in Table XIII.

Table XIII  
Principal Component Analysis  
of Subpopulation Officers

| VARIABLE                  | FACTOR 1<br>LOADINGS | FACTOR 2<br>LOADINGS      | VARIABLE<br>COMMUNALITIES |
|---------------------------|----------------------|---------------------------|---------------------------|
| Hoppock                   | .888                 | -.039                     | .789                      |
| Work                      | .870                 | .114                      | .771                      |
| Pay                       | .044                 | .965                      | .934                      |
| Promo                     | .647                 | .351                      | .542                      |
| Super                     | .713                 | -.052                     | .511                      |
| Co                        | .450                 | .180                      | .235                      |
| EIGENVALUES<br>OF FACTORS |                      | PERCENTAGE<br>OF VARIANCE |                           |
| 2.76                      |                      | 46.0                      |                           |
| 1.02                      |                      | 17.0                      |                           |
| .85                       |                      | 14.2                      |                           |
| .66                       |                      | 10.9                      |                           |
| .54                       |                      | 9.0                       |                           |
| .17                       |                      | 2.8                       |                           |

For these results, Factor 1 is called Satisfaction in General and Factor 2 is called Satisfaction with Pay. The loadings are extremely different between the two factors. Of note is the value of the communality on the Pay dimension. This indicates the importance of the second factor to this variable. The second factor is associated with the eigenvalue, 1.02, which is only slightly below the inclusion criterion. The analysis for one or two factors shows the same results when interpreted in total. The remaining subpopulation results are in Table XIV verifying the conclusions previously discussed for the subpopulation officers.

As a result of the principal component analysis, it shall be stated that the Hoppock measure does not display high factor loadings on five factors corresponding to the JDI dimensions. Hoppock's measure and a measure of satisfaction with pay will better measure more of the aspects of job satisfaction than Hoppock's measure alone. The use of the JDI will be discussed later in this chapter.

#### Analysis of Hoppock's Measure

The hypothesis to be studied is:

Hoppock's four questions each display high factor loadings on one factor called an overall measure of job satisfaction.

Principal component analysis of the entire data set indicates only one significant factor and high loadings as in Table XV.

Table XIV

Principal Component Analysis of  
JDI Dimensions and Hoppock with  
Two Significant Factors using  
Varimax Rotation

|      | VARIABLE | FACTOR 1<br>LOADINGS | FACTOR 2<br>LOADINGS | VARIABLE<br>COMMUNALITIES | EIGENVALUES<br>OF FACTORS | PERCENTAGE<br>OF VARIANCE |
|------|----------|----------------------|----------------------|---------------------------|---------------------------|---------------------------|
| GE25 | Hoppock  | .875                 | .058                 | .769                      | 2.83                      | 47.2                      |
|      | Work     | .892                 | .086                 | .803                      | 1.01                      | 16.9                      |
|      | Pay      | .008                 | .926                 | .857                      | .78                       | 13.1                      |
|      | Promo    | .474                 | .578                 | .559                      | .64                       | 10.7                      |
|      | Super    | .640                 | .242                 | .468                      | .54                       | 9.0                       |
|      | Co       | .611                 | .127                 | .390                      | .19                       | 3.2                       |
| GE5  | Hoppock  | .881                 | .058                 | .780                      | 2.80                      | 46.6                      |
|      | Work     | .891                 | .118                 | .807                      | 1.00                      | 16.7                      |
|      | Pay      | .012                 | .906                 | .821                      | .77                       | 12.9                      |
|      | Promo    | .400                 | .617                 | .541                      | .67                       | 11.2                      |
|      | Super    | .568                 | .338                 | .437                      | .54                       | 9.1                       |
|      | Co       | .619                 | .182                 | .417                      | .21                       | 3.5                       |
| Ops  | Hoppock  | .886                 | .062                 | .789                      | 2.85                      | 47.5                      |
|      | Work     | .847                 | .238                 | .774                      | 1.02                      | 17.0                      |
|      | Pay      | -.022                | .915                 | .838                      | .81                       | 13.5                      |
|      | Promo    | .650                 | .336                 | .436                      | .61                       | 10.2                      |
|      | Super    | .740                 | .034                 | .549                      | .52                       | 8.7                       |
|      | Co       | .321                 | .528                 | .382                      | .19                       | 3.1                       |

Table XIV

Principal Component Analysis of  
JDI Dimensions and Hopcock with  
Two Significant Factors using  
Varimax Rotation  
(Continued)

|         | VARIABLE | FACTOR 1<br>LOADINGS | FACTOR 2<br>LOADINGS | VARIABLE<br>COMMUNALITIES | EIGENVALUES<br>OF FACTORS | PERCENTAGE<br>OF VARIANCE |
|---------|----------|----------------------|----------------------|---------------------------|---------------------------|---------------------------|
| Mx      | Hopcock  | .619                 | .494                 | .627                      | 2.92                      | 48.6                      |
|         | Work     | .689                 | .469                 | .694                      | 1.06                      | 17.6                      |
|         | Pay      | .041                 | .800                 | .641                      | .82                       | 13.6                      |
|         | Promo    | .191                 | .803                 | .681                      | .57                       | 9.5                       |
|         | Super    | .818                 | .122                 | .683                      | .41                       | 6.9                       |
|         | Co       | .804                 | -.015                | .647                      | .23                       | 3.8                       |
| Complex | Hopcock  | .858                 | .052                 | .740                      | 2.43                      | 40.5                      |
|         | Work     | .803                 | .103                 | .655                      | 1.04                      | 17.4                      |
|         | Pay      | .088                 | .589                 | .355                      | .98                       | 16.3                      |
|         | Promo    | .699                 | .137                 | .507                      | .68                       | 11.3                      |
|         | Super    | .505                 | .513                 | .518                      | .51                       | 8.5                       |
|         | Co       | .039                 | .833                 | .696                      | .36                       | 6.0                       |
| Both    | Hopcock  | .911                 | -.013                | .830                      | 3.11                      | 51.8                      |
|         | Work     | .843                 | .221                 | .759                      | 1.04                      | 17.3                      |
|         | Pay      | .017                 | .916                 | .839                      | .73                       | 12.2                      |
|         | Promo    | .426                 | .660                 | .617                      | .51                       | 8.4                       |
|         | Super    | .716                 | .271                 | .586                      | .42                       | 7.0                       |
|         | Co       | .574                 | .431                 | .515                      | .20                       | 3.3                       |

Table XV  
Principal Component Analysis  
of Hoppock Questions

| VARIABLE   | FACTOR LOADINGS | EIGENVALUES OF FACTORS | PERCENTAGE OF VARIANCE |
|------------|-----------------|------------------------|------------------------|
| Question 1 | .917            | 3.05                   | 76.2                   |
| Question 2 | .883            | .41                    | 10.3                   |
| Question 3 | .827            | .33                    | 8.3                    |
| Question 4 | .863            | .21                    | 5.2                    |

These results indicate that each of the four questions contributes highly to one factor. Each question measures a different aspect of the job and is a needed part of the measure. Results for all subpopulations were similar and verify the hypothesis and therefore are not presented.

#### Analysis of the JDI

The hypothesis for study in this section is:

Principal component analysis shows each JDI dimension displays high factor loadings on one of five derived components.

Principal component analysis on the entire sample indicates only one significant factor. This is contrary to the conclusions by Smith, et al. that the JDI measures five different aspects of satisfaction. Based upon the results of Table XVI, it will be stated that high factor loadings by the JDI dimensions exist on one factor.

Table XVI  
Principal Component Analysis  
of the JDI Dimensions

| VARIABLES | FACTOR LOADINGS | EIGENVALUES OF FACTORS | PERCENTAGE OF VARIANCE |
|-----------|-----------------|------------------------|------------------------|
| Work      | .755            | 2.26                   | 45.2                   |
| Pay       | .539            | .90                    | 17.9                   |
| Promo     | .696            | .75                    | 14.9                   |
| Super     | .692            | .61                    | 12.1                   |
| Co        | .660            | .49                    | 9.8                    |

Analysis of other subpopulations verify the results of the previous sample and are not presented.

#### Summary of Results

From the analysis of the several subpopulations, results were obtained which indicated the relationship between the Hoppock measure of job satisfaction and the JDI. Hoppock related highly with Work and Supervision dimensions. Hoppock did not measure satisfaction with pay. Analysis of the Hoppock measure showed internal consistency of the measure. Analysis of the five JDI dimensions failed to show independence of the dimensions. It is concluded that both measures provide valid indices of satisfaction as was assumed for this study. Results indicated that the JDI provided more information about satisfaction than does the Hoppock measure. Satisfaction with pay levels is not highly related to satisfaction with the job and should be measured separately.

#### IV CONCLUSIONS AND RECOMMENDATIONS

##### Conclusions

Important to any future study of job satisfaction of Air Force personnel will be the instruments used and the information conveyed to the researcher. This study was conducted to determine the relationships that exist between the Job Descriptive Index and the Hoppock measure of satisfaction. The research was not accomplished to study the actual causes of high or low levels of satisfaction of the sample population.

The analytic methods used to evaluate the empirical data provided definitive methods for basing conclusions. The consistency of the results of the three methods strengthens the basis of the combined results. The correlation and principal component analyses indicated that satisfaction with pay levels is not extremely important in determining overall job satisfaction. Correlation analysis also indicated that promotions, coworkers, and supervisors have moderate impact on job satisfaction but were all secondary to satisfaction with actual work accomplished.

The results of regression analysis were more definitive than those of correlation analysis. The Hoppock overall job satisfaction score was shown to provide significant information on work satisfaction and satisfaction with supervisors as are scored by the JDI. The researcher found that the JDI dimensions of Pay, Promotions, and Coworkers were not of importance in prediction of the overall Hoppock score when the JDI scores are given. The implication is that these three dimensions provide duplicate information or relatively no information in predicting overall satisfaction.

The third method of an analysis, principal component factoring, showed that the two measures of satisfaction differ in several ways. Satisfaction with pay continually was shown to be irrelevant in the measure of overall job satisfaction. The other JDI dimensions displayed high or moderate significance, and are considered measurable by the Hoppock index.

The Hoppock measure was studied in order to determine the importance of each of the four questions of the measure to the overall score. Since the factor loadings were approximately equal, it was determined that the addition of the scores of the individual questions was valid. If the loadings had been different, a weighting scheme would be appropriate to place equal importance on each of the scores. Similarly, the principal component factor loadings of the JDI allowed the researcher to make several conclusions concerning the device. It was shown that only one factor was statistically significant with relatively unequal loadings. It shall be stated that the JDI is not a measure of five independent aspects of satisfaction and that an overall score must not be calculated by the equal summation of the five dimension scores.

Smith, et al. found that the JDI dimensions discriminate considerably between themselves and that there are five separate aspects measured by the JDI. They analyzed data by principal component analysis and indicated the factors accounted for 20, 20, 17, 20, and 23 percent of the common variance (Ref 18:54-58). The results of this study were 45, 18, 15, 12, and 10 percent of the common variance for the entire sample. These contrasting results create doubt as to the soundness of the assumptions made in the development of the measure.



This study has shown that Hoppock's measure of job satisfaction gives insight as to the levels of satisfaction with work and supervision. The researcher feels that satisfaction with pay is of importance to the military and should be measured. Satisfaction with coworkers and promotions did not prove to be important to the measure of job satisfaction. Many Air Force studies have analyzed promotion satisfaction and attitudes towards performance reports during the past several years. The main conclusion of this study is that the JDI does not warrant being used in place of the much simpler Hoppock measure. The Hoppock measure, on the other hand, does not capture all of the relevant information involved in satisfaction with specific aspects of the job environment. Therefore, several considerations will be made prior to recommending future questionnaire composition. Military pay levels are virtually uninfluenced by the desires of the individual. Pay raises are established by civilians. Satisfaction with supervisors and coworkers has been considered an extremely important element in recent human relations programs in the Air Force. The effectiveness of these programs is indicated by the relatively high score results obtained on the associated JDI dimensions. The importance of favorable personnel interaction is critical in effective military organizations.

#### Recommendations

It is recommended that in future surveys Hoppock's measure of satisfaction be used as a single measure of overall job satisfaction. This measure can be compared and contrasted for the many career fields to indicate the differing degrees of satisfaction. In addition, a

a brief measure of pay satisfaction should be developed. The use of these two scores would encompass much of the information given by the JDI.

The JDI should be used in an additional study which would sample military on many bases, in many diverse career fields. This would eliminate the biases that exist at a SAC missile wing on the northern tier of the United States.

#### Summary

This study sought to determine the relationships between two measures of satisfaction. It was found that the JDI provided more information about satisfaction than did Hoppock's measure; however, the JDI failed to measure five distinct aspects. Based on these findings, it was recommended that Hoppock and an independent measure of pay satisfaction be used in future Air Force studies. The use of this proposed methodology is believed to be the best way of determining the satisfaction of the individual in an easy and concise way.

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APPENDIX A

APPROVAL FOR THE SURVEY

DEPARTMENT OF THE AIR FORCE  
HEADQUARTERS 341ST STRATEGIC MISSILE WING (SAC)  
MALMSTROM AIR FORCE BASE, MONTANA, 59402



Captain William T. Bolyard  
4541 Wayne Meadows  
Dayton OH 45424

17 MAY 1976

Dear Captain Bolyard

I received your letter dated 16 April 1976. You have my approval and the full support of the 341st Strategic Missile Wing for your survey. This is, of course, contingent upon your survey being properly approved by Air Force.

Your point of contact will be Captain Michael Knorre, 341st SMW/DOTI, and he will be available to provide all necessary assistance. His address and phone are as follows:

Capt Michael J. Knorre  
22 Cedar Street  
Great Falls MT 59405

Phone: a/c 406 727-5018  
autovon 632-2434/3271

Please feel free to contact Captain Knorre as you require. Best wishes on the survey and on the successful completion of your MBA.

Sincerely

A handwritten signature in black ink, appearing to read "William R. Brooksher", is written over a horizontal line.

WILLIAM R. BROOKSHER  
Colonel, USAF  
Commander

*Peace . . . . is our Profession*

DEPARTMENT OF THE AIR FORCE  
HEADQUARTERS AIR FORCE MILITARY PERSONNEL CENTER  
RANDOLPH AIR FORCE BASE, TEXAS 78148



REPLY TO  
ATTN OF: DPMYPS

JUL 22 1976

SUBJECT: Request for Survey Control Number (Capt Bolyard) (Your  
Ltr, 7 July 1976)

TO: AU/EDV

1. Capt Bolyard's survey request and Job Satisfaction Questionnaire have been reviewed and approved. The questionnaire has been assigned survey control number SCN 7T-02.

2. If you have any questions, please contact Ms. Annette Altgelt, AUTOVON 487-5858/2849.

FOR THE COMMANDER

*Robert L. Rhame*

ROBERT L. RHAME, Major, USAF  
Chief, Military Survey Branch

1st Ind

JUL 1976

AU/EDV

TO: AFIT/ED

Please forward this survey approval information to AFIT/ENS for their action and files.

FOR THE COMMANDER

*John T. Meehan*

JOHN T. MEEHAN  
Director, Evaluation and Research  
DCS/Education



APPENDIX B

CORRESPONDENCE FROM

DR. P. C. SMITH





Bowling Green State University

Psychology Department  
Bowling Green, Ohio 43403  
(419) 372-2301

To Prospective Users of the JDI:

Thank you for your inquiry concerning use of the Job Descriptive Index. The scales are now being published through the University, and the copyright is being enforced. This change in policy has been necessitated by two factors.

(1) Although the permission to use the JDI has been, in the past, contingent upon the promise to return to us certain data necessary for further norming and validation, a very small percentage of users has honored their promises. Moreover, many people have used the scales without permission. We need some control over the use of the scales.

(2) The book covering the scales and norms (Smith, P. C., Kendall, L. M., and Hulin, C. L. The measurement of satisfaction in work and retirement. Chicago: Rand McNally, 1969) has gone out of print, so that these materials have to be made available elsewhere.

A price sheet is enclosed for your information. As you will note, the prices are not high. Any small profits from the sales will go for research or graduate fellowships.

We intend to continue to try to accumulate information about the scales, and to report the results through publications.

Other instruments are available in Bowling Green in which you may be interested; we are enclosing a brief description.

If you have any questions, please to do not hesitate to inquire.

Sincerely yours,  
*Patricia C. Smith*

Patricia C. Smith  
Professor

PCS/mld

enclosures

JOB DESCRIPTIVE INDEX (JDI)\*

JDI Booklets: Packages of 100 \$22.00

Research Kit (Available only accompanying purchase of JDI in multiples of 100):  
 Instruction sheet for hand scoring  
 Scoring stencils for five scales  
 Norms for five scales, stratified by Individual variables:  
 Sex  
 Income  
 Education  
 Job Tenure  
 Community variables or variates  
 Prosperity  
 Decrepitude  
 Explanation of norm tables \$18.00

plus postage and handling (per 100) (except for overseas orders) \$ 4.00

SURVEY OF WORK VALUES (SWV)\*\*  
FORM U (REVISED)

Scale Booklets (reusable) \$15.00  
 IBM answer sheets can be used  
 Hand scoring answer sheets \$ 5.00  
 Scoring sheets (for hand scoring) \$ 5.00  
 General Instructions No Charge

plus postage and handling (per 100) (except for overseas orders) \$ 4.00

SURVEY OF ATTITUDE TOWARD AUTHORITY (SAA)\*\*

SAA questionnaires

Likert scales (Form L): Packages of 100 \$26.00  
 Thurstone scale (Form T): Packages of 100 \$ 6.50  
 Scoring Keys and Norms No Charge

plus postage and handling (per 100) (except for overseas orders)  
 Form L \$ 4.00  
 Form T \$ 2.00

SURVEY OF INDIVIDUAL GOAL ORIENTATIONS (SIGO)\*\*

SIGO questionnaires: Packages of 100 \$26.00  
 Scoring Keys and Norms No Charge

plus postage and handling (except for overseas orders) \$ 3.00

Address purchase order to Account #037050-1B, Cost #04550

Dr. Patricia C. Smith  
Department of Psychology  
Bowling Green State University  
Bowling Green, Ohio 43403

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APPENDIX C

THE QUESTIONNAIRE

From: AFIT(ENS)/Capt Bolyard/AV 785-2549

Subject: Job Satisfaction Questionnaire

To: Personnel of the 341st Strategic Missile Wing

Attached is a questionnaire designed for personnel of the 341st SMW. The information will be used for my AFIT master's thesis. Only the researcher and Capt Knorre/DOTI will have access to the completed questionnaires.

Please complete this questionnaire as soon as possible. It should take less than 10 minutes to complete. Return the completed questionnaire to the designated collection point or send it to Capt Knorre/DOTI via base distribution.

Being a former crew member in the 564th SMS and a Code Custodian in the 341st SMW Codes Division, I am quite familiar with many of your jobs. My thanks go to Col Brooksher for his allowing me to conduct this survey, and to Capt Knorre for his assistance. I sincerely appreciate your completion of the questionnaire. Thank you all very much.



WILLIAM T. BOLYARD III, Captain, USAF  
Air Force Institute of Technology  
Department of Systems Management  
School of Engineering  
Wright-Patterson AFB, Ohio

USAF SCN 7T-02

(This number indicates Air Force approval of the questionnaire only.)

### 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) DOD Instruction 1100.13, 17 Apr 1968, Surveys of Department of Defense Personnel; and/or

(2) AFR 178-9, 9 Oct 1973, Air Force Military Survey Program; and/or

(3) 5 U.S.C. 301 and 10 U.S.C. 8012, Secretary of the Air Force, Powers, Duties, Delegation by Compensation.

b. Principle 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 elect not to participate in any or all of this survey.

CHECK THE CORRECT ANSWER OR FILL IN THE BLANK

RANK: \_\_\_\_\_

SEX: MALE \_\_\_\_\_ FEMALE \_\_\_\_\_

AGE: \_\_\_\_\_

TOTAL YEARS IN AIR FORCE: \_\_\_\_\_

I AM ASSIGNED TO: \_\_\_\_\_ OPERATIONS  
\_\_\_\_\_ MAINTENANCE  
\_\_\_\_\_ SECURITY POLICE  
\_\_\_\_\_ OTHER/SPECIFY \_\_\_\_\_

I PERFORM MY DUTIES: \_\_\_\_\_ MAINLY ON BASE  
\_\_\_\_\_ MAINLY IN THE MISSILE COMPLEX  
\_\_\_\_\_ ON BASE AND IN THE MISSILE COMPLEX

USAF SCN 7T-02

Put a Y beside an item if the item describes the particular aspect of your job(work, pay, etc.), put N if the item does not describe the aspect, or put ? if you cannot decide.

WORK

- Fascinating
- Routine
- Satisfying
- Boring
- Good
- Creative
- Respected
- Hot
- Pleasant
- Useful
- Tiresome
- Healthful
- Challenging
- On your feet
- Frustrating
- Simple
- Endless
- Gives sense of accomplishment

PAY

- Income adequate for normal expenses
- Satisfactory profit sharing
- Barely live on income
- Bad
- Income provides luxuries
- Insecure
- Less than I deserve
- Highly paid
- Underpaid

PROMOTIONS

- Good opportunity for advancement
- Opportunity somewhat limited
- Promotion on ability
- Dead-end job
- Good chance for promotion
- Unfair promotion policy
- Infrequent promotions
- Regular promotions
- Fairly good chance for promotion

SUPERVISION

- Asks my advice
- Hard to please
- Impolite
- Praises good work
- Tactful
- Influential
- Up-to-date
- Doesn't supervise enough
- Quick tempered
- Tells me where I stand
- Annoying
- Stubborn
- Knows job well
- Bad
- Intelligent
- Leaves me on my own
- Lazy
- Around when needed

CO-WORKERS

- Stimulating
- Boring
- Slow
- Ambitious
- Stupid
- Responsible
- Fast
- Intelligent
- Easy to make enemies
- Talk too much
- Smart
- Lazy
- Unpleasant
- No privacy
- Active
- Narrow interests
- Loyal
- Hard to meet

Choose the ONE of the following statements which best tells how well you like your job. Place a check mark in front of that statement:

- I hate it
- I dislike it
- I don't like it
- I am indifferent to it
- I like it
- I am enthusiastic about it
- I love it



Check one of the following to show HOW MUCH OF THE TIME  
you feel satisfied with your job:

- All of the time
- Most of the time
- A good deal of the time
- About half of the time
- Occasionally
- Seldom
- Never

Check the ONE of the following which best tells how you  
feel about changing your job:

- I would quit this job at once if I could get anything  
else to do.
- I would take almost any other job in which I could earn  
as much as I am earning now.
- I would like to change both my job and my occupation.
  
- I would like to exchange my present job for another job  
in the same line of work.
- I am not eager to change my job, but I would do so if I  
could get a better job.
- I cannot think of any jobs for which I would exchange  
mine.
- I would not exchange my job for any other.

Check one of the following to show how you think you compare  
with other people:

- No one likes his job better than I like mine.
- I like my job much better than most people like theirs.
- I like my job better than most people like theirs.
- I like my job about as well as most people like theirs.
- I dislike my job more than most people dislike theirs.
- I dislike my job much more than most people dislike theirs.
- No one dislikes his job more than I dislike mine

Thank you for your cooperation.

APPENDIX D

SUBPOPULATION DESCRIPTIONS

APPENDIX D

Subpopulation Descriptions

Subpopulation Breakdown:

| <u>Rank</u>            | <u>Number</u> | <u>Age</u> | <u>Number</u> |
|------------------------|---------------|------------|---------------|
| Airman                 | 60            | 18-19      | 79            |
| Airman 1st Class       | 174           | 20-21      | 129           |
| Sergeant               | 98            | 22-23      | 106           |
| Staff Sergeant         | 73            | 24-25      | 60            |
| Technical Sergeant     | 38            | 26-27      | 46            |
| Master Sergeant        | 13            | 28-29      | 43            |
| Senior Master Sergeant | 6             | 30-31      | 49            |
| 2nd Lieutenant         | 39            | 32-33      | 38            |
| 1st Lieutenant         | 31            | 34-over    | 78            |
| Captain                | 85            |            |               |
| Major                  | 8             |            |               |
| Lieutenant Colonel     | 3             |            |               |

| <u>Years of Service</u> | <u>Number</u> | <u>Sex</u> | <u>Number</u> |
|-------------------------|---------------|------------|---------------|
| 0-1                     | 182           | Male       | 601           |
| 2-3                     | 156           | Female     | 27            |
| 4-5                     | 65            |            |               |
| 6-7                     | 37            |            |               |
| 8-9                     | 57            |            |               |
| 10-11                   | 35            |            |               |
| 12-13                   | 28            |            |               |
| 14-over                 | 68            |            |               |

| <u>SUBPOPULATION:</u> | <u>Officers</u> |
|-----------------------|-----------------|
| <u>Type of Duty:</u>  |                 |
| Operations            | 143             |
| Maintenance           | 9               |
| SPS                   | 5               |
| Other                 | 9               |
| <u>Place of Duty:</u> |                 |
| Base                  | 39              |
| Missile Complex       | 67              |
| Both                  | 60              |

| <u>SUBPOPULATION:</u> | <u>Enlisted</u> |
|-----------------------|-----------------|
| <u>Type of Duty:</u>  |                 |
| Operations            | 43              |
| Maintenance           | 109             |
| SPS                   | 210             |
| Other                 | 100             |
| <u>Place of Duty:</u> |                 |
| Base                  | 257             |
| Missile Complex       | 160             |
| Both                  | 45              |

| <u>SUBPOPULATION:</u> | <u>LE24</u> |
|-----------------------|-------------|
| <u>Rank:</u>          |             |
| Officer               | 32          |
| Enlisted              | 317         |
| <u>Type of Duty:</u>  |             |
| Operations            | 45          |
| Maintenance           | 75          |
| SPS                   | 183         |
| Other                 | 46          |
| <u>Place of Duty:</u> |             |
| Base                  | 156         |
| Missile Complex       | 149         |
| Both                  | 44          |

SUBPOPULATION: GE25  
Rank:  
 Officer 134  
 Enlisted 145  
Type of Duty:  
 Operations 141  
 Maintenance 43  
 SPS 32  
 Other 63  
Place of Duty:  
 Base 140  
 Missile Complex 78  
 Both 61

SUBPOPULATION: LE4  
Rank:  
 Officer 61  
 Enlisted 320  
Type of Duty:  
 Operations 67  
 Maintenance 81  
 SPS 185  
 Other 48  
Place of Duty:  
 Base 160  
 Missile Complex 166  
 Both 55

SUBPOPULATION: GE5  
Rank:  
 Officer 105  
 Enlisted 142  
Type of Duty:  
 Operations 119  
 Maintenance 37  
 SPS 30  
 Other 61  
Place of Duty:  
 Base 61  
 Missile Complex 136  
 Both 50

SUBPOPULATION: Complex  
Rank:  
 Officer 67  
 Enlisted 160  
Type of Duty:  
 Operations 74  
 Maintenance 39  
 SPS 103  
 Other 11

SUBPOPULATION: SP  
Rank:  
 Officer 5  
 Enlisted 210  
Place of Duty:  
 Base 95  
 Missile Complex 103  
 Both 17

SUBPOPULATION: Base  
Rank:  
 Officer 39  
 Enlisted 257  
Type of Duty:  
 Operations 53  
 Maintenance 53  
 SPS 95  
 Other 95

SUBPOPULATION: Both  
Rank:  
 Officer 60  
 Enlisted 45  
Type of Duty:  
 Operations 59  
 Maintenance 26  
 SPS 17  
 Other 3

SUBPOPULATION: Mx  
Rank:  
 Officer 9  
 Enlisted 109  
Place of Duty:  
 Base 53  
 Missile Complex 39  
 Both 26

SUBPOPULATION: Other  
Rank:  
 Officer 9  
 Enlisted 100  
Place of Duty:  
 Base 95  
 Missile Complex 11  
 Both 3

SUBPOPULATION: Ops  
Rank:  
 Officer 143  
 Enlisted 43  
Place of Duty:  
 Base 53  
 Missile Complex 74  
 Both 59

APPENDIX E  
SPSS PROGRAM

APPENDIX E

SPSS Program

```
VARIABLE LIST  RANK,SEX,AGE,YEARS,ORG,PLACE,A,AA,B,BB,C,CC,D,DD,E,EE,
                H1,H2,H3,H4,
INPUT MEDIUM  CARD
N OF CASES    628
INPUT FORMAT  FIXED(F2.0,F1.0,2F2.0,2F1.0,2F2.0,4F1.0,4F2.0,4F1.0)
COMPUTE       WORK=3*A+AA
COMPUTE       PAY=3*B+BB
COMPUTE       PROMO=3*C+CC
COMPUTE       SUPER=3*D+DD
COMPUTE       CO=3*E+EE
COMPUTE       HO=H1+H2+H3+H4
REGRESSION    METHOD=STEPWISE/
                VARIABLES=HO,WORK,PAY,PROMO,SUPER,CO/
                REGRESSION=HO(*,3.84,.01,3.83)WITH WORK,PAY,PROMO,SUPER,
                CO/RESIDUALS/
STATISTICS    ALL
READ INPUT DATA
03119013202006030170012004344
      .
      .
      .
03121022110012030070004036645
PEARSON CORR  WORK,PAY,PROMO,SUPER,CO
FACTOR        VARIABLES=H1,H2,H3,H4/
                TYPE=PA1
                VARIABLES=HO,WORK,PAY,PROMO,SUPER,CO
                TYPE=PA1
FREQUENCIES   GENERAL=ALL
OPTIONS       5,8
FINISH
```

## VITA

William Thomas Bolyard, III was born on 2 July 1947 in Watseka, Illinois. He graduated from high school in New Wilmington, Pennsylvania in 1965 and attended Westminster College (PA) from which he received the degree of Bachelor of Science in June 1969. Upon graduation, he attended Officer Training School and was subsequently commissioned 2nd Lieutenant in October 1969. He was initially assigned as Deputy Missile Combat Crew Commander. After serving as a Missile Combat Crew Commander, he was assigned as Alternate Positive Control Code Custodian at the 341st Strategic Missile Wing until he entered the School of Engineering, Air Force Institute of Technology, in June 1975.

Permanent Address: 230 Meadowbrook Drive  
New Wilmington, Pennsylvania 16142

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| 18. SUPPLEMENTARY NOTES  |                       |   |
| 19. KEY WORDS (Continue on reverse side if necessary and identify by block number)<br>Job<br>Satisfaction<br>Job Satisfaction  |                       |   |
| 20. ABSTRACT (Continue on reverse side if necessary and identify by block number)<br>Job satisfaction measures developed in recent years have taken one of two basic approaches: the measure of overall satisfaction, and the measure of satisfaction with various aspects of the job. This study shows the relationships between two such devices, the Hoppock measure of satisfaction and Smith, Hulin, and Kendall's Job Descriptive Index (JDI).<br>Correlation analysis, linear regression analysis, and principal component factor analysis techniques were used to determine the statistical relationships. |                       |   |



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Data for the analysis was from Air Force members of the 341st Strategic Missile Wing at Malmstrom Air Force Base, Montana. Analysis of the data revealed that Hoppock's measure encompasses several of the aspects studied by the JDI with the exception of satisfaction with pay levels. The author recommended continued use of the Hoppock measure in future Air Force surveys.

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