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## ABSTRACT


This study tested the usefulness of distinguishing between three components of performance. First, pairs of supervisors rated 506 mechanics' performance in one of four areas. Intraclass correlations and internal consistency reliability estimates showed supervisory ratings of task performance, job dedication, interpersonal facilitation, and overall performance had acceptable reliability. Another group of supervisors provided independent ratings of the task performance, job dedication, interpersonal facilitation, and overall performance of 760 Air Force mechanics in a second sample. Structural equations analyses showed the performance factors were different from each other. When measurement error was incorporated in the analysis, a proposed model which posited direct paths from each performance component to overall performance was rejected. An alternative model in which task performance and interpersonal facilitation have direct paths to overall performance, but job dedication affects overall performance indirectly through task performance and interpersonal facilitation was supported. Data describing the mechanics' ability, experience, job knowledge, conscientiousness, goal orientation, general self-esteem, extraversion, agreeableness, positive affectivity, and confidence in social situations were available for 430 of the subjects. A

full model incorporating these predictors showed significant paths between agreeableness and interpersonal facilitation, conscientiousness and job dedication, and job knowledge and task performance. In addition, there were significant paths from both experience and ability to job knowledge. Results confirm that performance, at least as judged by supervisors, is multidimensional. In addition, the study provides evidence of a causal structure among performance elements.

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# EVIDENCE FOR THE USEFULNESS OF TASK PERFORMANCE, JOB DEDICATION, AND INTERPERSONAL FACILITATION AS COMPONENTS OF PERFORMANCE

BY
JAMES R. VAN SCOTTER

A DISSERTATION PRESENTED TO THE GRADUATE SCHOOL
OF THE UNIVERSITY OF FLORIDA IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY

UNIVERSITY OF FLORIDA

1994

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Abstract of Dissertation Presented to the Graduate School of the University of Florida in Partial Fulfillment of the Requirements for the Degree of Doctor of Philosophy

EVIDENCE FOR THE USEFULNESS OF TASK PERFORMANCE, JOB DEDICATION, AND INTERPERSONAL FACILITATION AS COMPONENTS OF OVERALL PERFORMANCE

By

James R. Van Scotter

August 1994

Chairman: Stephan J. Motowidlo
Major Department: Management

This study tests the usefulness of distinguishing between three components of performance. The inter-rater reliabilities of supervisory ratings of task performance, job dedication, interpersonal facilitation, and overall performance were assessed in a sample of 506 Air Force mechanics. Pairs of supervisors rated the mechanics' performance in one of four areas. Intraclass correlations and internal consistency reliability estimates showed supervisory ratings had acceptable reliability. Supervisors provided independent ratings of the task performance, job dedication, interpersonal facilitation, and overall performance of 760 Air Force mechanics in a second sample. Results showed the performance factors were different from each other. A proposed model with direct paths from each performance component to overall performance was rejected.

An alternative model in which task performance and interpersonal facilitation have direct paths to overall performance, but job dedication affects overall performance indirectly through task performance and interpersonal facilitation was supported. Data describing the mechanics' ability, experience, job knowledge, conscientiousness, goal orientation, general self-esteem, extraversion, agreeableness, positive affectivity, and confidence in social situations were available for 430 of the subjects. A full model incorporating these predictors showed significant paths between agreeableness and interpersonal facilitation, conscientiousness and job dedication, and job knowledge and task performance. In addition, there were significant paths from both experience and ability to job knowledge. Results confirm that performance, at least as judged by supervisors, is multidimensional. In addition, the study provides evidence of a causal structure among performance elements.

# CHAPTER 1
# INTRODUCTION

There is growing awareness that effective organizational functioning requires employees to perform in ways that go beyond the task requirements of their jobs (Borman, 1991; Campbell, McCloy, Oppler & Sager, 1993; Guion, 1991). Recently, Borman and Motowidlo (1993) coined the term "contextual performance" to describe a category of behaviors that contribute to organizations by acting as a catalyst for task activities and maintaining the social and psychological context necessary for effective performance. Some examples are helping coworkers, cooperating, working hard, and persisting in spite of difficulties. They argued that these behaviors were different from task performance but still contributed importantly to organizational effectiveness. Recent research in organizational citizenship behavior (Smith, Organ, & Near, 1983; Organ, 1988); prosocial organizational behavior (Brief & Motowidlo, 1986); military performance research (Borman, Motowidlo, & Hanser, 1983); and criterion development efforts as part of the Army's Project A (Campbell, McHenry, & Wise, 1990) have highlighted similar patterns of behavior.

Borman and Motowidlo (1993) suggested expanding the criterion domain used in personnel selection to include elements of contextual performance. Motowidlo and Van Scotter (in press) provided evidence task and contextual performance could be distinguished from each other, and that each of them explained a significant amount of unique variance in the overall performance of 421 U.S. Air Force mechanics. Thus, an initial empirical study supported Borman and Motowidlo's view of the performance criterion domain.

The present study extended this research by investigating the usefulness of distinguishing between task performance and two categories of contextual performance, interpersonal facilitation and job dedication. Job dedication consists of self-motivated, disciplined behaviors like working hard, attending to important details, and persisting to finish a difficult task. Interpersonal facilitation includes cooperative, helpful, considerate, and altruistic behaviors. Therefore, the present study could either support an expanded three-factor model of performance, or, by failing to do so, leave the two-factor model implied by Motowidlo and Van Scotter's (in press) study as the only contextual performance model with empirical support. Either outcome would advance this stream of research. Regardless of the outcome, helping to define the criterion of job performance more accurately is important for personnel selection.

The primary purpose of this study was to test the usefulness of distinguishing between task performance, interpersonal facilitation, and job dedication. A secondary purpose was to develop a prediction model that related individual attributes to task performance, interpersonal facilitation, and job dedication, and linked those performance factors to overall performance.

# CHAPTER 2
# LITERATURE REVIEW

Following Campbell et al. (1970), Borman and Motowidlo (1993) defined performance as behavior that is under individual control and relevant to organizational goals. They incorporated contextual and task performance into an over-arching performance criterion domain that encompassed the organizationally relevant behaviors of organizational citizenship behavior (Smith et al., 1983), prosocial organizational behavior (Brief & Motowidlo, 1986), organizational spontaneity (George & Brief, 1992), and the non-task behaviors described in recent research to develop multi-dimensional performance models in military settings (e.g., Borman, Motowidlo & Hanser, 1983; Campbell, 1990; Campbell et al., 1990; Campbell, McCloy, Oppler, & Sager, 1992; Lance, Teachout & Donnelly, 1992).

After gleaning a list of performance behaviors from this research, they grouped the behaviors into two categories. The first, task performance, involved the types of specialized, technical behaviors upon which job requirements are based. They identified proficiency as the greatest source of variation in these behaviors. Proficiency, in turn, was the product of training, experience, and ability. The second group of behaviors

included elements that contributed to organizational effectiveness by making an individual's own task performance more effective, making a coworker's task performance more effective, or by supporting and maintaining an organizational environment that favored accomplishment of organizational goals. They labeled this category as "contextual performance."

While the value of task performance as a criterion in personnel selection is accepted, the contribution contextual performance might make to personnel selection has not been demonstrated. Contextual performance is only useful if it accounted for a significant portion of the variance in overall performance above the variance accounted for by task performance.

## Evidence for Two Performance Dimensions

Motowidlo and Van Scotter (in press) tested the usefulness of distinguishing between the dimensions of task and contextual performance. They found task and contextual performance explained separate portions of the variance in overall supervisory performance ratings of Air Force mechanics. In multiple regression analysis the factors jointly explained over 29 percent of the variance in overall supervisory performance ratings (uncorrected multiple $R=.54$, $p<.01$). Moreover, beta weights in the regression equation were .37 ($p<.01$) for task performance, and .33 ($p<.01$) for contextual performance, indicating the factors were uniquely and significantly associated with overall performance.

Two features of the study make these results especially compelling. First, each supervisor rated one and only one dimension of performance (task, contextual, or overall performance). Thus, covariance among overall performance and task or contextual performance can not be attributed to same-source bias. Correlations between overall performance and task and contextual performance represent the proportion of the variance in overall performance explained by these components. Second, the authors investigated the possibility that measurement errors might have influenced the study's findings. This was accomplished by correcting correlations for attenuation (e.g., Nunnally, 1978; pp.219-220) and computing new regression equations to simulate various levels of measurement error. This analysis showed stronger and stronger support for distinguishing between task and contextual performance as inter-rater reliabilities reached lower and lower levels. Therefore, the multiple-R of .54 reported above is a conservative estimate of the true variance in overall performance explained by these two performance components.

The study investigated additional hypotheses that contextual and task performance were differently related to experience, formal technical training school grades, and personality variables. T-tests identified significant differences in the correlations of task and contextual performance with 4 of 6 personality variables, technical training grades, and job experience. Personality factors of

work orientation, dependability, cooperativeness, and internal control were significantly more strongly associated with contextual performance than task performance, while job experience was more strongly correlated with task performance. Thus, contextual and task performance could be distinguished from each other on the basis of their relationships with overall performance, as well as their relationships with appropriate sets of predictor variables.

## Expanding the Range of Interpersonal Behaviors

Motowidlo and Van Scotter's (in press) contextual performance measure combined job dedication and interpersonal facilitation behaviors in the same scale, but emphasized the job dedication dimension. Additional research was needed to enlarge the scope of contextual performance behaviors measured, and to measure contextual performance dimensions separately so their individual contributions can be clarified.

Katz and Kahn's (1978) ideas about innovative and spontaneous helpful behaviors have been frequently mentioned in organizational research involving non-task behavior. The literatures of social psychology, personality psychology, and individual differences psychology describe a broad range of interpersonal behaviors that seem likely to aid accomplishment of core task activities or to help maintain a social context conducive to effective performance. More recent research in social psychology (e.g., Aronoff & Wilson, 1985; Bierhoff, 1988; Deutsch, 1982; Salovey &

Rodin, 1985; Schwartz & Howard, 1982) describes other interpersonal behaviors that are relevant in organizations. They include sympathizing with others, listening to others, considering others' needs, cooperating with others, coordinating with others, acting altruistically, and influencing or persuading others.

## Evidence for Three Dimensions of Performance

The literature provides four types of evidence that support the claim that task performance, interpersonal facilitation, and job dedication are different from each other. They differ on their nature (instrumental/expressive), their knowledge and skill requirements, and their antecedents. In addition, a few empirical studies have identified similar performance dimensions.

### Instrumental/Expressive Nature

One reason to view interpersonal facilitation, job dedication, and task performance as distinct aspects of performance has to do with their function for the actor. Task performance and job dedication are instrumental in nature. These behaviors are performed to achieve some outcome or with some goal in mind even if the goal is only to finish the task or satisfy the organization's immediate requirements.

Interpersonal facilitation behaviors may be either expressive or instrumental. Behaviors such as coaxing someone to work harder, instructing a new employee on how to

do a job, or persuading a coworker to change his or her behavior are instrumental. Expressive interpersonal behaviors communicate feelings about other people, work, or oneself. Actors may not have any particular goal in mind beyond expressing their feelings. Of course, not all expressions of emotion are appropriate in work settings (Rafaeli & Sutton, 1986).

Knowledge and Skill Requirements

Task performance, interpersonal facilitation, and job dedication may also be distinguished from each other based on their different knowledge and skill requirements. Knowledge and skill are a critical source of variation in task performance (Campbell, 1990; Hunter, 1983; Schmidt, Hunter, & Outerbridge, 1986). Some aspects of interpersonal facilitation are a function of interpersonal skill. Some people are better at monitoring and controlling their expressive behaviors (Snyder, 1974), at using and interpreting non-verbal signals (Furnham & Capon, 1989), and at using persuasion techniques (Rafaeli & Sutton, 1989). Instead of knowledge or skill, the prime source of variation in job dedication is motivation and will.

Antecedents of Task Performance

Task performance is predicted by a cluster of variables that reflect proficiency in task activities. They include formal training, job knowledge, experience, cognitive ability, perceptual ability, and psychomotor ability. Of these, job knowledge, experience, and cognitive ability seem

especially useful in predicting task performance in the current study.

Over the last 10 years, a series of studies have investigated the relationships between these predictors and supervisory ratings. Hunter and Hunter (1984) summarized predictive validity research and concluded ability was the most important predictor of job performance across jobs. Recent studies (i.e., Dickinson & Teachout, 1991) have usually found positive relationships between ability measures and supervisory ratings; however, restriction in range is often a problem in concurrent validity studies when ability measures are used as criteria to select the subjects.

Experience has received a lot of attention. Hunter and Hunter (1984) reported a mean correlation between experience and proficiency of .18 over 425 studies. Motowidlo and Van Scotter (in press) found experience correlated .34 with task performance but less strongly with contextual performance. Research has shown that job experience predicts job knowledge (Schmidt, Hunter, & Outerbridge, 1986; Schmidt, Hunter, Outerbridge, & Goff, 1988), and that job knowledge is the best predictor of task proficiency measured via work samples (Borman, White, Pulakos, & Oppler, 1991; Hunter, 1983; Schmidt et al., 1986).

Schmidt et al. (1986) showed that ability and experience predict job knowledge, and job knowledge predicts supervisory performance ratings. This pattern of

relationships addresses concerns about low correlations between ability test scores and job performance measures. The model by Schmidt et al. (1986) was adopted for use in the current study. Thus, ability and experience were expected to be related to task performance indirectly through job knowledge in the present study.

Antecedents of Interpersonal Facilitation

Variation in interpersonal facilitation behaviors has been attributed to differences in interpersonal orientation (Cooper & Hazelrigg, 1988; Gurtman, 1992; Trapnell & Wiggins, 1990; Wiggins, Trapnell & Phillips, 1988) and interpersonal skill (Birtchnell, 1990; Furnham & Capon, 1983; Stricker & Rock, 1990). These attributes are associated with personality variables such as extraversion, agreeableness (e.g., Costa & McCrae, 1989), positive affectivity (e.g., Watson & Clark, 1992), and social confidence (Fleming & Courtney, 1984; Malouff, Schutte, Bauer, Mantelli, Pierce, Cordova, & Reed, 1990).

Extraversion describes a social orientation, activity level, and outgoing disposition. High scorers are warm, sociable, assertive, gregarious, talkative, active, and upbeat. Introverts are independent, reserved, but not unhappy. Scores on extraversion were expected to be positively associated with interpersonal facilitation ratings.

People who score highly on agreeableness are described as honest, trustworthy, altruistic, compliant, humble,

helpful and sympathetic. Low scorers are described as logical, arrogant, competitive, aggressive, and manipulative. A positive relationship between this trait and interpersonal facilitation was expected.

Positive affectivity (PA) is another likely predictor of interpersonal facilitation. It is the predisposition to experience positive mood states. According to Watson and Clark (1992) it is associated with social activity, interpersonal satisfaction and self-confidence. Watson and Clark (1992) found PA was strongly predicted by extraversion. Extraversion accounted for 23.4 to 40.4 percent of the variance in PA over four samples. PA has been associated with the frequency and tone of interpersonal behaviors. It was expected to be positively related to interpersonal facilitation.

Social confidence is a type of self-esteem that involves evaluation of one's own competence in social situations (Fleming & Courtney, 1984; Malouff et al., 1990). It is more specific than general self-esteem, but is not task specific (Eden, 1988). Social confidence was expected to be positively related to the type of behaviors comprising interpersonal facilitation.

Predictor-Job Dedication Relationships

The behavioral patterns of effort, initiative, discipline and compliance share a different set of predictors. Individual differences in conscientiousness, goal-orientation, self-esteem, and beliefs about work

converge on a general predisposition to act in motivated ways. For want of a better term, I will refer to this cluster of individual differences as "motivation." Each of the variables described here, conveys some aspect of motivation. For example, people who are conscientious are organized, efficient, persistent, punctual, and conventional. They strive for excellence, make plans, and exhibit self-control (Costa & McCrae, 1989; Goldberg, 1990). Therefore, conscientiousness was expected to be positively related to job dedication. Protestant work ethic is a stable orientation toward hard work, responsibility, and moral values (Furnham, 1984, 1990). Merrens and Garrett (1975) found people high in protestant work ethic persisted longer on a boring task than those who scored lower on it. Furnham (1984) noted that Blood's (1969) pro-protestant work ethic scale was correlated with internal work motivation and satisfaction with work. Protestant work ethic was expected to correlate positively with job dedication.

Recently, researchers have begun to think of goal orientation as a stable orientation (Malouff et al., 1990; Nuttin, 1985; Robbins & Patton, 1985). Scores on the "goal-orientation" scale by Malouff et al. are associated with need for achievement, the number of long term goals, and impulsiveness. Goal orientation was expected to correlate positively with job dedication.

Several authors have recently suggested the usefulness of self-esteem, self-efficacy, feelings of self-competence,

and expectancy of success in personnel selection (Brockner, 1988; Eden & Kinnar, 1991; Gist, 1987; Gist & Mitchell, 1992; Hollenbeck, Brief, Whitener, & Pauli, 1988; Hollenbeck & Whitener, 1988; Motowidlo, 1979). Self-esteem is viewed as a general sense of competence or self-approval (Brockner, 1988), an indicator of a characteristic level of motivation (Hollenbeck et al., 1988), or as trait expectancy (Eden, 1988).

Motowidlo (1979) described general self-esteem as influencing a worker's beliefs and behaviors about work, before, during, and after employment begins. Carver and Scheier (1981) predicted individuals with high self-esteem would persist longer in task performance and work harder to overcome obstacles to success. Hollenbeck et al. (1988) found an aptitude/self-esteem interaction was a significant factor in predicting the performance of life insurance salesmen, illustrating this situation. However, when a category of performance, such as job dedication, is defined in terms of behaviors exhibiting effort, persistence, conscientiousness, and compliance, direct effects of self-esteem seem likely. Extensive research on goal setting, which was summarized by Locke and Latham (1990), supports this view. Thus, general self-esteem was expected to correlate positively with job dedication.

Empirical Evidence

A few studies provide evidence that supervisors may already use categorization schemes similar to the three

factors described in this study. Motowidlo, Packard, and Manning (1986) investigated the influence of negative and positive affect and stress on nurses' performance. They derived two dimensions via factor analysis which were labeled interpersonal effectiveness and cognitive/ motivational effectiveness. Their descriptions were generally consistent with interpersonal facilitation and job dedication. Items describing concentration, composure, perseverance, and adaptability had high loadings on the cognitive/motivational effectiveness factor. Items with high factor loadings on the interpersonal dimension included personal warmth, morale, teamwork and cooperation, and sensitivity to patients. That these behaviors clustered together suggests supervisors may view interpersonal behaviors and job dedication behaviors as distinct categories of performance.

More recently, Day and Silverman (1989) reported interpersonal orientation (measured via a personality composite) correlated .21 with supervisory ratings of work ethic (willingness to work long hours to complete tasks), but .42 with cooperation. The difference in these correlations is significant ($p<.05$), suggesting that combining the work ethic and cooperation criteria into a single performance criterion measure might obscure information meaningful in personnel selection.

A performance model developed for the Army's large scale selection and classification project (Project A:

Campbell et al., 1990) emphasizes the importance of job dedication-type dimensions across 250 very diverse entry-level Army jobs. Project A researchers developed predictor and criterion constructs for use in predicting applicants performance and assigning them to 250 occupational specialties. They found two task-performance factors and three Army-wide non-task performance factors. The non-task factors are: a) effort and leadership, b) maintaining personnel discipline, and c) military bearing and physical fitness. The effort and leadership dimension was described as consisting of effort, perseverance, dependability, willingness to work and cooperate, and supportiveness of other soldiers. Thus it described a composite of job dedication and interpersonal facilitation behaviors. The other two dimensions seem strongly related to job dedication. Personal discipline was described in terms of adherence to service regulations and traditions, integrity, and self-control. They viewed military bearing and physical fitness as organizationally required elements of performance associated with volition, conscientiousness, and compliance. A LISREL VI (Joreskog & Sorbom, 1986) structural model relating these dimensions provided a reasonably good fit across nine Army jobs (total n=9,430) that were selected as representative of all 250 jobs.

## Methods Issues

A few methods issues are potentially important for the present study. They are discussed next.

Use of Supervisory Ratings

Campbell et al. (1970) viewed performance as a judgement which can best be provided by experts that understand job requirements and the processes used to achieve them. They noted that supervisory raters have often observed the ratee's performance over a period of time and a variety of situations. As a result, they may be aware of performance trends and outcomes occurring in several jobs. Supervisory ratings may consider a wider range of behavior than is possible with other methods.

Ratings have the potential to avoid deficiency and contamination (Borman, 1991). However, human raters are not infallible, and a number of rater errors might affect their ratings. The problem is that there is no way to separate the portion of the variance attributable to the ratee from rating errors when variables are measured by a single rater. When two or more judges rate the same subject, inter-rater reliability estimates can be computed (e.g., Shrout & Fleiss, 1979) to describe the degree of rater agreement and variance attributable to error. Since ignoring measurement error can lead to erroneous conclusions (Campbell, 1990; Saal et al., 1980), researchers have increasingly been concerned about the reliability of performance ratings (Borman, 1978; Rothstein, 1990; Saal, Downey & Lahey, 1980).

Inter-rater reliabilities tend to be considerably lower than internal consistency reliabilities, but they are more relevant to job performance. Rothstein (1990) estimated

single-rater reliabilities ranged between .43 and .48 in her sample of managers from 79 firms. Military research accomplished for Project A obtained similar results. Campbell and Zook (1992) reported single-rater reliabilities of .43 for task ratings; .45 for personal discipline, .56 for military bearing, .48 for technical skill and effort, and .50 for leading and supervising (Campbell & Zook, 1992).

Supervisory ratings are more reliable when supervisors have had adequate opportunity to observe the ratee's performance (Rothstein, 1990), when they have observed the same aspects of performance (Borman, 1978), and when they are knowledgeable about task procedures and organizational goals (Borman, 1991). Therefore, selection of supervisory raters who are themselves skilled in relevant aspects of task performance, have adequate observational opportunity, and whose attention is directed to specific behavioral aspects of performance is necessary in the present study.

## Definition of Performance Constructs

The performance constructs for overall performance and the three performance components are defined and described below. Following Borman (1991) and Campbell (1990), performance is viewed as behavior that is under a worker's control and organizationally relevant.

### Overall Performance

Overall performance is defined as the effectiveness of a subordinate's performance compared with coworkers' performance and organizational expectations. Persons with

low overall performance are much less effective than their peers, fail to meet performance standards, or otherwise detract from the organization's ability to achieve its goals. High performers are more effective than their counterparts, exceed performance standards, and make important contributions to the organization.

Supervisory ratings of overall performance are the criterion against which the usefulness of task performance, interpersonal facilitation, and job dedication will be judged. While supervisor's weighting processes are not well understood (Guion, 1983), overall performance ratings are believed to reflect organizational values (Borman, 1991; Campbell et al., 1970; Landy & Farr, 1980).

Task Performance

Task performance is defined as the effectiveness with which an individual carries out the technical or specialized activities that define his or her job. Task performance behaviors contribute directly or indirectly to the organization's technical core processes--the processes through which goods and services are produced. Line jobs generally contribute directly to the technical core. Staff jobs in accounting, finance, or personnel contribute indirectly.

The emphasis in task performance is proficiency, i.e., knowledge about task processes and how to carry them out efficiently. Use of the term "proficiency" here is compatible with Campbell's (1990) description of declarative

and procedural knowledge (i.e., being able to describe the steps in a task, and having the skills to carry them out). Workers low on task performance are unskilled. Performers at the top of the scale are highly skilled. They work quickly, expertly, and effectively.

In many jobs, attaining an acceptable level of task proficiency requires lengthy preparation through apprenticeship, trade school, college, or on-the-job training. Much of this preparation occurs before an individual becomes a member of the organization. Because of their technical nature, important aspects of task performance are likely to be role-prescribed. They reflect performance requirements that directly or indirectly support the organization's core processes and often reflect a level of expertise or specialization that sets incumbents apart from other organizational members. Thus, jobs are defined in terms of organizational requirements, which specify the types of task proficiency necessary (Borman, 1991).

Task performance and proficiency are not the same the thing, however. Proficiency measures, such as job knowledge tests or work samples, are narrow in scope. They measure maximum performance. In contrast, supervisory ratings measure typical performance, and typical performance is a better indicator of an individual's actual contribution to the organization than maximum performance (Borman, 1991).

Interpersonal Facilitation

Interpersonal facilitation is defined as the extent to which a worker helps others, contributes to their effective task performance, or helps maintain a social and psychological climate that facilitates accomplishment of the organizations' goals.

Interpersonal facilitation consists of several types of inter-related behaviors including cooperation, helping, consideration, altruism, and attempts to influence the work-related behavior of others. High performers cooperate effectively with others; go out of their way to help others; listen to other's problems; offer friendly advice; seek out others' advice and opinions; display a warm, cheerful, or positive attitude; say and do things to reduce conflict; complement coworkers, supervisors, or subordinates; participate in informal or after-work social events with coworkers; express loyalty, trust, and concern for coworkers; encourage others to act in organizationally relevant ways; praise others who are successful at work; and consider coworkers' interests and feelings before acting. George and Brief (1992) suggested these types of behaviors contribute to the social atmosphere at work by putting coworkers in a positive mood.

Workers low on interpersonal facilitation display a negative attitude; speak loudly at inappropriate times; complain about coworkers, supervisors, or subordinates publicly; refuse to cooperate; disagree vocally, act

aggressively, or pick fights; tell lies or spread rumors about others; manipulate others; compete with coworkers; act selfishly; fail to help others; avoid associating with coworkers during breaks; and complain about working conditions. These behaviors detract from the interpersonal climate at work and distract coworkers from their organizational responsibilities.

Job Dedication

Job dedication is defined as volitional, motivated behaviors that contribute to individual and organizational effectiveness. Job dedication behaviors are driven by will, motivational orientation, and beliefs about the value and importance of work. Workers high on job dedication pay close attention to details, take good care of organizational equipment, persist in overcoming obstacles to complete a task, develop innovative solutions to problems, work hard to do a good job, strive to become expert in the technical aspects of their job, set high personal goals and standards, follow formal rules and informal social norms, follow instructions even when the boss is not present, comply with organizational appearance standards, choose to work on tasks where individual contributions are apparent, and select medium difficulty tasks to work on. High performers on this dimension are likely to be over-achievers who get intrinsic satisfaction from some aspects of work, most probably the aspects they excel at. In the long run, job dedication is associated with self-training to improve work skills,

seeking more important and challenging jobs, and taking on increased responsibility.

Workers low on job dedication avoid work, take extra breaks, take a long time transitioning between work assignments, miss work more than others, come to work late, miss appointments or training sessions, refuse to stay late or work overtime, break administrative rules frequently, do not follow work procedures, avoid difficult assignments, depend on others for help with complex or heavy work, seldom take initiative, disregard supervisor's instructions, do not accept responsibility for problems, and blame their problems on other people, facilities, or equipment. In short, workers low on job dedication can not be trusted to meet quality standards, complete work on time, or make responsible choices about work performance. They display little interest in work, and may not meet organizational behavior requirements (i.e., use of safety equipment, conduct, deportment, dress, or grooming).

## Proposed Model of Performance

The three elements of performance: task performance, job dedication, and interpersonal facilitation were each expected to account for separate portions of the variance in overall performance. This model was based on the idea that each performance dimension contributes to the organization in a different way. Task performance contributes directly or indirectly to the production of goods or services through proficient, skillful, and effective behaviors. Job

dedication supports individual and organizational goals through conformance with formal and informal rules, personal discipline and responsibility, hard work, persistent effort, and initiative. Interpersonal facilitation primarily supports other members of the organization through expressions of concern, consideration, cooperative and helpful acts, and by encouraging others to perform in organizationally relevant ways. The hypothesized relationships between these performance components and overall performance are shown on the right side of Figure 2-1.

Task performance, job dedication, and interpersonal facilitation were each expected to explain a significant portion of the variance in overall performance. After the correlations had been corrected for rater unreliability (as suggested by Campbell, 1990), this path model was expected to account for much of the variance in overall performance. The three performance elements were expected to be positively intercorrelated.

The expected predictor-performance element relationships are shown on the left side of Figure 2-1. The focus is on their combined contribution to the associated performance element. While the variables included in the predictor sets were expected to be strongly related to one of the performance categories, they were not necessarily the only or best predictors of performance in the respective categories. Instead, they were viewed as a sample of

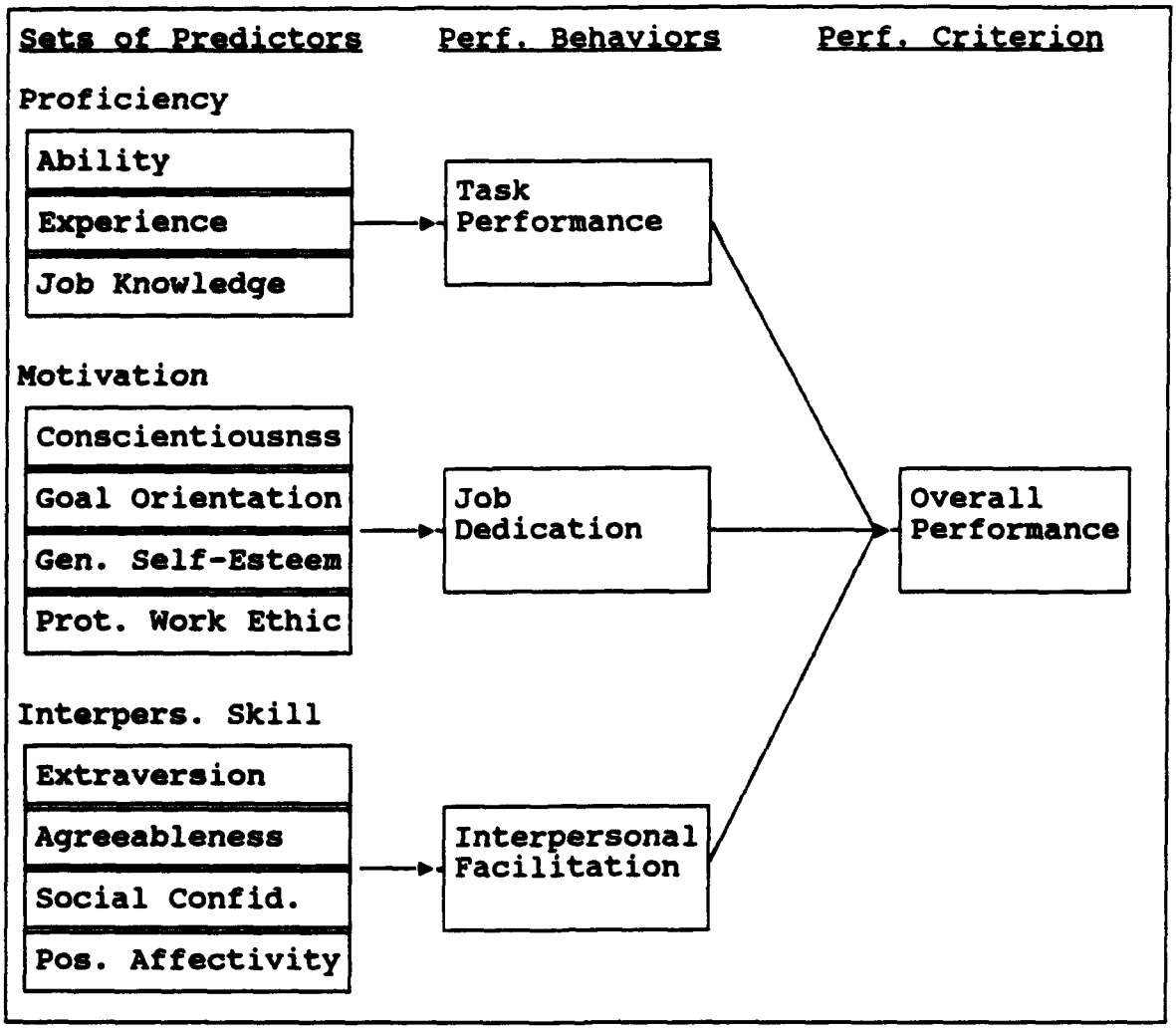



FIGURE 2-1
OVERVIEW OF PROPOSED MODEL

potential predictors from the individual difference domain that are associated with particular types of performance behavior. This approach generally corresponds with Cohen and Cohen's (1983) discussion of the use of functional sets of variables in prediction. The three categories of predictors described in the preceding section (proficiency, motivation, and interpersonal skill) were hypothesized to contribute differently to the prediction of the three performance elements.

## Research Objectives

The primary objective of this study was to test the usefulness of distinguishing between task performance, interpersonal facilitation, and job dedication. The second objective was to develop a prediction model incorporating appropriate predictor variables, performance elements, and overall performance.

The objectives listed above were restated in the form of research questions and testable propositions. The research questions and propositions are listed next.

## Research Questions/Propositions

Question 1: Are task performance, interpersonal facilitation, and job dedication different aspects of performance that explain unique and significant portions of the variance in overall performance?

a. Proposition 1: Task performance, job dedication, and interpersonal facilitation each have statistically significant paths to overall performance.

Question 2: Are task performance, job dedication, and interpersonal facilitation more strongly related to some sets of individual difference variables than others?

a. Proposition 2: The proficiency predictors (ability, experience, and job knowledge) explain a significant amount of variance in task performance over the variance accounted for by the interpersonal skill predictors (extraversion, agreeableness, social confidence, and positive affectivity).

b. Proposition 3: The interpersonal skill predictors do not explain a significant portion of variance in task performance beyond the variance explained by the proficiency predictors.

c. Proposition 4: The proficiency predictors explain a significant amount of variance in task performance over the variance accounted for by the motivation predictors (conscientiousness, general self-esteem, goal orientation, and Protestant Work Ethic).

d. Proposition 5: The motivation predictors do not explain a significant amount of variance in task performance over the variance explained by the proficiency predictors.

e. Proposition 6: The interpersonal skill predictors explain a significant amount of variance in interpersonal facilitation over the variance explained by the task proficiency variables.

f. Proposition 7: The proficiency predictors do not explain a significant amount of variance in interpersonal facilitation over the variance explained by the interpersonal skill predictors.

g. Proposition 8: The interpersonal skill predictors explain a significant amount of variance in interpersonal facilitation over the variance explained by the motivation predictors.

h. Proposition 9: The motivation predictors do not explain a significant amount of variance in interpersonal facilitation over the variance explained by the interpersonal skill predictors.

i. Proposition 10: The motivation predictors explain a significant amount of variance in job dedication over the variance explained by the proficiency predictors.

j. Proposition 11: The proficiency predictors do not explain a significant amount of variance in job dedication over the variance explained by the motivation predictors.

k. Proposition 12: The motivation predictors explain a significant amount of variance in job dedication over the variance explained by the interpersonal skill predictors.

l. Proposition 13: The interpersonal skill predictors do not explain a significant amount of variance in job dedication over the variance explained by the motivation predictors.

# CHAPTER 3
# METHODS

The first section of this chapter describes the methods used to obtain estimates of the inter-rater reliabilities of the supervisory ratings used in this study. Then procedures used in the main study are outlined and the results of preliminary analyses are reported.

## Study #1

The primary purpose of the reliability study was to estimate the inter-rater reliabilities of task performance, interpersonal facilitation, job dedication, and overall performance ratings. A second purpose was to identify problems with the rating forms or self-report instruments that might have needed correcting before the main study began. The reliability study's sample, instruments, methods and some pertinent results are described below. Supervisors and subordinates were members of the same population (enlisted Air Force mechanics) as those in the main study, but worked in a separate location. Their working conditions, facilities, equipment, training, manning levels, and work standards were similar in nearly all respects.

### Subjects

The subjects for the study were 506 Air Force mechanics in the grades of E-2 (Airman) through E-5 (Staff Sergeant).

The mechanics and their supervisors were responsible for launching and recovering F-15 and F-16 fighter aircraft and for maintaining and configuring aircraft, ordnance, and armament systems. Because the subjects were not active participants in this study, detailed information about them was not available, but official records provided some descriptive information. A measure of job experience (total time in the Air Force) was obtained for 383 subjects. Twenty-one percent of this group had 2 years experience or less; 28 percent had 2-4 years experience; 29 percent had 5-8 years experience; the remainder had more than 8 years experience.

To ensure supervisors had adequate opportunity to observe their subordinates' performance, I required that ratings be based on a minimum of 120 days of observation. Supervisors understood and accepted this rule, partly because the same standard was incorporated in the formal Air Force performance evaluation system. Job tenure data was available from automated records for 403 subjects; the period of supervision for the remaining subjects was verified manually. In total, 45 subjects who did not meet the 120 days of supervision criteria were identified and eliminated from the study.

Records showed that 98 of the 403 mechanics with automated job tenure data had been in their present job between 4 and 12 months; 109 had 12-23 months tenure; 112 had 24-35 months in their present position and 39 had been assigned to the same work center for 3 years or more. Thus,

there was evidence the subjects had been in their positions long enough to demonstrate a representative sample of performance.

Raters

Supervisors voluntarily participated in the study. To develop inter-rater reliability estimates, each mechanic was independently rated by two supervisors capable of judging his or her performance. They held titles such as Superintendent, Assistant Superintendent, Flight Chief, Section Chief, and Work Leader. Because of the nature of their work, these supervisors typically maintained close contact with their subordinates, often working alongside them for hours at a time. When subordinates worked without direct supervision their work was reviewed regularly by supervisors.

Although subordinates were supervised closely in general, it was still possible that some individual supervisors might not have worked with a particular subordinate long enough, or closely enough, to have observed a representative sample of performance. To address this possibility, I used the following minimum criteria for supervisory raters in the study: a) the supervisor must have observed the performance of each subject he/she rates for 120 days, b) the supervisor must be authorized to direct the mechanic's performance and give instructions about how work should be performed, c) the supervisor must be expert in the technical aspects of the job, and d) the supervisor must hold the rank of E-5 or above. This last requirement

was intended to ensure the raters had a minimum level of supervisory experience. Supervisors who did not meet these criteria were excluded from the study. In addition, a few supervisors were eliminated because a second qualified rater was not available for their workgroup.

Thirteen pairs of task performance raters, 10 pairs of interpersonal facilitation raters, 11 pairs of job dedication raters, and 8 pairs of overall performance raters met all criteria for inclusion in the study. This group included 2 Senior Master Sergeants (E-8), 31 Master Sergeants (E-7), 48 Technical Sergeants (E-6), and 3 Staff Sergeants (E-5). On average, raters had just over 2 years in their present job and 15.2 years of total job experience. A few individuals rated more than one category of performance.

In summary, the general working conditions and methods of supervision practiced in this sample put supervisors in a good position to judge how effectively the subordinates interacted with others in the work group and how well they performed the technical aspects of the job. The 120 day minimum supervision requirement ensured they had the opportunity to observe a representative sample of performance. The supervisor's experience levels provided evidence that they were well qualified to make judgements about their subordinates' performance.

Rating instruments

Supervisory performance ratings were used to assess four separate aspects of performance. Three of the rating

instruments were developed in a previous study (Motowidlo & Van Scotter, in press). The overall performance measure was unchanged. The task performance and job dedication measures were modified slightly to better fit the objectives of the current research. A fourth instrument, which measured interpersonal facilitation, was designed for the current research. After completing their ratings, supervisors were asked to point out errors or problems with the forms. They did not give any reason to modify the rating forms.

Overall performance

Overall performance was measured by 3 7-point rating scales. Supervisors are asked to rate subordinates' overall performance in comparison with performance standards, the performance of peers, and peers' overall contributions to unit effectiveness. Missing data accounted for less than one percent of the total items. Item scores were averaged for all subjects with two or more ratings. A copy of the scale is contained in Appendix A.

Task performance

The task performance scale was designed to capture differences in how effectively subjects performed the technical aspects of their jobs. Items were based on critical incident categories developed for light vehicle mechanics in the Army's Project A (Campbell, 1987), and task activity dimensions identified in Air Force task analyses of aircraft maintenance jobs. The scale asked: "In comparison with others, how effective is this person in ... a) inspecting, testing, and detecting problems with equipment;

b) trouble-shooting; c) performing routine maintenance; d) repairing; e) using tools and/or test equipment; f) using technical documentation; g) operating equipment; h) working safely; i) inventorying tools; j) cleaning and lubricating equipment components; and k) overall technical performance." Subjects were rated on a 5 point scale that ranged from 1=Much below average to 5=Much above average. Missing data accounted for less than 3% of total responses. Missing responses were replaced with the median of existing item scores for cases with responses on at least 7 items. A few cases with less than 7 responses were set to missing data. A copy of the instrument used by raters is in Appendix B.

Job dedication

A 13-item instrument was developed to measure behavioral patterns like effort, persistence, compliance, discipline and other self-motivated behaviors encompassed by the concept of job dedication. Some of these items originated in Motowidlo and Van Scotter's (in press) contextual performance scale. New items were added to enlarge the range of motivated behaviors tapped by the scale. The instrument is contained in Appendix C. The rating scale asked supervisors: "While performing his or her job, how likely is it that this person would ... a) put in extra hours to get work done on time; b) pay close attention to important details; c) work harder than necessary; d) ask for a challenging work assignment; e) avoid shortcuts when work is overdue; f) defend the supervisor's decisions; g) display proper military appearance and bearing; h) take

initiative to solve a work problem; i) exercise personal discipline and self-control; j) persist in overcoming obstacles to complete a task; k) render proper military courtesy; l) follow the supervisor's instructions; m) tackle a difficult work assignment enthusiastically." Subjects were rated on a 5 point scale ranging from 1=Not at all likely to 5=Extremely likely. Missing data accounted for one percent of the data. Missing responses were replaced with the median of existing item scores for cases with ratings on at least 9 items.

Interpersonal facilitation

A 13 item scale was developed to measure the type of behaviors encompassed by interpersonal facilitation. It can be found in Appendix D. Items used in Motowidlo and Van Scotter's (1993) contextual performance measure were augmented by new items describing cooperative, helpful, altruistic, considerate, expressive, and directive behaviors. This measure asks raters: "While performing his or her job, how likely is it that this person would . . a) display a cheerful, confident outlook; b) cooperate with others effectively; c) communicate effectively at work; d) praise coworkers when they are successful; e) listen to others' ideas about getting work done; f) support or encourage a coworker with a personal problem; g) give coworkers advice about how to do their jobs; h) offer to help others do their work; i) talk to others before taking actions that might affect them; j) say things to make people feel good about themselves or the work group; k) encourage

others to overcome their differences and get along; l) treat others fairly; m) help someone without being asked." Subjects were rated on a 5 point scale ranging from 1=Not at all likely to 5=Extremely likely. Missing data accounted for less than one percent of the total number of items. Missing responses were replaced with the median of existing item scores for cases with ratings on at least 9 items.

Procedures

With the assistance of project contacts at the site, personnel rosters listing the supervisors and subordinates within each work group were obtained a few weeks before data collection was scheduled to begin. Project contacts helped determine which groups and individuals would be available during the time scheduled for data collection. Four sets of rating forms, one for each performance dimension and overall performance, were prepared for each work group that were expected to be available to participate.

The actual data collection was accomplished in one of two ways. The primary method was to meet with a group of 5-10 supervisors, describe the project to them, and then ask for volunteers. None of the supervisors approached this way declined to participate. However, some supervisors did not attend the meetings. There was no way to tell if those not in attendance were absent because of job requirements or because they did not want to participate in the study. In addition, some individuals who volunteered did not meet the participation criteria. Next, supervisors were provided with rating forms containing the names of their

subordinates. Rating procedures were explained and the supervisors were asked to complete the ratings before leaving the meeting room. The entire process was usually completed within 30 minutes. When operational commitments did not permit this, or key supervisors could not attend the meeting scheduled in their area, a fall-back method was to have a project officer (normally an E-8 or E-9) distribute the rating forms, instruct the supervisors on how to use them, and ensure the completed forms were returned as soon as possible. Every effort was made to safeguard the privacy of participants.

These procedures netted 648 pairs of ratings that met all criteria. There were 192 sets for task performance; 147 for interpersonal facilitation; 168 for job dedication; and 141 for overall performance. The methods described above ensured that ratings used to estimate inter-rater reliabilities were made by qualified, independent raters who had adequate time to observe their subordinates' performance.

## Results

Intraclass correlations were computed using the ICC(2,1) formula presented by Shrout and Fleiss (1979). It is appropriate when reliability estimates from one group will be used in a different group. Initial estimates calculated for the full rating scales indicated the inter-rater reliabilities were high enough to be useful in the main study.

The alpha reliabilities indicate a high level of internal consistency. The intraclass correlations are comparable with those obtained with Army supervisors as part of the research for Project A (Borman et al., 1991; Campbell & Zook, 1992), and are large enough to be useful in the current research. If the reliabilities had been to low to be useful, or serious problems with the instruments had been identified, changes would have been made at this time. Since they were acceptable, the decision was made to go ahead with the main study on schedule. Table 3-1 shows the reliabilities computed for the supervisory ratings.

TABLE 3-1
INITIAL PERFORMANCE SCALE RELIABILITY ESTIMATES

RELIABILITY ESTIMATES
FOR INITIAL RATING SCALES

| Scale | N | Alpha | ICC(2,1) |
|---|---|---|---|
| 1. Overall Performance | 141 | .95 | .66 |
| 2. Task Performance | 192 | .96 | .46 |
| 3. Interpersonal Facilitation | 147 | .94 | .53 |
| 4. Job Dedication | 168 | .93 | .66 |

Note: Alphas reported above are the average of the alphas computed for Rater "A" and Rater "B."

## Study #2

The second study addressed the two main objectives of this research. The first was to determine whether or not task performance, interpersonal facilitation, and job dedication could be distinguished from each other. The second was to determine whether or not each of them contributed independently to overall performance. To ensure unreliable measures did not lead to false conclusions, measurement error was incorporated in the analysis.

### Subjects

In total, 1136 Air Force mechanics participated in the study by completing self-report measures, receiving performance ratings, or both. By grade, 131 were Airmen (E-2); 224 held the rank of Airman First Class (E-3); 415 were Sergeants (E-4); 343 were Staff Sergeants (E-5); and there were 23 individuals whose grade could not be determined. The mechanics and their supervisors worked closely together to maintain and support F-15 and F-16 aircraft, ordnance, and armament systems. A total of 598 subjects voluntarily completed a self-report questionnaire measuring job knowledge, personality traits, and orientations that were expected to predict the pattern of behaviors described by one of the performance factors.

The self-report form also asked for information about the subjects' personal characteristics and experience in the Air Force. Subjects who provided self-report data were primarily White (82.2%) males (93.8%) between the ages of 21 and 30 (68.5%). About 16 percent (15.9%) of the subjects

indicated they were over 30 years old; and 15.6 percent reported being under 21 years of age. About 6.2 percent of the total were female; 10.6 percent were Black; 4.4 percent were Asian; and 1.5 percent were Hispanic. Total service time was used as the measure of job experience. Twenty-two percent of 1118 subjects for which experience data were available had less than 2 years experience; 20 percent had 2-3 years experience; 12 percent had 4-5 years experience; 16 percent had 6-7 years experience; 12 percent had 8-9 years experience; and 18 percent had 10 or more years of experience.

As in the reliability study, I required a minimum of 120 days supervision for performance ratings used in this study. Information on the length of time a supervisor had observed a subordinate's performance was calculated from official records on both individuals, supplemented by supervisors' reports and subjects' self-reports. After ratings that did not meet the minimum standards were eliminated, there were 760 subjects whose performance had been rated on all four performance measures. The average period of observation for ratings included in the study ranged from 11.8 months (SD=6.4) for overall performance to 12.5 months (SD=8.0) for interpersonal facilitation.

Raters

A total of 268 supervisors voluntarily provided ratings of one or more subordinates' performance. The criteria for supervisors' participation used in the reliability study were used in this study without modification. These

criteria provided some assurance that ratings used to test the study's propositions were based on representative samples of subordinates' performance, and that the supervisors had the requisite experience to accurately judge the technical aspects of job performance. These Work Leaders, Section Chiefs, Flight Chiefs, and Superintendents worked closely with their subordinates and monitored their work regularly.

By grade, the supervisors included 1 Chief Master Sergeant (E-9); 5 Senior Master Sergeants (E-8); 96 Master Sergeants (E-7); 116 Technical Sergeants (E-6); and 40 Staff Sergeants (E-5s). The majority (78.6%) of the 253 supervisors reporting their race were White; 15 percent were Black; 2 percent were Hispanic; 1 percent were Asian; the remainder did not respond. Ninety-four percent were male; 2 percent were female; and 4 percent did not indicate their gender. The average supervisor had 14.4 years of Air Force experience and had been in his or her present assignment for 27 months. These statistics provide evidence that the supervisors had adequate experience and observational opportunities to rate their subordinates' performance.

Instruments

The instruments used to obtain supervisory ratings on the three performance dimensions and overall performance were described in the last section. Since they were not modified, that description will not be repeated here. The objectives of this study also required measurement of individual difference variables expected to predict the

behavioral patterns of task performance, interpersonal facilitation, job dedication, and overall performance. A 139-item self-report questionnaire was designed to measure antecedents of the 3 performance factors and collect demographic data describing the sample. The measures comprising the self-report questionnaire are described below.

Demographic information

Demographic information collected for the study included the subject's age, race, gender, educational level, Air Force Specialty Code (AFSC), and length of time assigned to the current organization.

Task performance predictors

Following research conducted by Hunter (1983), and extended by Schmidt et al., (1986) and Borman et al., (1991), experience, ability and job knowledge were expected to predict ratings of task performance. Total service time was used as the measure of experience. The ability measure was the subject's Armed Forces Qualifying Test (AFQT) score. Studies reviewing the psychometric properties of the Armed Services Vocational Aptitude Battery (ASVAB) composites that are summed to form the AFQT have supported the reliability (Palmer, Hartke, Ree, Walsh, & Valentine, 1988) and validity (Wilbourn, Valentine & Ree, 1984) of the ASVAB. The experience and ability measures were obtained from official records.

Subjects completed a 25-question job knowledge test as part of the self-report questionnaire. Job knowledge tests

for the maintenance specialties likely to participate in this research were provided by the Air Force Extension Course Institute (ECI). Later, ECI subject matter experts provided scoring instructions and ensured tests for the 14 maintenance specialties were relevant to the specific types of equipment maintained by participants in the study. After scoring was complete, raw scores were standardized within occupation and rescaled to a mean of 50 and a standard deviation of 10. The weighted average alpha reliability across the 14 tests was .65 (N=572).

Interpersonal facilitation predictors

The four variables expected to predict interpersonal facilitation were extraversion, agreeableness, social confidence, and positive affectivity. The personality dimensions of extraversion and agreeableness, were measured by the short form of Costa and McCrae's (1989) NEO Five-Factor Inventory. Subjects used a 5-point scale ranging from 1=Strongly disagree to 5=Strongly agree to indicate their feelings about statements reflecting extraversion or agreeableness. Alpha reliabilities for this sample (.71; N=592) for extraversion and (.73; N=594) for agreeableness are comparable to those reported by Costa and McCrae (1989).

Social confidence was measured with 10 items described by Fleming and Courtney (1984) that asked the respondent how frequently he or she felt anxious, nervous, or inadequate in various group or social situations. Anchors for the 5-point scale were 1=Not at all to 5=All the time. The internal consistency of the scale was acceptable (alpha=.85; N=588).

Item scores were summed to obtain an index of social confidence.

Positive affectivity was measured via Watson, Clark, and Tellegen's (1988) 10-item scale. Subjects were asked to: "Indicate to what extent you have felt this way during the past year." The 5-point response scale ranges from 1=Very slightly or not at all to 5=Extremely. Internal consistency reliability was .87 (N=595). Use of a fairly long time period "past year" as the reference period was suggested by George (1991) as appropriate for measurement of the trait aspects of PA.

Job dedication predictors

Four constructs were expected to predict job dedication: conscientiousness, goal orientation, general self-esteem, and protestant work ethic. Item scores were summed to form scale scores for each item. Conscientiousness was measured by 12 items on Costa and McCrae's (1989) NEO Five Factor Inventory. Alpha reliability for the scale was .79 (N=592). Goal-orientation was measured via Malouff et al.'s (1990) 15 item instrument which asked subjects how strongly they agreed with statements about the frequency with which they engaged in goal-oriented behaviors. Responses were on a 5-point scale ranging from 1=Strongly disagree to 5=Strongly agree. The alpha reliability was .87 (N=588). General self-esteem was measured by 12 items describing assessments of personal competence, feelings of confidence, and self-esteem. Ten items from Motowidlo's (1979) scale formed the core of this

measure; two closely related items suggested by Fleming and Courtney's (1984) study completed the scale. Items were anchored by a 5-point scale ranging from 1=Not at all to 5=All the time. The alpha reliability was .77 (N=588) for this sample. Protestant work ethic was assessed via eight items from Blood's (1969) scale. Subjects used a 5-point scale (1=Strongly disagree to 5=Strongly agree) to indicate their feelings about work and personal values. The alpha reliability obtained for this scale (.45; N=595) was unacceptable and this variable was dropped from further analyses.

Refining the Performance Scales

Factor analysis was used to refine the task performance, interpersonal facilitation, and job dedication scales. The objective was to sharpen the focus of the scales and remove extraneous sources of variation that might have confounded analysis procedures or interpretation of the study's results. In contrast, there were no good reasons to attempt to refine the predictor variables. They were selected because they were the best measures available to test the study's objectives. Changes would make the study's results uninterpretable and sever links with other research.

Correlated measurement error

A decision about correlated measurement error was made before the analyses reported below were accomplished. A key assumption of the LISREL method is that measurement errors are uncorrelated. This is seldom the case (MacCallum, Roznowski & Necowitz, 1992). The implications of various

strategies for dealing with correlated errors have received some recent attention (Anderson & Gerbing, 1986; Joreskog, 1993; McCallum et al., 1992; Reddy, 1992). Since the generalizability of the inter-rater reliabilities from one sample to another was important in the present research, McCallum et al.'s (1992) study was the most relevant. They showed that data-driven modifications are unlikely to generalize to other samples. Their analysis, coupled with Joreskog and Sorbom's (1993) advice to emphasize theoretical considerations over empirical ones convinced me not to free error covariances in order improve a model's fit.

Factor analysis approach

To ensure theoretical considerations influenced the form of the final scales, I identified four "anchor" items from each performance scale before the analysis began. The anchors were essential items that conveyed the central theme of the performance category. No matter what interim factor analysis results indicated, these items would not be dropped from the scale. If all the other items were dropped in this process, the final scale for that performance category would only contain the four anchors, and the analysis would have done no more than confirm the a priori scale. On the other hand, if the final scales contained additional items, those items reflected the core concept described by the anchors more than some other source of variance.

Anchors. The anchors for the task performance scale were ratings of effectiveness in: a) inspecting, testing, and detecting problems with equipment; b) performing routine

maintenance; c) repairing; and d) overall technical performance. The rationale for using anchors was straightforward: If the task performance scale did not measure these behaviors, it did not measure task performance as it had been defined in this study.

The same logic applied to the other dimensions. Items considered essential for the interpersonal facilitation scale asked raters, "... how likely is that this person would: a) support or encourage a coworker with a personal problem; b) talk to others before taking actions that might affect them; c) treat others fairly; d) help someone without being asked." Thus, helpful and considerate behaviors anchored the measure of interpersonal facilitation.

Job dedication was anchored by items that measured the likelihood that the subject would: a) put in extra hours to get work done on time; b) pay close attention to important details; c) work harder than necessary; d) persist in overcoming obstacles to complete a task. Behaviors displaying effort anchored the measure of job dedication. Selecting core items for each scale ensured theoretical considerations influenced the content of the final scales.

Samples for factor analyses. Researchers have consistently advised the use of cross-validation samples with LISREL to avoid misspecification (Byrne, 1989; Bollen, 1989; Joreskog & Sorbom, 1989). I identified development and cross-validation samples before beginning the analyses. Sample 1 consisted of ratings on the performance dimension obtained from rater "A" in the reliability study. Sample 2

consisted of ratings obtained from rater "B" in that study. Samples 1 and 2 shared a common source of variance (the subjects), so they were dependent. To ensure this factor did not adversely affect conclusions, a third sample, which was totally independent from the others was identified. Sample 3 consisted of subjects from the main sample who were missing ratings on at least one performance dimension, but had valid ratings on others.

Scale development procedure. In the first stage of the analysis, data from Sample 1 were used in the way described above to develop an initial factor structure. The procedure was very simple. Maximum likelihood factor analysis was used iteratively to: 1) compute a two factor solution and identify items with loadings $\geq |.30|$ on the second factor, and 2) compute the $X^2$ statistic and significance for a one-factor model after the item(s) had been removed. This process continued until a non-significant $X^2$ statistic was obtained for the one-factor model or no items loaded $\geq |.3|$ on the second factor. The only exception was that anchor items were considered essential; they would never be deleted because of statistical criteria.

Cross-validation procedures. Next, the factor structure was cross-validated in Sample 2 (same-subject, different-rater). LISREL confirmatory factor analysis procedures were used to estimate the scale's overall fit and to determine whether or not all factor loadings were significant in the new sample. The same procedure was repeated in Sample 3 (different-subject, different-rater).

These methods followed Joreskog and Sorbom's (1993) advice in emphasizing theoretical rather than statistical criteria in scale development and testing. This approach led to the use of anchors to ensure performance factor scales centered on the sources of variation that were theoretically important. Confirmatory analyses in two samples provided thorough cross-validation of the performance scales' overall fit.

Results for task performance

The final task performance scale consisted of the 6 items shown in Figure 3-1. The words "completely standardized" at the top of the table indicate the observed and latent variables have all been scaled to a variance of one (Joreskog & Sorbom, 1993). Inspection of the scale items shows that they correspond to the underlying theme of proficiency that was intended for this scale. The range of behavioral patterns encompassed by these items is fairly large. The items appear to cover the most relevant parts of the task performance domain for the mechanics in this study. The pattern of factor loadings is very similar across the three samples, indicating a high degree of consistency in supervisors' responses. The overall fit indices in Table 3-2 support the usefulness of the scale. The range of values for Bentler and Bonett's (1980) Normed Fit Index (NFI) and Bentler's (1990) Comparative Fit Index (CFI) shown here (NFI=.97 to .99; CFI=.98 to 1.0) signal an excellent fit. Goodness of fit indexes of 0.90 or greater are generally considered to indicate an acceptable fit (Bollen, 1989;

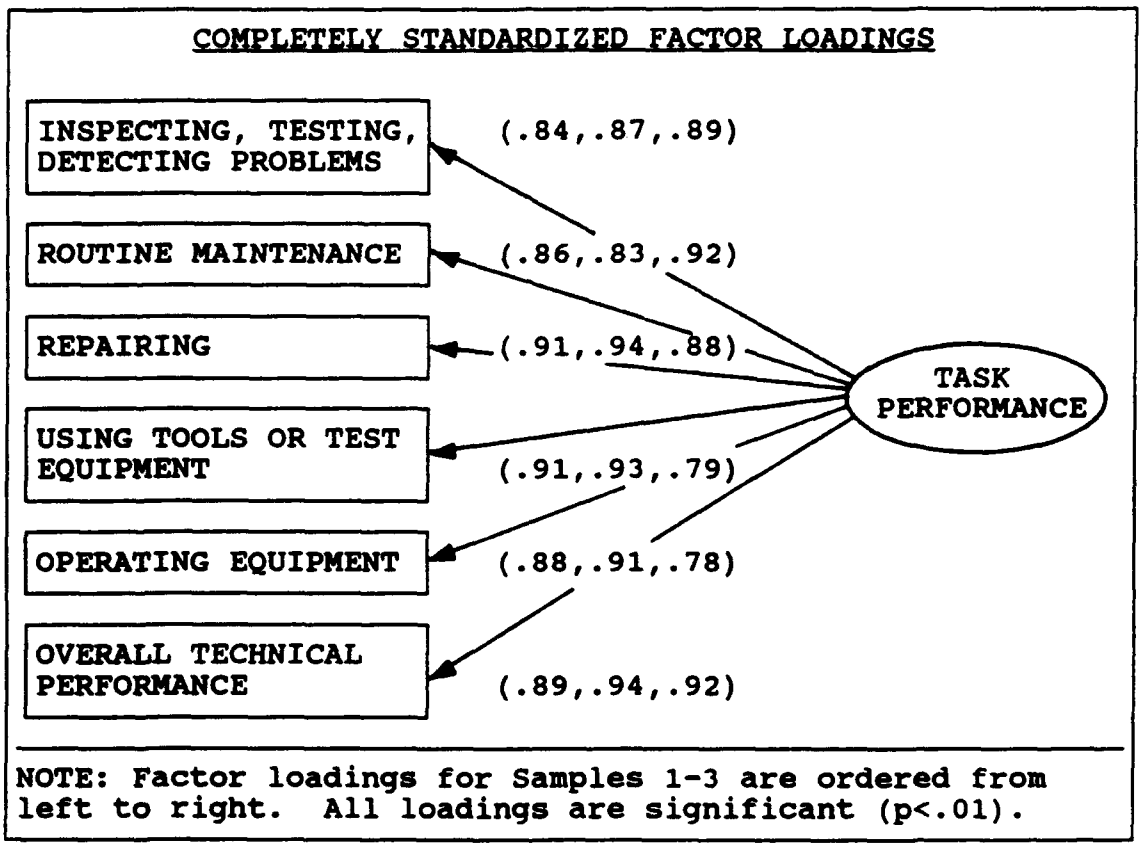



FIGURE 3-1
TASK PERFORMANCE SCALE FACTOR LOADINGS

Byrne, 1989; Marsh, Balla & McDonald, 1988). Confirming the scale in two additional samples increases confidence that these results did not result from sample specific error (Joreskog & Sorbom, 1993).

TABLE 3-2
TASK PERFORMANCE FACTOR ANALYSIS RESULTS

| | Description of Analysis | N | $X^2$ | DF | p< | NFI | CFI |
|---|---|---|---|---|---|---|---|
| 1 | Exploratory (Sample 1) | 192 | 14.4 | 9 | .110 | .99 | 1.00 |
| 2 | Confirmatory (Sample 2) Same subjects, new raters. | 192 | 50.1 | 9 | .000 | .96 | .97 |
| 3 | Confirmatory (Sample 3) New subjects, new raters. | 168 | 26.5 | 9 | .002 | .97 | .98 |

Results for interpersonal facilitation

The factor analysis procedure resulted in a 7 item interpersonal facilitation scale. The scale items are shown in Figure 3-2. Besides the core behaviors of helpfulness and consideration for others, this scale contains items describing things people do to make others feel good about themselves and to get along with each other. Aside from the word "coworker" in a few of the items, there is little about these behaviors that is work-specific. They seem to represent a standard of desirable behaviors that would apply in most situations. The scale items also seem compatible

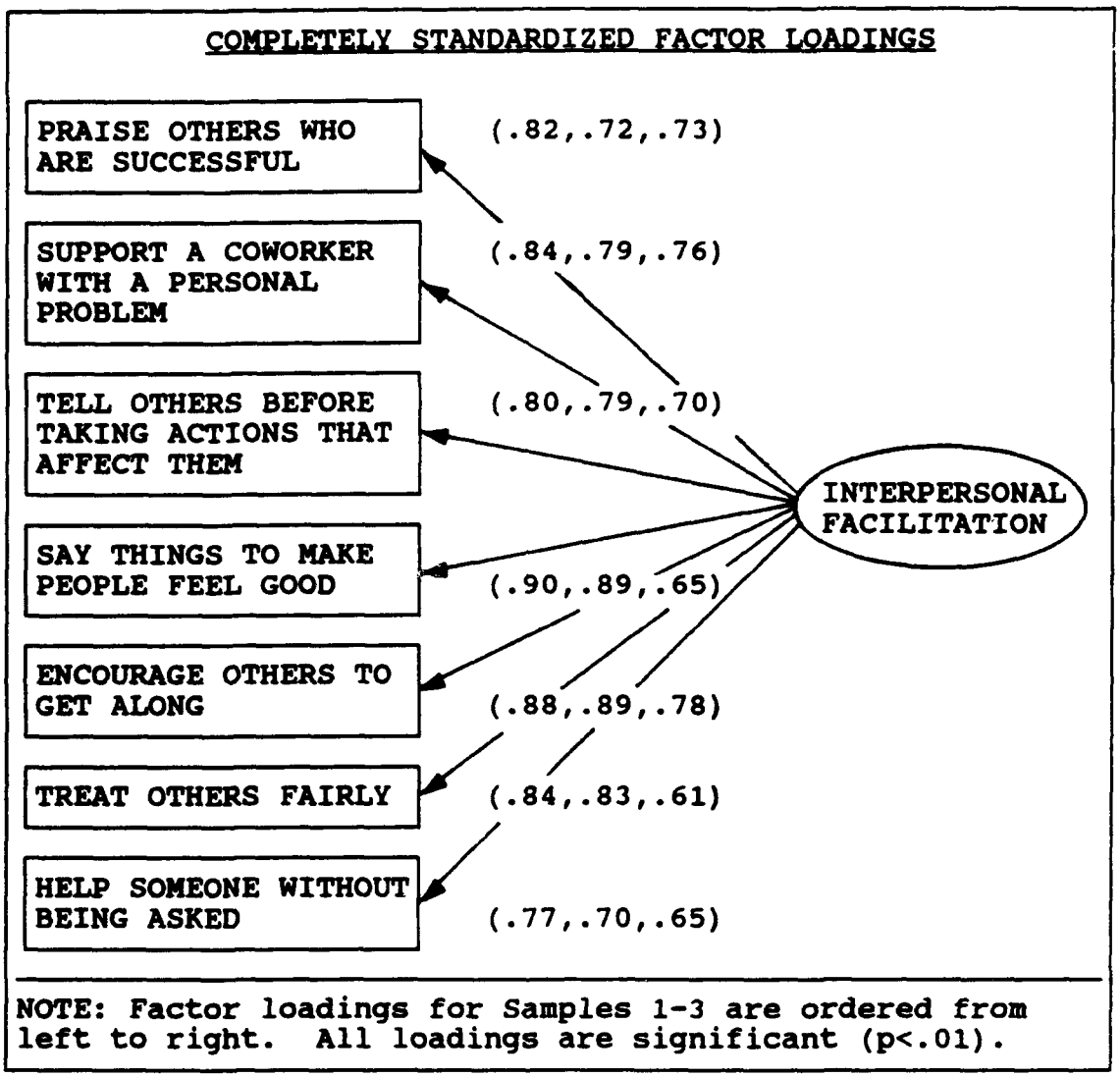



FIGURE 3-2
INTERPERSONAL FACILITATION SCALE FACTOR LOADINGS

with the idea that some behaviors would affect others' performance by: a) helping them personally; b) encouraging or praising them personally; or c) helping to create an interpersonal climate favorable to effective performance performance. It is hard to see how any of these behaviors would contribute directly to the organization's technical core or to the actor's effectiveness at task activities. All loadings are significant, and the pattern of loadings is consistent across the samples. The structure implied by this scale fits the data very well, as the fit indices in Table 3-3 show. Results for Sample 2 and Sample 3 support the refined scale. The results for Sample 3 are particularly encouraging since its raters and subjects were completely independent from the other 2 samples.

TABLE 3-3
INTERPERSONAL FACILITATION FACTOR ANALYSIS RESULTS

| | Description of Analysis | N | $X^2$ | DF | p< | NFI | CFI |
|---|---|---|---|---|---|---|---|
| 1 | Exploratory (Sample 1) | 147 | 26.2 | 14 | .025 | .97 | .99 |
| 2 | Confirmatory (Sample 2) Same subjects, new raters. | 147 | 56.1 | 14 | .000 | .92 | .94 |
| 3 | Confirmatory (Sample 3) New subjects, new raters. | 147 | 34.2 | 14 | .002 | .92 | .95 |

Results for job dedication

Factor analysis produced an 8 item job dedication scale. The items shown in Figure 3-3 all describe some aspect of effort. The pattern of factor loadings is very similar across three samples. The overall fit indices in Table 3-4 also shows that this scale fits the data in all 3 samples.

TABLE 3-4
JOB DEDICATION FACTOR ANALYSIS RESULTS

| | Description of Analysis | N | $X^2$ | DF | p< | NFI | CFI |
|---|---|---|---|---|---|---|---|
| 1 | Exploratory (Sample 1) | 168 | 34.2 | 20 | .024 | .97 | .99 |
| 2 | Confirmatory (Sample 2) Same subjects, new raters. | 168 | 51.0 | 20 | .000 | .96 | .98 |
| 3 | Confirmatory (Sample 3) New subjects, new raters. | 123 | 75.1 | 20 | .000 | .91 | .94 |

Inter-Rater Reliability

The inter-rater reliabilities for the performance measures were estimated next. Shrout and Fleiss' (1979) case 2 intraclass correlation, ICC(2,1), was appropriate since the reliability estimates were based on paired ratings from the sample collected in study #1. ICC(2,1) estimates the single-rater reliability that would be found if a scale was used by a number of different raters. Shrout and Fleiss provided the following formula: ICC(2,1)= (BMS-EMS)÷[BMS+(k-1)EMS+k(JMS-EMS)/n']. BMS is the between target mean square error (MSE)

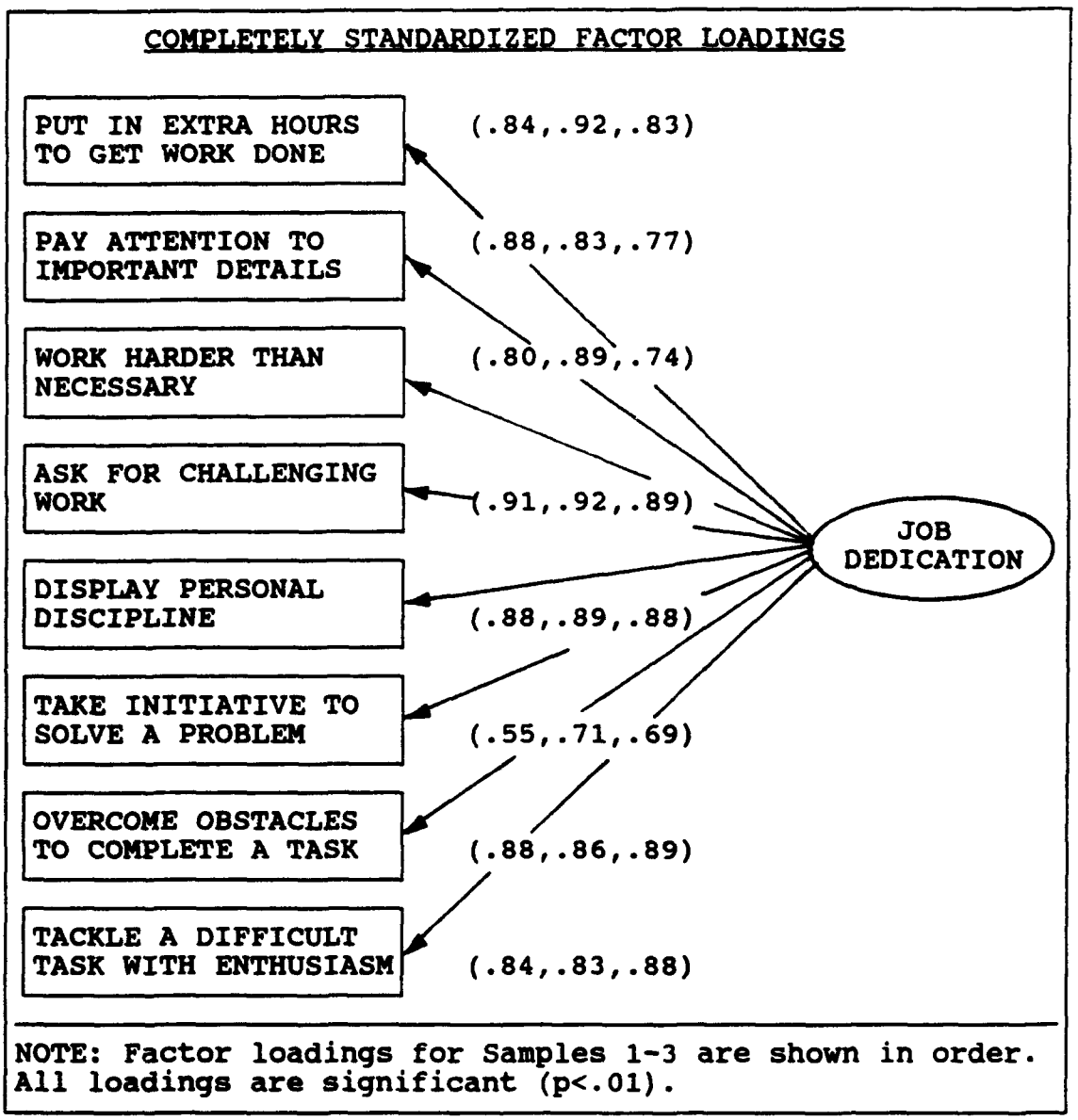



FIGURE 3-3
JOB DEDICATION SCALE FACTOR LOADINGS

from a two-way targetXjudge Analysis of Variance (ANOVA) table; JMS is the between judge MSE; EMS is the residual MSE; k is the number of judges; and n′ is the number of targets. I will refer to this reliability estimate as the standard ICC(2,1) to distinguish it from another method that is presented below.

Shrout and Fleiss's formula assumes targets, raters, and random error are responsible for all the variance in ratings. Group effects may be an additional source of variance in the present study (Shavelson, Mayberry, Li, & Webb, 1990). Recall that task performance ratings were aggregated across 13 workgroups to arrive at the total of 192 paired ratings. For each of the 13 workgroups, a pair of judges rated the same list of subordinates. As a result, judges and situational characteristics were not constant for all targets.

Since the standard ICC(2,1) formula does not include a group variance component, variance associated with group differences is distributed among the existing variance components. If differences associated with group membership are small, the standard ICC(2,1) accurately estimates inter-rater reliability. When differences are large, the standard ICC(2,1) produces a conservative (under) estimate of the reliability of ratings.

Pooled variance ICC(2,1)

Recently, Shavelson et al. (1990) demonstrated a general method for accommodating group differences in reliability analyses. Instead of computing a single two-way ANOVA for the whole sample, they computed separate ANOVA's for each

group and totaled the sums of squares and degrees of freedom. In the present study, reliability estimates were calculated for these pooled sums of squares and degrees of freedom using the ICC(2,1) formula presented above. If group effects explain a significant portion of the variance in ratings, the pooled variance method will estimate ICC(2,1) more accurately than the standard ICC(2,1). If rating group effects are not a significant factor, results obtained from this method should equal those obtained by the standard ICC(2,1) method.

There are advantages and disadvantages to both methods. The standard ICC(2,1) approach requires less computation, and is probably more familiar to researchers, but it may ignore an important source of variance. The pooled variance method deals with the variance associated with rating group membership efficiently, but has a greater risk of capitalizing on chance because it requires more ANOVAs with smaller samples.

It is not clear which method produces the best estimate of reliability. The standard ICC(2,1) considers all of the variance associated with groups (or raters) to be true variance; the pooled ICC(2,1) considers it to be error. The true reliability is somewhere in the middle, framed by the standard ICC(2,1) at the low end and the pooled ICC(2,1) at the high end. Thus, it seems useful to think of the two intraclass correlations as a kind of confidence interval. Both estimates were reported, but decisions in this study were based on the standard ICC(2,1). It provides a more conservative (and rigorous) test of the propositions in this study because the smaller reliabilities computed with the

standard ICC(2,1) produce larger corrected correlations, and the closer the corrected correlations get to 1.0, the more difficult it is to distinguish between the performance components. The standard correction formula, $r_{12c} = r_{12} + (\sqrt{r_{11}\ r_{12}})$, reported in Nunnally (1978, pp. 219-220) illustrates this relationship. Since the central question in this study is whether or not three types of performance could be distinguished from each other, using the ICC(2,1) estimate to correct correlations provides a conservative test. On the other hand, if estimating the maximum size of the correlation between 2 variables was the objective of the study, using a higher reliability estimate would be more conservative (e.g., Guilford, 1965, pp. 486-488).

TABLE 3-5
REVISED PERFORMANCE RATING SCALE RELIABILITIES

RELIABILITY ESTIMATES FOR REVISED RATING SCALES

| Scale | N | Alpha | Standard ICC(2,1) | Pooled Var. ICC(2,1) |
|---|---|---|---|---|
| 1. Overall Performance | 141 | .95 | .66 | .70 |
| 2. Task Performance | 192 | .96 | .50 | .68 |
| 3. Interpersonal Facilitation | 147 | .93 | .41 | .59 |
| 4. Job Dedication | 168 | .95 | .69 | .78 |

Note: Alphas reported above are the average of the alphas computed for Rater "A" and Rater "B."

# CHAPTER 4
# RESULTS

This chapter describes results obtained in testing the study's propositions, the effects of measurement error on those results, and supplemental analyses testing an alternate performance model.

## Initial Analyses

Multiple linear regression, hierarchical linear regression, and hierarchical set regression methods (Cohen & Cohen, 1983) were initially used to test the study's propositions. Parallel analyses demonstrated the effects of measurement error on path coefficients and squared multiple correlations. Measurement error was incorporated into the analysis by correcting correlation matrices for attenuation. Table 4-1 shows the uncorrected and corrected correlations among the performance measures.

An examination of Table 4-1 provides some information about how the performance dimensions are related and how measurement error affects their inter-relationships. The inter-correlations are stronger than expected. Since each subject was rated by four independent supervisors, the size of the correlations can not be explained by common-method variance.

TABLE 4-1
UNCORRECTED CORRELATIONS AMONG PERFORMANCE MEASURES AND CORRELATIONS CORRECTED USING THREE ESTIMATES OF RELIABILITY

| Type Reliability Used to Correct Correlations | Reliability Estimate | a | b | c |
|---|---|---|---|---|
| 1. Uncorrected | | | | |
| a. Overall Performance | 1.00 | | | |
| b. Task Performance | 1.00 | .55 | | |
| c. Interpersonal Facilitation | 1.00 | .45 | .37 | |
| d. Job Dedication | 1.00 | .53 | .48 | .34 |
| 2. Alpha | | | | |
| a. Overall Performance | .95 | | | |
| b. Task Performance | .96 | .58 | | |
| c. Interpersonal Facilitation | .93 | .48 | .39 | |
| d. Job Dedication | .95 | .56 | .50 | .36 |
| 3. Pooled Variance ICC(2,1) | | | | |
| a. Overall Performance | .70 | | | |
| b. Task Performance | .68 | .80 | | |
| c. Interpersonal Facilitation | .59 | .70 | .50 | |
| d. Job Dedication | .78 | .71 | .66 | .50 |
| 4. Standard ICC(2,1) | | | | |
| a. Overall Performance | .66 | | | |
| b. Task Performance | .50 | .96 | | |
| c. Interpersonal Facilitation | .41 | .87 | .82 | |
| d. Job Dedication | .69 | .79 | .82 | .64 |

Notes: N=760 for correlations. N=141-192 paired ratings for reliability estimates. Correlations were corrected for unreliability in both measures.

In the uncorrected matrix, each of the performance factors is more strongly related to overall performance than any of the other performance factors, but correlations with job dedication are nearly as large. Task performance correlates more strongly with overall performance than interpersonal facilitation does ($p<.01$; one-tailed), and job dedication was more strongly associated with overall

performance than interpersonal facilitation was ($p<.01$; one-tailed).

These relationships remain the same under the alpha and pooled ICC(2,1) estimates. When the lowest reliability estimate is used, the pattern changes. In this situation, task performance and interpersonal facilitation have the stronger correlations with overall performance. Job dedication is more strongly correlated with task performance than overall performance. This relationship suggests another interpretation of these overall relationships; it is possible the performance ratings are highly correlated because the performance factors are not strictly independent of each other. Perhaps there are causal relationships among the performance factors. Based on the motivation literature the most likely relationship would have job dedication influencing the other two.

Table 4-2 shows the uncorrected intercorrelations and alpha reliabilities for all variables in the analysis. The pattern of correlations supports distinguishing task performance from the other two factors. The correlation between experience and task performance was significantly larger ($p<.01$; one-tailed) than its correlation with interpersonal facilitation or job dedication. Job knowledge correlated more strongly with task performance than interpersonal facilitation ($p<.05$; one-tailed). Agreeableness did not correlate with task performance ($r=0.0$), but correlated positively and significantly with

TABLE 4-2
UNCORRECTED CORRELATIONS AND RELIABILITIES OF ALL MEASURES

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. Overall Rating | (.95) | | | | | | | | | | | | | |
| 2. Task Performance | .56 | (.96) | | | | | | | | | | | | |
| 3. Int. Facilitation | .47 | .40 | (.93) | | | | | | | | | | | |
| 4. Job Dedication | .53 | .53 | .38 | (.95) | | | | | | | | | | |
| 5. AQE Score | .01 | .02 | -.02 | .01 | (.93) | | | | | | | | | |
| 6. Experience | .23 | .31 | .17 | .20 | -.36 | --- | | | | | | | | |
| 7. Job Knowledge | .16 | .19 | .09 | .15 | .17 | .18 | (.65) | | | | | | | |
| 8. Conscientiousness | .22 | .17 | .12 | .15 | .01 | .02 | .10 | (.79) | | | | | | |
| 9. Goal Orientation | .05 | .03 | .10 | .05 | .06 | -.13 | .03 | .62 | (.88) | | | | | |
| 10. Gen. Self-Esteem | .19 | .11 | .09 | .10 | .15 | .03 | .11 | .53 | .38 | (.77) | | | | |
| 11. Extraversion | .04 | -.03 | .04 | -.08 | .06 | -.12 | -.02 | .35 | .33 | .35 | (.71) | | | |
| 12. Agreeableness | .14 | .00 | .14 | .13 | -.10 | .05 | .00 | .24 | .20 | .08 | .21 | (.73) | | |
| 13. Soc. Confidence | .04 | .02 | .03 | .01 | .02 | .10 | -.02 | .18 | .10 | .44 | .13 | .02 | (.85) | |
| 14. Pos. Affectivity | .14 | .07 | .09 | .11 | .04 | -.06 | -.03 | .50 | .47 | .49 | .49 | .15 | .16 | (.87) |

Notes: N=430. $p<.05$ for $r>.08$; $p<.01$ for $r>.11$. Alpha reliabilites are shown on the diagonal. Job experience was measured by a single item obtained from official records. It was assumed to have a reliability of 1.0.

interpersonal facilitation ($r=.14$; $p<.01$) and job dedication ($r=.13$, $p<.01$).

It is noteworthy that extraversion supports differentiating between interpersonal facilitation and job dedication; the difference between its correlations with those two variables was significant ($p<.05$). The best predictors of the performance factors, across the board, were experience, job knowledge, conscientiousness, and agreeableness. Conscientiousness correlated with 11 of the other 13 variables in the matrix. Agreeableness and positive affectivity correlated significantly with both sets of personality predictor variables. The motivation variables were highly correlated with each other, but the relationships among the interpersonal facilitation predictors were not as strong.

Tests of Propositions

Tests of the study's propositions are described below.

Proposition 1

Proposition 1 predicted that task performance, interpersonal facilitation, and job dedication each had statistically significant paths to overall performance. Proposition 1 was first tested by regressing overall performance on the three performance factors. This produced the standardized path coefficients and significance values shown in Table 4-3. All path coefficients are positive and significant ($p<.01$). For the uncorrected data, Proposition 1 cannot be rejected. Path coefficients computed on correlation matrices corrected for Alpha reliability and the

TABLE 4-3
STANDARDIZED PATH COEFFICIENTS FOR THE REGRESSION OF OVERALL PERFORMANCE ON THREE PERFORMANCE FACTORS

| Performance Factor | Uncorrected Path Coefficient | Standardized Path Coefficients for 3 Estimates of Reliability | | |
|---|---|---|---|---|
| | | Alpha | Pooled ICC | Standard ICC |
| Task Performance | .32** | .33 | .45 | .72 |
| Interpersonal Facilitation | .23** | .24 | .24 | .26 |
| Job Dedication | .32** | .31 | .26 | .03 |

Notes: N=760. **p<.01. The 3 standardized path coefficients on the right are based on correlation matrices corrected for attenuation in both variables.

pooled variance ICC(2,1) estimate support the same conclusion. The three factors accounted for a substantial portion of the variance in overall performance ($R^2$=.44) exceeding the amount of variance explained by task and contextual performance ($R^2$=.29) in Motowidlo and Van Scotter's (in press) study. This supports the usefulness of the three performance factors. However, the studies differed in other ways that could have influenced the percentage of variance explained in overall performance. The path coefficients computed on a correlation matrix corrected with the standard ICC(2,1) reliability estimate (the lowest of the three reliability estimates) does not support Proposition 1.

A second test of Proposition 1 was accomplished with hierarchical regression. These analys amined the unique variance in overall performance explained by each performance factor. The results, which are compatible with the first test

TABLE 4-4
THE UNIQUE CONTRIBUTION OF TASK PERFORMANCE, INTERPERSONAL FACILITATION, AND JOB DEDICATION TO PREDICTION OF OVERALL PERFORMANCE

| Performance Factor | Uncorrected Unique $R^2$ Contribution | Unique Contrib. to Overall Perf. for 3 Estimates of Reliability | | |
|---|---|---|---|---|
| | | Alpha | Pooled ICC | Standard ICC |
| Task Performance | .08** | .08 | .10 | .09 |
| Interpersonal Facilitation | .04** | .05 | .06 | .02 |
| Job Dedication | .07** | .07 | .04 | .00 |

Notes: N=760. **p<.01. These values were based on correlation matrices corrected for attenuation in both variables.

are summarized in Table 4-4. When measurement error is ignored, each performance variable accounts for a significant amount of unique variance in overall performance, and Proposition 1 cannot be rejected. When the conservative estimate of measurement error is incorporated in the analysis, job dedication does not explain incremental variance in overall performance, and the incremental variance explained by interpersonal facilitation shrinks to $\Delta R^2$=.02. The lack of appropriate tests makes it impossible to interpret the statistical significance of small values such as the $\beta$=.03 shown in Table 4-3, but the $\Delta R^2$=.00 for job dedication in Table 4-4 leaves no doubt that measurement error affected these relationships in an important way.

Propositions 2-5

Propositions 2-5 tested the strength of the relationship between task performance and the set of variables expected to

predict task performance (ability, experience, and job knowledge) compared with the strength of the relationship between task performance and either of the two sets of variables not expected to predict task performance. Results indicated task performance was better predicted by experience, job knowledge, and ability than the variables associated with interpersonal facilitation. Table 4-5 shows the results of hierarchical set regression analyses testing Propositions 2-5.

a. The analyses supported Proposition 2. Task proficiency variables explained a significant amount of the variance in task performance over the variance accounted for by interpersonal facilitation predictors ($\Delta R^2=.13$, $p<.01$).

b. Proposition 3 was supported. The interpersonal skill predictors did not explain a significant amount of variance in task performance over and above the variance accounted for by the task performance predictors.

c. Proposition 4 was supported. The proficiency predictors explained a significant amount of incremental variance ($\Delta R^2=.11$, $p<.01$) in task performance over the variance accounted for by the predictors associated with job dedication.

d. Proposition 5 was not supported. It predicted the job dedication predictors would not explain a significant amount of variance in task performance over and above the variance accounted for by the task performance predictors. The incremental variance was larger than expected ($\Delta R^2=.02$, $p<.01$).

TABLE 4-5
HIERARCHICAL REGRESSION ANALYSES OF RELATIONSHIPS BETWEEN TASK PERFORMANCE AND THREE PREDICTOR VARIABLE SETS INCORPORATING MEASUREMENT ERROR

| Predictor Variable Set/ Regression Procedure | Uncorrected | | Reliability Est. Used in the Analysis: Alpha | | Pooled Var. ICC(2,1) | | Standard ICC(2,1) | |
|---|---|---|---|---|---|---|---|---|
| | $R^2$ | $\Delta R^2$ | $R^2$ | $\Delta R^2$ | $R^2$ | $\Delta R^2$ | $R^2$ | $\Delta R^2$ |
| **1. Interpersonal Facilitation** | | | | | | | | |
| A. Enter Interpersonal Facilitation Predictors | .01 | ---- | .01 | --- | .02 | --- | .03 | --- |
| B. Enter Task Performance Predictors (Tests Prop. 2) | .14** | .13** | .15 | .14 | .21 | .19 | .29 | .26 |
| C. Remove Interpersonal Facil. Predictors (Tests Prop. 3) | .13** | -.01 | .14 | -.01 | .19 | -.02 | .27 | -.02 |
| **2. Job Dedication Predictors** | | | | | | | | |
| A. Enter Job Dedication Predictors | .04** | ---- | .06 | --- | .09 | --- | .12 | --- |
| B. Enter Task Performance Predictors (Tests Prop. 4) | .15** | .11** | .17 | .11 | .25 | .16 | .34 | .22 |
| C. Remove Job Dedication Predictors (Tests Prop. 5) | .13** | -.02** | .14 | -.03 | .19 | -.06 | .27 | -.07 |

Notes: N=430. *p<.05; **p<.01 (two-tailed). Correlations were corrected for unreliability (in both variables) using three reliability estimates: Alpha, the pooled variance ICC(2,1), and the standard ICC(2,1).

Propositions 6-9

Propositions 6-9 tested relationships between interpersonal facilitation and the three sets of predictor variables. Interpersonal skill predictors were expected to explain unique variance in interpersonal facilitation while the other predictors were not. This expectation was not supported consistently. Results are shown in Table 4-6.

a. Proposition 6 was supported. The incremental variance in interpersonal facilitation explained by the interpersonal skill variables over the task proficiency predictors was significant ($\Delta R^2=.03$, $p<.05$).

b. Proposition 7 was not supported. Contrary to expectations, the proficiency predictors explained a significant amount of variance in interpersonal facilitation over and above the interpersonal skill variables ($\Delta R^2=.03$, $p<.01$).

c. Proposition 8 was not supported. The interpersonal skill variables did not explain a significant amount of the incremental variance in interpersonal facilitation ($\Delta R^2=.01$, ns) over and above the variance accounted for by the motivation predictor set.

d. Proposition 9 was supported. The motivation predictors did not explain a significant amount of incremental variance in interpersonal facilitation ($\Delta R^2=.01$, ns) over and above the variance accounted for by the interpersonal skill variables.

TABLE 4-6
HIERARCHICAL REGRESSION ANALYSES OF RELATIONSHIPS BETWEEN INTERPERSONAL FACILITATION AND THREE PREDICTOR VARIABLE SETS INCORPORATING MEASUREMENT ERROR

| Predictor Variable Set/ Regression Procedure | Reliability Est. Used in the Analysis: None | | Alpha | | Pooled Var ICC(2,1) | | Standard ICC(2,1) | |
|---|---|---|---|---|---|---|---|---|
| | $R^2$ | $\Delta R^2$ | $R^2$ | $\Delta R^2$ | $R^2$ | $\Delta R^2$ | $R^2$ | $\Delta R^2$ |
| **1. Task Performance Predictors** | | | | | | | | |
| A. Enter Task Performance Predictors | .03** | ---- | .04 | --- | .06 | --- | .09 | --- |
| B. Enter Interpersonal Facil. Predictors (Tests Prop. 6) | .06** | .03* | .07 | .03 | .12 | .06 | .17 | .08 |
| C. Remove Task Performance Predictors (Tests Prop. 7) | .03* | -.03** | .04 | -.03 | .06 | -.06 | .09 | -.08 |
| **2. Job Dedication Predictors** | | | | | | | | |
| A. Enter Job Dedication Predictors | .02 | ---- | .02 | --- | .04 | --- | .12 | --- |
| B. Enter Interpersonal Facil. Predictors (Tests Prop. 8) | .03 | .01 | .04 | .02 | .07 | .03 | .15 | .03 |
| C. Remove Job Dedication Predictors (Tests Prop. 9) | .03* | -.01 | .03 | -.01 | .06 | -.01 | .08 | -.07 |

Notes: N=430. *p<.05; **p<.01 (two-tailed). Correlations were corrected for unreliability (in both variables) using three reliability estimates: Alpha, the pooled ICC(2,1) intraclass correlation, and the standard ICC(2,1) intraclass correlation.

Propositions 10-13

Propositions 10-13 tested the incremental variance in job dedication explained by variables expected to predict it and those not expected to predict it. The results are shown in Table 4-7.

a. Proposition 10 was supported. Motivational variables explained a significant amount of variance in job dedication ($\Delta R^2=.02$, $p<.05$) over the variance accounted for by proficiency predictors.

b. Proposition 11 was not supported. The proficiency predictors accounted for a significant amount of variance ($\Delta R^2=.05$, $p<.01$) over the variance in job dedication accounted for by the motivation variables.

c. Proposition 12 was not supported. The motivation predictors did not account for a significant amount of variance in job dedication over the variance accounted for by the interpersonal skill variables ($\Delta R^2=.01$, ns).

d. Proposition 13 was not supported. The interpersonal skill variables accounted for a significant portion of the variance in job dedication ($\Delta R^2= .02, p<.05$) over the variance accounted for by the motivational predictors.

Summary of regression results

Regression analyses using uncorrected data supported Proposition 1. Each performance factor had a significant path to overall performance. Hierarchical regression analyses provided additional evidence that the 3 performance factors each explained a significant portion of unique

TABLE 4-7
HIERARCHICAL REGRESSION ANALYSES OF RELATIONSHIPS BETWEEN JOB DEDICATION AND THREE PREDICTOR VARIABLE SETS INCORPORATING MEASUREMENT ERROR

| Predictor Variable Set/ Regression Procedure | Reliability Est. Used in the Analysis: None | | Alpha | | Pooled Var ICC(2,1) | | Standard ICC(2,1) | |
|---|---|---|---|---|---|---|---|---|
| | $R^2$ | $\Delta R^2$ | $R^2$ | $\Delta R^2$ | $R^2$ | $\Delta R^2$ | $R^2$ | $\Delta R^2$ |
| **1. Task Performance Predictors** | | | | | | | | |
| A. Enter Task Performance Predictors | .06* | ---- | .07 | --- | .08 | --- | .10 | --- |
| B. Enter Job Dedication Predictors (Tests Prop.10) | .08** | .02* | .10 | .03 | .12 | .03 | .13 | .04 |
| C. Remove Task Performance Predictors (Tests Prop.11) | .03** | -.05** | .04 | -.06 | .05 | -.07 | .05 | -.08 |
| **2. Interpersonal Facilitation** | | | | | | | | |
| A. Enter Interpersonal Facilitation Predictors | .03** | ---- | .05 | --- | .05 | --- | .07 | --- |
| B. Enter Job Dedication Predictors (Tests Prop.12) | .05** | .01 | .07 | .02 | .08 | .03 | .10 | .03 |
| C. Remove Interpersonal Facil. Predictors (Tests Prop.13) | .03** | -.02* | .04 | -.03 | .05 | -.03 | .05 | -.04 |

Notes: N=430. *p<.05; **p<.01 (two-tailed). Correlations were corrected for unreliability (in both variables) using three reliability estimates: Alpha, the pooled variance ICC(2,1), and the standard ICC(2,1).

variance in overall performance. These results did not hold when a conservative estimate of measurement error was incorporated in the analysis.

The proposition that task performance and interpersonal facilitation were related to sets of predictor variables differently was supported. However, there was little evidence that interpersonal facilitation and job dedication, or job dedication and task performance could be distinguished from each other based on their relationships with the predictor variables in this study. The low correlations between many of the predictors and the performance factors was certainly a factor.

Parallel regression analyses using data corrected for 3 estimates of measurement error did not give any reason to believe that measurement error influenced the results involving task performance and interpersonal facilitation described above. However, when more and more conservative (smaller) estimates of reliability were used to correct intercorrelations of the performance variables, $\Delta R^2$ values in four of the twelve regression analyses grew large enough that they could potentially change the decision about the proposition being tested. Three of these involve the relationships of predictors with interpersonal facilitation and job dedication. With conservative estimates of measurement error they had $\Delta R^2 = |.02|$ or $\Delta R^2 = |.03|$. Unfortunately, there was no way to test the significance of these parameters.

## Additional Analyses

When the most conservative estimate of measurement error was incorporated in the analysis, the three-factor model originally proposed in this research was rejected. It specified that each performance factor had a direct path to overall performance, and the performance factors were not related to each other in any causal way. Although the proposed model was rejected, it seemed possible that a slightly different model would fit adequately regardless of measurement error. To investigate this possibility, I decided to conduct additional analyses using more powerful structural modeling methods. The procedures and results are described below.

### Method

LISREL 8 (Joreskog & Sorbom, 1993) latent variable path analyses were used to incorporate estimates of measurement error in significance tests of overall fit and model parameters. The same 3 estimates of measurement error that were incorporated in the regression analyses were used here.

### Samples

Following Joreskog and Sorbom's (1989) recommendations, the sample was split into two sub-samples. One was identified as the development sample. It consisted of 330 cases for which a complete set of four performance measures were available, but which lacked one or more of the predictor variables. This sample was used to test a priori models and develop an alternative model based on relationships observed in the data.

The second sample was used to confirm the results found in exploratory analyses in the first sample, and test a full model containing performance variables and predictor variables. The cross-validation sample consisted of 430 cases which had been measured on all performance and predictor variables. Given the objectives of the current study, and the results obtained up to this point, splitting the sample into 2 sub-samples seemed the best way to continue the analysis. However, interpretation of the results should be tempered by the possibility that this procedure may have influenced them in some way.

Reliability estimates

Latent variables in this study were represented by single indicators, using procedures described by Joreskog and Sorbom (1989). This method for incorporating measurement error into single-indicator structural models has been illustrated in several recent studies (Borman et al., 1991; Moorman, 1991; Williams & Hazer, 1986). Factor loadings for each indicator were set to the square root of the indicator's reliability. Error variances for each indicator were set to the product of the observed variance and one minus the reliability.

The use of independent estimates of reliability is a key assumption of this method (Joreskog & Sorbom, 1989). The procedures used to develop independent estimates of the reliabilities of the performance variables were described earlier. Independent estimates of the reliabilities of the predictor variables were computed for subjects who lacked at

least one of the performance measures, but had completed the self-report instrument. These reliability estimates are shown in Table 4-8.

TABLE 4-8
INDEPENDENT RELIABILITY ESTIMATES FOR LISREL ANALYSES

| Scale | N | Alpha | Pooled Var. ICC(2,1) | Standard ICC(2,1) |
|---|---|---|---|---|
| 1. Overall Performance | 141 | .95 | .70 | .66 |
| 2. Task Performance | 192 | .96 | .68 | .50 |
| 3. Interpersonal Fac. | 147 | .93 | .59 | .41 |
| 4. Job Dedication | 168 | .95 | .78 | .69 |
| 5. Experience | N/A | 1.00 | --- | --- |
| 6. Ability | N/A | .93 | --- | --- |
| 7. Job Knowledge | 112 | .60 | --- | --- |
| 8. Conscientiousness | 127 | .81 | --- | --- |
| 9. Goal Orientation | 125 | .89 | --- | --- |
| 10. General Self-Esteem | 124 | .79 | --- | --- |
| 11. Extraversion | 128 | .77 | --- | --- |
| 12. Agreeableness | 127 | .75 | --- | --- |
| 13. Social Confidence | 126 | .88 | --- | --- |
| 14. Positive Affectivity | 128 | .88 | --- | --- |

Notes: Alphas reported for the performance variables are the average of the alphas computed for Rater "A" and Rater "B." The experience measure was assumed to be perfectly reliable. The reliability estimate for the ability measure was based on military research (McCormick, Dunlap, Kennedy & Jones, 1983) cited in Borman et al. (1991).

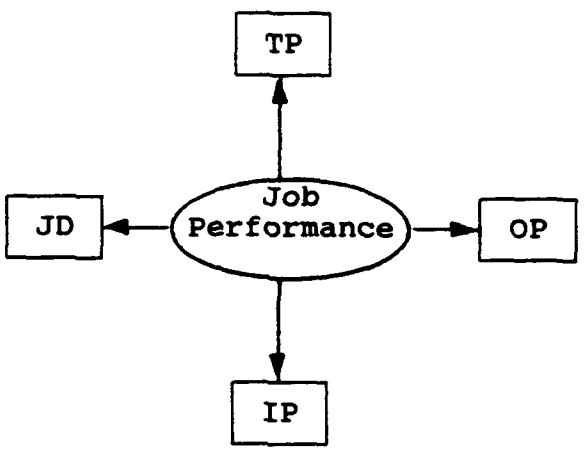
The relationships between the performance factors and overall performance were examined first. The objective of this process was to identify a performance structure that was theoretically appealing and relatively unaffected by measurement error.

Performance model analyses

Three models were tested using latent variable path analysis: a congeneric model, the model originally proposed, and an alternative model.

Congeneric model. The diagram for the congeneric model is shown in Figure 4-1. Following structural modeling conventions, the latent variable of job performance is identified by the oval shape, while the manifest variables are shown in boxes. The $X^2$ for this model tests the hypothesis that the indicators all measure the same underlying latent variable. Thus, testing the congeneric model addressed the central question in this research. Failing to reject it would indicate that task performance, interpersonal facilitation, job dedication, and overall performance cannot be distinguished from each other. Rejecting the test supports the hypothesis that more than one latent factor is responsible for the performance measures.

The results provide clear evidence that performance, at least as it was measured in this study, is not one-dimensional. The $X^2$ statistic obtained in this analysis ($X^2$=124.64, df=9,$p<.01$) indicates a large discrepancy between the congeneric model and the variance observed in the data. Other goodness of fit indices (NFI=.59; CFI=.61) are far below the minimum value of .90 required for acceptance. These indices make it clear the model is a bad fit, and must be rejected. $X^2$ statistics for models incorporating the pooled variance ICC(2,1) estimate



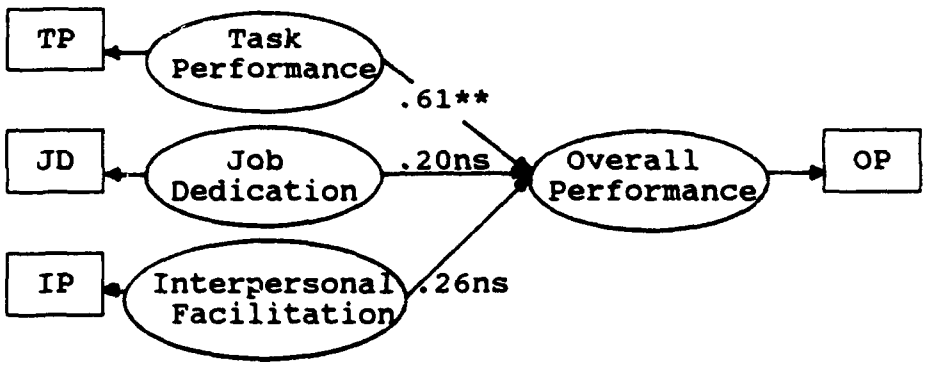

Notes: N=330. TP=Task Performance, JD=Job Dedication, IP=Interpersonal Facilitation, OP=Overall Performance

FIGURE 4-1
CONGENERIC MODEL

of measurement error, $X^2=360.9$; or the alpha estimate, $X^2=7847$ show even larger discrepancies. Thus, the hypothesis that performance is unidimensional was rejected, regardless of the estimate of measurement error incorporated in the analysis.

Proposed three-factor model. The second analysis tested another aspect of Proposition 1: the hypothesis that task performance, interpersonal facilitation, and job dedication each had a significant path to overall performance. This model was saturated (i.e., had zero degrees of freedom) so overall model fit statistics could not be computed. However, since finding any of the path coefficients non-significant would require rejection of the model, it could be adequately tested on structural grounds (James, Mulaik & Brett, 1982). Figure 4-2 displays the results of this test. With less conservative estimates of measurement error (i.e., alpha and the pooled variance ICC(2,1) all three paths were significant. Results for the model incorporating the standard ICC(2,1) reliability estimates showed that path coefficients for the paths between interpersonal facilitation and overall performance and job dedication and overall performance were not significant ($p>.05$, one-tailed). Therefore, the model was rejected. These results parallel those of the regression analyses.

Tests of alternate models. After this model was rejected, an alternate model was tested. The alternate model was suggested by the size and pattern of correlations




Completely Standardized Path Coefficients for Three Estimates of Reliability

| Performance Factor | Alpha | Pooled ICC | Standard ICC |
|---|---|---|---|
| 1. Task Performance | .34** | .45** | .61** |
| 2. Interpersonal Facilitation | .23** | .28** | .26ns |
| 3. Job Dedication | .33** | .33** | .20ns |

Notes: N=330. **p<.01 (one-tailed). TP=Task Performance measure, JD=Job Dedication measure, IP=Interpersonal Facilitation measure, OP=Overall Performance measure.

FIGURE 4-2
PROPOSED THREE-FACTOR MODEL

among overall performance, task performance, interpersonal facilitation, and job dedication. The size of the intercorrelations could not be explained by common-method variance; the dimensions were rated by independent supervisors. The pattern of correlations suggested that job dedication might be positively associated with effectiveness in task performance and interpersonal facilitation. This is compatible with manager's beliefs that working hard, paying attention to details, and demonstrating personal discipline contribute to effective performance. The first analysis tested whether or not job dedication affects overall performance directly and also indirectly through task performance and interpersonal facilitation. The path from job dedication to overall performance was not significant in the model that incorporated the most conservative estimate of reliability. This indicates that the path contributes practically nothing to the model. Therefore, this model was rejected on structural grounds.

This path was omitted in the next analysis. The model estimated without the direct path from job dedication to overall performance provided nearly identical path coefficients and fit indices. The $X^2$ statistics for both models was the same ($X^2$=8.65, df=2), a clear indication the path accounted for almost no variance. The $X^2$ statistic and other fit indices (NFI=.97; CFI=.98) indicate an excellent fit. The model can not be rejected. The final performance model is shown in Figure 4-3. In this model, interpersonal facilitation and task performance directly influence overall

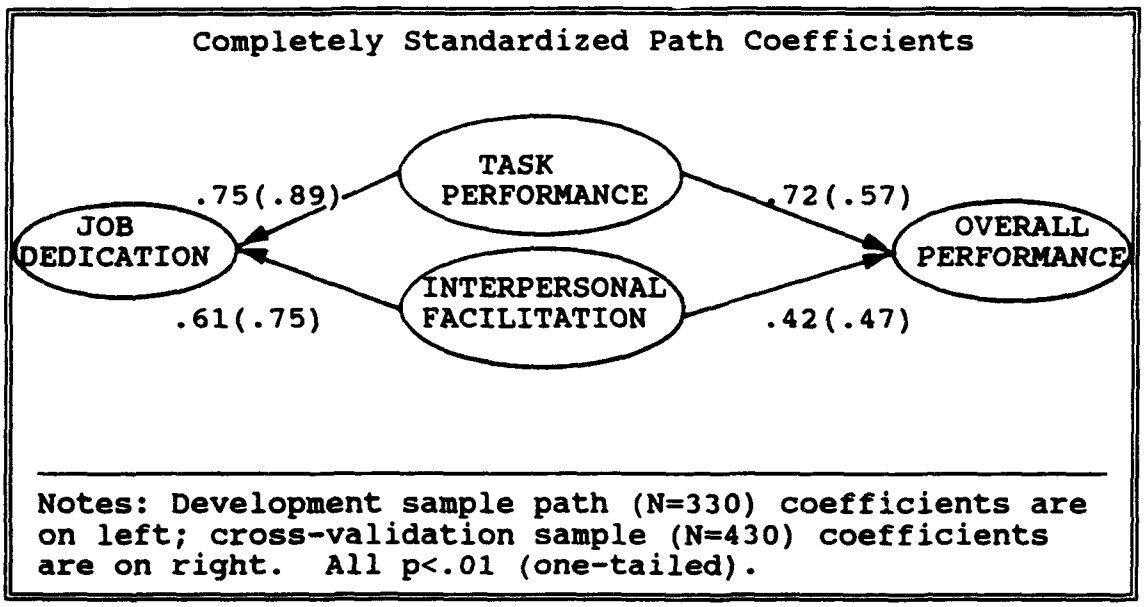



FIGURE 4-3
FINAL PERFORMANCE MODEL

performance but job dedication only effects overall performance indirectly. Its main effects are on task performance and interpersonal facilitation.

Cross-validation.

Since the model was developed empirically, it was desirable to cross-validate it in another sample (Anderson & Gerbing, 1986; Joreskog & Sorbom, 1989). A sub-sample of 430 mechanics was used for this purpose. For convenience, the results of model tests for the cross-validation and development samples are all included in Table 4-9. The cross-validation results are identified as Model 3. All paths are significant ($p<.01$) and the overall fit indices (NFI=.97; CFI=.98) signal an excellent fitting model. This model implies the performance domain is more complex than researchers have usually assumed. Besides offering evidence that performance is comprised of three factors, it shows specific relationships between the dimensions.

Developing the full predictor-performance factor model

In the next analysis, all the predictor variables were added to the performance model in the sets previously identified. For task performance, ability and experience had paths to job knowledge, and only job knowledge directly influenced task performance. For job dedication and interpersonal performance, direct paths were specified for all predictors in their respective sets. The fit of the model incorporating the standard ICC(2,1) estimate of measurement error was acceptable ($X^2=96.4$, df=41, $p<.00$; NFI=.94; CFI=.96). As expected, a number of paths were non-

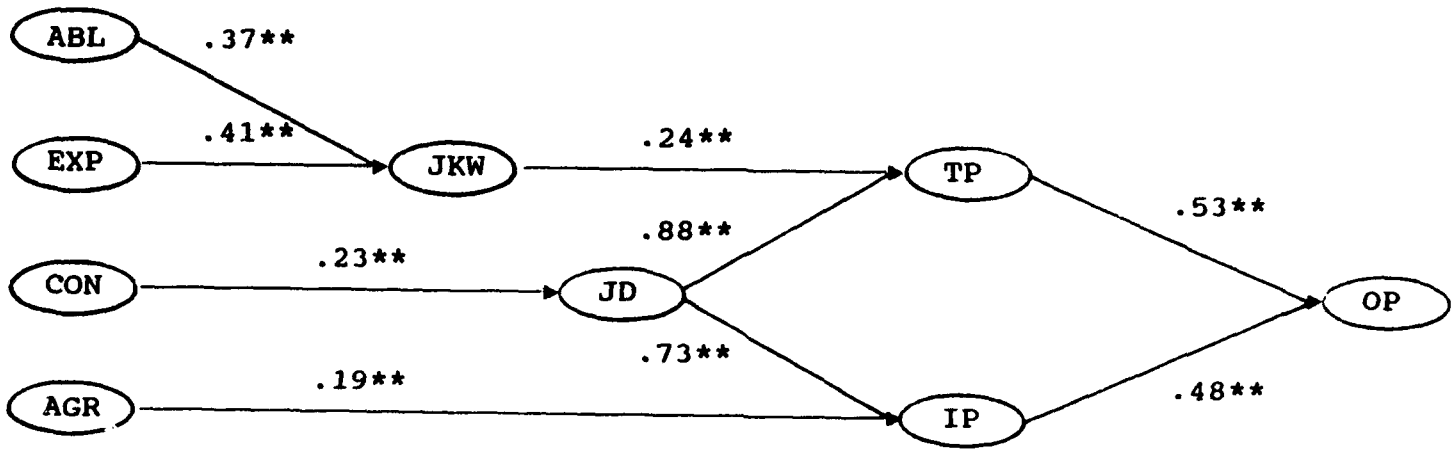
TABLE 4-9
PATH COEFFICIENTS AND FIT INDICES FOR MODELS IN WHICH JOB DEDICATION HAS DIRECT AND INDIRECT EFFECTS ON OVERALL PERFORMANCE

| Model | Completely Standardized Path Coefficients | | | | | Overall Fit Indices | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | JD->TP | JD->IP | JD->OP | TP->OP | IP->OP | $X^2$ | DF | p< | NFI | CFI |
| 1. Direct Effects for Job Dedication | | | | | | | | | | |
| Alpha | .44** | .32** | .34** | .35** | .23** | 16.53 | 1 | .00 | .95 | .95 |
| Pooled ICC(2,1) | .60** | .46** | .29** | .49** | .32** | 11.81 | 1 | .00 | .96 | .96 |
| Standard ICC(2,1) | .75** | .61** | .01ns | .71** | .42** | 8.65 | 1 | .00 | .97 | .97 |
| 2. Indirect Effects for Job Dedication | | | | | | | | | | |
| Alpha | .45** | .32** | ----- | .49** | .30** | 57.95 | 2 | .00 | .81 | .81 |
| Pooled ICC(2,1) | .65** | .51** | ----- | .67** | .42** | 21.29 | 2 | .00 | .93 | .94 |
| Standard ICC(2,1) | .75** | .61** | ----- | .72** | .42** | 8.65 | 2 | .01 | .97 | .98 |
| 3. Cross-validation Indirect Effects for Job Dedication | | | | | | | | | | |
| Alpha | .56** | .41** | ----- | .47** | .33** | 57.64 | 2 | .00 | .88 | .88 |
| Pooled ICC(2,1) | .76** | .61** | ----- | .60** | .44** | 16.44 | 2 | .00 | .97 | .97 |
| Standard ICC(2,1) | .89** | .75** | ----- | .57** | .47** | 13.67 | 2 | .00 | .97 | .98 |

Notes: N=330 for Models 1 and 2. N=430 for model 3. **p<.01. JD=Job Dedication, TP=Task Performance, IP=Interpersonal Facilitation, OP=Overall Performance.

significant ($p<.05$; one-tailed). Specifically, goal orientation and general self-esteem did not have significant paths to job dedication; and positive affectivity, extraversion, and social confidence did not have significant paths to interpersonal facilitation.

After trimming these paths, the model was re-estimated. Fit statistics did not change appreciably ($X^2=106.8$, $df=46$, $p<.00$; NFI=.93, CFI=.96). The final version of the model fit the data well. The task performance predictors fit within the pattern described by Schmidt et al. (1986). Conscientiousness had a direct path to job dedication ($\tau=.23$, $p<.01$), and agreeableness was linked to interpersonal facilitation ($\tau=.19$, $p<.01$).




Notes: N=430. **p<.01 (one-tailed test). Completely standardized path coefficients. ABL=Ability, EXP=Experience, JKW=Job Knowledge, CON=Conscientiousness, AGR=Agreeableness, JD=Job Dedication, TP=Task Performance, IP=Interpersonal Facilitation, OP=Overall Performance.

FIGURE 4-4
TRIMMED PREDICTOR-PERFORMANCE FACTOR MODEL

# CHAPTER 5
# DISCUSSION

This study provided evidence that task performance, interpersonal facilitation, and job dedication are different from each other and that each contributes to organizational effectiveness. Analyses incorporating different estimates of measurement error demonstrated that measurement error did not alter this conclusion, although the relationships between the performance components were affected. The study extended previous research (Motowidlo & Van Scotter, in press) which demonstrated that task performance and a single contextual performance dimension could be distinguished from each other. With data that had not been corrected for measurement error, the three performance components in the current study accounted for 44 percent of the variance in overall performance. Thus, use of three factors of performance accounted for more of the variance in overall performance than task and a single factor of contextual performance did in Motowidlo and Van Scotter's study.

The content of these factors and the structure of their relationships is more important. The present study has direct implications for criterion research and is at least partly relevant to research on organizational citizenship behavior (Smith et al., 1983), and prosocial behavior (Brief

& Motowidlo, 1986). It contributes to criterion research by demonstrating that it is possible to separate three types of behaviors within the criterion domain. Measuring categories of behaviors separately makes it possible to test relationships between different types of performance behaviors. Based on the results of this study, this method has the potential to be useful in improving the match between personality measures and job performance.

## Predictor Model

A prediction model relating individual attributes, task performance, interpersonal facilitation, and job dedication, and overall performance was developed. It included significant paths from job knowledge to task performance, conscientiousness to job dedication, and agreeableness to interpersonal facilitation. Paths from ability and experience to job knowledge were also supported. The coefficients for these paths followed the pattern described by Schmidt, Hunter, and Outerbridge (1986), except that work sample data were unavailable.

The present study complements and extends the research by Schmidt et al. by using a specialized task performance rating scale; by showing the effects of job dedication on task performance and by showing the effects of task performance on overall effectiveness ratings. The effects of job dedication are especially interesting. Most supervisors and managers would probably agree that behaviors such as working hard, persisting, taking initiative, and

paying attention to details are fundamental aspects of performance, yet they have seldom been measured separately from task performance in research. Examining job dedication independently in the current study begins to explain relationships between these components of performance.

The current study provides evidence that conscientiousness is significantly and positively associated with job dedication and influences the effectiveness of task performance and interpersonal facilitation through job dedication. In addition, agreeableness was linked to interpersonal facilitation. The pattern of relationships in this model supported a key thesis of the current study: that the sources of variation for task performance, interpersonal facilitation, and job dedication are different. It also pointed out the potential value of including individual difference predictors like conscientiousness and agreeableness in selection programs. Campbell (1990) argued that adding new predictors to models predicting overall performance was not likely to be a fruitful exercise. Use of multiple performance criterion factors like the ones featured in this study with well-matched predictors may be useful in developing more detailed and pertinent information for selection or human resource decisions.

## Performance Model

Results for the performance factor side of the model are more complex. In this model, task performance and

interpersonal facilitation have direct paths to overall performance. Job dedication influences task performance and interpersonal facilitation directly, but does not have a path to overall performance. Thus, there are causal relationships among elements of the criterion domain. Because job dedication affects the other two performance categories, but is not influenced by them, it is at the top of the hierarchy. Job dedication explains a substantial amount of the variance in task performance ($r_c$=.82; $r^2_c$=.67; standard ICC estimate). Therefore, in the absence of job dedication (i.e., effort, persistence, attention to detail) there would be little or no task performance. Job dedication's influence on interpersonal performance is somewhat weaker ($r_c$=.64; $r^2_c$=.41), but still considerable.

In many areas of the task and interpersonal realms, effective performance requires some minimum level of proficiency. Beyond that point, job dedication behaviors have a strong influence on task performance, or interpersonal facilitation. Therefore, incorporating the job dedication aspects of contextual performance into personnel selection criteria holds much promise.

The interpersonal facilitation dimension has a very different focus from task performance or job dedication. These behaviors are valuable because they help other workers perform effectively or contribute to an organizational climate that favors effective performance. Supervisors may reward interpersonal facilitation because they recognize its

effects on the general level of performance in a work group. They might value the pleasant organizational climate it creates. Another possibility is that interpersonal facilitation reduces the supervisor's uncertainty about how subordinates will act in difficult situations. Or perhaps behaviors like this influence ratings because they make supervisors' jobs easier as Organ (1988) suggested. Finding that interpersonal facilitation influences overall performance nearly as much as task performance implies that both behaviors are valuable, and that supervisors view performance in fairly broad terms.

## Measurement Error

Measurement error was an important element in this study. From the beginning, steps were taken to avoid measurement error or control its effects. Efforts began with setting criteria for rater and subject participation that included minimum observation times of 120 days. A reliability study was conducted in a separate sample to estimate ICC(2,1). Factor analysis was used to focus the scales and identify any extraneous sources of variation.

Reliability estimates for the revised scales were made. These estimates were incorporated in the analyses by correcting correlation matrices for attenuation. Models were tested using alpha, the pooled variance ICC(2,1), and the standard ICC(2,1) to estimate measurement error. Since the standard ICC(2,1) reliabilities were lowest, they provided the most conservative test of the study's

propositions. Any other estimate of reliability would have supported the proposed three-factor direct effects model. In either case, there is evidence the three performance factors can be distinguished from each other. Thus, measurement error does not affect the study's conclusions about the usefulness of the three components of overall performance.

## Summary

Campbell (1990) criticized the practice of focusing on the relationship between a single dependent variable and one or more independent variables, and advocated incorporating a wider range of criteria in selection research. The current study tests the usefulness of job dedication and interpersonal facilitation as criteria and describes their relationships with predictor variables including conscientiousness and agreeableness. In addition, it adds another dimension to criterion research: the idea that one performance factor may be causally related to another.

Campbell's recommendation to expand the criteria used in personnel selection is especially appropriate at a time when our nation's industrial-based economy is making a transition to a service economy, and the nature of jobs and work performance is changing (Johnson & Packer, 1987; Offermann & Gowing, 1993). The focus of personnel selection programs is certain to adapt to these changes. The "classic" prediction model Campbell described reflects a view of work performance that, to some extent, has been

overtaken by new jobs, new technology, and a new emphasis on teamwork, flexibility, and effectiveness.

The ideas underlying Borman and Motowidlo's (1993) discussion of contextual performance capture much of this emphasis. Respecifying contextual performance in terms of interpersonal facilitation and job dedication seems a natural and useful extension to their theory.

APPENDIX A
OVERALL JOB PERFORMANCE RATING FORM

HQ USAF/LGM AND HQ USAF/LGT SPONSORED
WORK PERFORMANCE RESEARCH STUDY

OVERALL PERFORMANCE FORM

for

SUPERVISORS

1. Read the INFORMATION FOR PARTICIPANTS and PRIVACY ACT information, then sign the informed consent form on page 3.

2. Answer the question on pages 4 about your background and experience as a supervisor.

3. Complete the rating form on pages 5-7. The best way to complete it is to rate every person listed on your rating form on each item before going on to the next item. This procedure will save time and simplify the rating process.

4. The success of this project depends on the accuracy of the information you provide. Please do your best. Your responses will be kept confidential.

Number:____ Rank/Name: _____

Squadron/Duty Section: _____

## INFORMATION
## ABOUT THE WORK PERFORMANCE RESEARCH STUDY

Thank you for agreeing to participate in this research project. Your participation in this survey is strictly VOLUNTARY. Your work experience can make an important contribution to the goals of this research project.

Description of the study: The goal of this study is to learn how different types of performance contribute to overall effectiveness at work.

How your responses will be used: The information you provide will help to explain how various things people do at work make them effective or ineffective at their jobs. In the long run, it may help the Air Force do a better job of matching new recruits' skills and interests with their career fields by considering personality factors. This research will not affect anyone presently on active duty in any way.

Confidentiality of your responses: This information is being collected for research purposes only. No one in your unit, base, or MAJCOM will EVER be allowed to see your responses. You are welcome to discuss this questionnaire with anyone you choose, but please do not discuss the performance ratings you assign with anyone. This information should be considered confidential.

## PRIVACY ACT STATEMENT

In accordance with AFR 12-35, paragraph 8, the following information is provided as required by the Privacy Act of 1974.

Authority: 10 U.S.C. 8012, Secretary of the Air Force; powers and duties; delegation by; implemented by AFR 30-23, Air Force Personnel Survey Program.

Purpose: To obtain information regarding the influence of different types of work performance on the overall performance of Air Force members.

Routine Use: To increase understanding of various types of work performance. Elements identifying specific individuals will be stripped from the data as soon as data obtained from subjects and supervisory personnel are merged. Data will be

grouped prior to analysis. No analyses of individual responses will be conducted and only members of the research team will be permitted access to the raw data. Reports summarizing trends in large groups of people may be published.

Participation: Participation is VOLUNTARY. No adverse action will be taken against any member who does not participate in this survey or who does not complete any part of the survey.

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PARTICIPANTS INFORMED CONSENT FORM

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(Please read and sign at the bottom)

I am voluntarily participating in this study. I understand that I will be asked to provide background/biographical data. I understand that I am being asked to provide information about the work performance of other individuals. I understand that the information I provide will be used for research purposes only and will not affect the pay, promotions, or work assignments of any of the individuals I have been selected to rate. I further understand that no one from my base will ever be allowed to see my responses.

I understand that my participation in this study should take 15 minutes or less. I understand that I do not have to answer any questions I do not want to. I understand that no compensation will be provided for my participation in this study. I understand that participation or non-participation will not effect my pay, promotions, or work assignments in any way, and that I may withdraw at any time.

I further understand that my responses to this survey will be treated as confidential, and will be safeguarded in a manner appropriate for classified or sensitive information. I understand that any personal identifiers will be removed from the data collected in this study before any analyses are conducted.

I have read and understood the description of the study's procedures. I agree to participate in the study. I have received a copy of this description.

Rank/Name: _____ Date: _____

## BACKGROUND INFORMATION

Please answer the following questions about your background and job experience. This information will be used to develop a profile of the participants in this study. Your responses will be kept completely confidential.

1. What is your sex? (check one):
   (1) ____:Male
   (2) ____:Female

2. What is your race? (check one):
   (1) ____:White
   (2) ____:Black
   (3) ____:Hispanic
   (4) ____:Asian
   (5) ____:Other (please specify: _____)

3. What is your age in years?

   (Fill in): _____ years.

4. Highest education level completed? (check one):
   (1) ____: Did not complete High School
   (2) ____: High School Diploma or GED
   (3) ____: 2-Year College Degree
   (4) ____: 4-Year College Degree
   (5) ____: Other

5. How long have you been in the Air Force?

   (Fill in): _____ years

6. What is your present grade?

   (Circle one): E-5 E-6 E-7 E-8 E-9 Other

7. About how long have you worked in the same work center?

   (Fill in): _____ years _____ months

8. What is your career field (AFSC)?

   (Fill in): _____

9. What is your present skill level?

   (Circle one): 5 7 9 Other

10. About how many formal technical courses have you attended?

    (Fill in): _____

11. How many courses in human relations or management have you attended?

    (Fill in): _____

OVERALL JOB PERFORMANCE

(Because of format requirements, the actual scale could not be shown. This form was furnished to supervisors with a list of ratee names. The rating items below appeared in a slightly different format in the actual study.)

---

Select the number that best represents the overall job performance of each person listed below.

| | | |
|---|---|---|
| 7<br>6 | HIGH | Exceeds standards for job performance. |
| 5<br>4<br>3 | MODERATE | Meets standards for job performance. |
| 2<br>1 | LOW | Does not meet standards for job performance |

---

OVERALL JOB PERFORMANCE

Select the number that best represents the overall job performance of each person listed below.

| | | |
|---|---|---|
| 7<br>6 | HIGH | Performs at a high level compared with others of the same rank |
| 5<br>4<br>3 | MODERATE | Performs at an average level compared with others of the same rank. |
| 2<br>1 | LOW | Performs at a low level compared with others of the same rank. |

## OVERALL JOB PERFORMANCE

Select the number that best represents the overall job performance of each person listed below.

| | | |
|---|---|---|
| 7<br>6 | HIGH | Contributes <u>more</u> to unit effectiveness than most members of the work-unit. |
| 5<br>4<br>3 | MODERATE | Makes an average contribution to unit effectiveness. |
| 2<br>1 | LOW | Contributes <u>less</u> to unit effectiveness than most members of the work-unit. |

APPENDIX B
TASK PERFORMANCE RATING FORM

FOR OFFICIAL USE ONLY

HQ USAF/LGM AND HQ USAF/LGT SPONSORED
WORK PERFORMANCE RESEARCH STUDY

TASK PERFORMANCE FORM

for

SUPERVISORS

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2. Answer the questions on page 4 about your background and experience as a supervisor.

3. Complete the rating form on pages 5-15. The best way to complete it is to rate every person listed on your rating form on each item before going on to the next item. This procedure will save time and simplify the rating process.

4. The success of this project depends on the accuracy of the information you provide. Please do your best. Your responses will be kept confidential.

Number:_____ Rank/Name: _____

Squadron/Duty Section: _____

_____

FOR OFFICIAL USE ONLY

## INFORMATION
## ABOUT THE WORK PERFORMANCE RESEARCH STUDY

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Description of the study: The goal of this study is to learn how different types of performance contribute to overall effectiveness at work.

How your responses will be used: The information you provide will help to explain how various things people do at work make them effective or ineffective at their jobs. In the long run, it may help the Air Force do a better job of matching new recruits' skills and interests with their career fields by considering personality factors. This research will not affect anyone presently on active duty in any way.

Confidentiality of your responses: This information is being collected for research purposes only. No one in your unit, base, or MAJCOM will EVER be allowed to see your responses. You are welcome to discuss this questionnaire with anyone you choose, but please do not discuss the performance ratings you assign with anyone. This information should be considered confidential.

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Routine Use: To increase understanding of various types of work performance. Elements identifying specific individuals will be stripped from the data as soon as data obtained from subjects and supervisory personnel are merged. Data will be grouped prior to analysis. No analyses of individual responses will be conducted and only members of the research team will be permitted access to the raw data. Reports

summarizing trends in large groups of people may be published.

Participation: Participation is VOLUNTARY. No adverse action will be taken against any member who does not participate in this survey or who does not complete any part of the survey.

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I understand that my participation in this study should take 15 minutes or less. I understand that I do not have to answer any questions I do not want to. I understand that no compensation will be provided for my participation in this study. I understand that participation or non-participation will not effect my pay, promotions, or work assignments in any way, and that I may withdraw at any time.

I further understand that my responses to this survey will be treated as confidential, and will be safeguarded in a manner appropriate for classified or sensitive information. I understand that any personal identifiers will be removed from the data collected in this study before any analyses are conducted.

I have read and understood the description of the study's procedures. I agree to participate in the study. I have received a copy of this description.

Rank/Name: _____ Date: _____

## BACKGROUND INFORMATION

Please answer the following questions about your background and job experience. This information will be used to develop a profile of the participants in this study. Your responses will be kept completely confidential.

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   (1) ____:Male
   (2) ____:Female

2. What is your race? (check one):
   (1) ____:White
   (2) ____:Black
   (3) ____:Hispanic
   (4) ____:Asian
   (5) ____:Other (please specify: _____)

3. What is your age in years?

   (Fill in): _____ years.

4. Highest education level completed? (check one):
   (1) ____: Did not complete High School
   (2) ____: High School Diploma or GED
   (3) ____: 2-Year College Degree
   (4) ____: 4-Year College Degree
   (5) ____: Other

5. How long have you been in the Air Force?

   (Fill in): _____ years

6. What is your present grade?

   (Circle one): E-5 E-6 E-7 E-8 E-9 Other

7. About how long have you worked in the same work center?

   (Fill in): _____ years _____ months

8. What is your career field (AFSC)?

   (Fill in): _____

9. What is your present skill level?

   (Circle one): 5 7 9 Other

10. About how many formal technical courses have you attended?

    (Fill in): _____

11. How many courses in human relations or management have you attended?

    (Fill in): _____

# TASK PERFORMANCE

(Because for format requirements, the actual rating scale could not be shown here. Only scale items and stems are shown. This form was furnished to supervisors with a list of ratee names.)

---

Read the statement below and select the number that best describes the performance of each person listed below.

---

1- Much below average
2- Below average
3- Average
4- Above average
5- Much above average
0- Never performs task

---

How effective is this person in....

1. inspecting, testing, and detecting problems with equipment
2. trouble-shooting
3. performing routine maintenance
4. repairing
5. using tools and/or test equipment
6. using technical documentation
7. operating equipment
8. working safely
9. inventorying tools
10. cleaning and lubricating equipment components
11. overall technical performance.

APPENDIX C
JOB DEDICATION RATING FORM

HQ USAF/LGM AND HQ USAF/LGT SPONSORED
WORK PERFORMANCE RESEARCH STUDY

JOB DEDICATION PERFORMANCE FORM

for

SUPERVISORS

1. Read the INFORMATION FOR PARTICIPANTS and PRIVACY ACT information, then sign the informed consent form on page 3.

2. Answer the questions on page 4 about your background and experience as a supervisor.

3. Complete the rating form on pages 5-17. The best way to complete it is to rate every person listed on your rating form on each item before going on to the next item. This procedure will save time and simplify the rating process.

4. The success of this project depends on the accuracy of the information you provide. Please do your best. Your responses will be kept confidential.

Number:____ Rank/Name: _____

Squadron/Duty Section: _____

## INFORMATION
## ABOUT THE WORK PERFORMANCE RESEARCH STUDY

Thank you for agreeing to participate in this research project. Your participation in this survey is strictly VOLUNTARY. Your work experience can make an important contribution to the goals of this research project.

Description of the study: The goal of this study is to learn how different types of performance contribute to overall effectiveness at work.

How your responses will be used: The information you provide will help to explain how various things people do at work make them effective or ineffective at their jobs. In the long run, it may help the Air Force do a better job of matching new recruits' skills and interests with their career fields by considering personality factors. This research will not affect anyone presently on active duty in any way.

Confidentiality of your responses: This information is being collected for research purposes only. No one in your unit, base, or MAJCOM will EVER be allowed to see your responses. You are welcome to discuss this questionnaire with anyone you choose, but please do not discuss the performance ratings you assign with anyone. This information should be considered confidential.

## PRIVACY ACT STATEMENT

In accordance with AFR 12-35, paragraph 8, the following information is provided as required by the Privacy Act of 1974.

Authority: 10 U.S.C. 8012, Secretary of the Air Force; powers and duties; delegation by; implemented by AFR 30-23, Air Force Personnel Survey Program.

Purpose: To obtain information regarding the influence of different types of work performance on the overall performance of Air Force members.

Routine Use: To increase understanding of various types of work performance. Elements identifying specific individuals will be stripped from the data as soon as data obtained from subjects and supervisory personnel are merged. Data will be grouped prior to analysis. No analyses of individual responses will be conducted and only members of the research

team will be permitted access to the raw data. Reports summarizing trends in large groups of people may be published.

Participation: Participation is VOLUNTARY. No adverse action will be taken against any member who does not participate in this survey or who does not complete any part of the survey.

---

PARTICIPANTS INFORMED CONSENT FORM

---

(Please read and sign at the bottom)

I am voluntarily participating in this study. I understand that I will be asked to provide background/biographical data. I understand that I am being asked to provide information about the work performance of other individuals. I understand that the information I provide will be used for research purposes only and will not affect the pay, promotions, or work assignments of any of the individuals I have been selected to rate. I further understand that no one from my base will ever be allowed to see my responses.

I understand that my participation in this study should take 15 minutes or less. I understand that I do not have to answer any questions I do not want to. I understand that no compensation will be provided for my participation in this study. I understand that participation or non-participation will not effect my pay, promotions, or work assignments in any way, and that I may withdraw at any time.

I further understand that my responses to this survey will be treated as confidential, and will be safeguarded in a manner appropriate for classified or sensitive information. I understand that any personal identifiers will be removed from the data collected in this study before any analyses are conducted.

I have read and understood the description of the study's procedures. I agree to participate in the study. I have received a copy of this description.

Rank/Name: _____ Date: _____

## BACKGROUND INFORMATION

Please answer the following questions about your background and job experience. This information will be used to develop a profile of the participants in this study. Your responses will be kept completely confidential.

1. What is your sex? (check one):
   (1) ____:Male
   (2) ____:Female

2. What is your race? (check one):
   (1) ____:White
   (2) ____:Black
   (3) ____:Hispanic
   (4) ____:Asian
   (5) ____:Other (please specify: _____)

3. What is your age in years?

   (Fill in): _____ years.

4. Highest education level completed? (check one):
   (1) ____: Did not complete High School
   (2) ____: High School Diploma or GED
   (3) ____: 2-Year College Degree
   (4) ____: 4-Year College Degree
   (5) ____: Other

5. How long have you been in the Air Force?

   (Fill in): _____ years

6. What is your present grade?

   (Circle one): E-5 E-6 E-7 E-8 E-9 Other

7. About how long have you worked in the same work center?

   (Fill in): _____ years _____ months

8. What is your career field (AFSC)?

   (Fill in): _____

9. What is your present skill level?

   (Circle one): 5 7 9 Other

10. About how many formal technical courses have you attended?

    (Fill in): _____

11. How many courses in human relations or management have you attended?

    (Fill in): _____

JOB DEDICATION

(Because of format requirements, the actual rating form could not be shown here. Only scale items and stems are shown. This form was furnished to supervisors with a list of ratee names.)

---

Read the statement below and select the number that best describes the performance of each person listed below.

---

1- Not at all likely
2- Slightly likely
3- Somewhat likely
4- Very likely
5- Extremely likely

---

While performing his or her job, how likely is it that this person would ...

1. work harder than necessary
2. persist in overcoming obstacles to complete a task
3. display proper military appearance and bearing
4. put in extra hours to get work done on time
5. avoid shortcuts when work is overdue
6. ask for a challenging work assignment
7. pay close attention to important details
8. defend the supervisor's decisions
9. pay close attention to important details
10. render proper military courtesy
11. follow the supervisor's instructions
12. take the initiative to solve a work problem
13. exercise personal discipline and self-control
14. tackle a difficult work assignment enthusiastically

APPENDIX D
INTERPERSONAL PERFORMANCE RATING FORM

HQ USAF/LGM AND HQ USAF/LGT SPONSORED
WORK PERFORMANCE RESEARCH STUDY

INTERPERSONAL PERFORMANCE FORM

for

SUPERVISORS

1. Read the INFORMATION FOR PARTICIPANTS and PRIVACY ACT information, then sign the informed consent form on page 3.

2. Answer the questions on page 4 about your background and experience as a supervisor.

3. Complete the rating form on pages 5-17. The best way to complete it is to rate every person listed on your rating form on each item before going on to the next item. This procedure will save time and simplify the rating process.

4. The success of this project depends on the accuracy of the information you provide. Please do your best. Your responses will be kept confidential.

Number:____ Rank/Name: _____

Squadron/Duty Section: _____

## INFORMATION
## ABOUT THE WORK PERFORMANCE RESEARCH STUDY

Thank you for agreeing to participate in this research project. Your participation in this survey is strictly VOLUNTARY. Your work experience can make an important contribution to the goals of this research project.

Description of the study: The goal of this study is to learn how different types of performance contribute to overall effectiveness at work.

How your responses will be used: The information you provide will help to explain how various things people do at work make them effective or ineffective at their jobs. In the long run, it may help the Air Force do a better job of matching new recruits' skills and interests with their career fields by considering personality factors. This research will not affect anyone presently on active duty in any way.

Confidentiality of your responses: This information is being collected for research purposes only. No one in your unit, base, or MAJCOM will EVER be allowed to see your responses. You are welcome to discuss this questionnaire with anyone you choose, but please do not discuss the performance ratings you assign with anyone. This information should be considered confidential.

## PRIVACY ACT STATEMENT

In accordance with AFR 12-35, paragraph 8, the following information is provided as required by the Privacy Act of 1974.

Authority: 10 U.S.C. 8012, Secretary of the Air Force; powers and duties; delegation by; implemented by AFR 30-23, Air Force Personnel Survey Program.

Purpose: To obtain information regarding the influence of different types of work performance on the overall performance of Air Force members.

Routine Use: To increase understanding of various types of work performance. Elements identifying specific individuals will be stripped from the data as soon as data obtained from subjects and supervisory personnel are merged. Data will be grouped prior to analysis. No analyses of individual responses will be conducted and only members of the research team will be permitted access to the raw data. Reports

summarizing trends in large groups of people may be published.

Participation: Participation is VOLUNTARY. No adverse action will be taken against any member who does not participate in this survey or who does not complete any part of the survey.

---

PARTICIPANTS INFORMED CONSENT FORM

---

(Please read and sign at the bottom)

I am voluntarily participating in this study. I understand that I will be asked to provide background/biographical data. I understand that I am being asked to provide information about the work performance of other individuals. I understand that the information I provide will be used for research purposes only and will not affect the pay, promotions, or work assignments of any of the individuals I have been selected to rate. I further understand that no one from my base will ever be allowed to see my responses.

I understand that my participation in this study should take 15 minutes or less. I understand that I do not have to answer any questions I do not want to. I understand that no compensation will be provided for my participation in this study. I understand that participation or non-participation will not effect my pay, promotions, or work assignments in any way, and that I may withdraw at any time.

I further understand that my responses to this survey will be treated as confidential, and will be safeguarded in a manner appropriate for classified or sensitive information. I understand that any personal identifiers will be removed from the data collected in this study before any analyses are conducted.

I have read and understood the description of the study's procedures. I agree to participate in the study. I have received a copy of this description.

Rank/Name: _____ Date: _____

## BACKGROUND INFORMATION

Please answer the following questions about your background and job experience. This information will be used to develop a profile of the participants in this study. Your responses will be kept completely confidential.

1. What is your sex? (check one):
   (1) ____:Male
   (2) ____:Female

2. What is your race? (check one):
   (1) ____:White
   (2) ____:Black
   (3) ____:Hispanic
   (4) ____:Asian
   (5) ____:Other (please specify: _____)

3. What is your age in years?

   (Fill in): _____ years.

4. Highest education level completed? (check one):
   (1) ____: Did not complete High School
   (2) ____: High School Diploma or GED
   (3) ____: 2-Year College Degree
   (4) ____: 4-Year College Degree
   (5) ____: Other

5. How long have you been in the Air Force?

   (Fill in): _____ years

6. What is your present grade?

   (Circle one): E-5 E-6 E-7 E-8 E-9 Other

7. About how long have you worked in the same work center?

   (Fill in): _____ years _____ months

8. What is your career field (AFSC)?

   (Fill in): _____

9. What is your present skill level?

   (Circle one): 5 7 9 Other

10. About how many formal technical courses have you attended?

    (Fill in): _____

11. How many courses in human relations or management have you attended?

    (Fill in): _____

# INTERPERSONAL FACILITATION SCALE

(Because of format requirements, the actual rating form could not be shown here. Only scale items and stems are shown. This form is furnished to supervisors with a list of ratee names.)

---

Read the statement below and select the number that best describes the performance of each person listed below.

---

1- Not at all likely
2- Slightly likely
3- Somewhat likely
4- Very likely
5- Extremely likely

---

While performing his or her job, how likely is it that this person would ...

1. communicate effectively at work
2. say things to make people feel good about themselves or the work group
3. display a cheerful, confident outlook
4. offer to help others in their work
5. help someone without being asked
6. support or encourage a coworkers with a personal problem
7. talk to others before taking actions that might affect them
8. praise coworkers when they are successful
9. treat others fairly
10. cooperate effectively with others
11. listen to others' ideas about getting work done
12. encourage others to overcome differences and get along
13. give coworkers advice about what to do when they need help to get started

APPENDIX E
SELF-REPORT QUESTIONNAIRE

FOR OFFICIAL USE ONLY

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HQ USAF/LGM AND USAF/LGT SPONSORED

WORK PERFORMANCE RESEARCH STUDY

1. Please read the INFORMATION FOR PARTICIPANTS and review the PRIVACY ACT information. The survey administrator will be glad to answer any questions you may have.

2. Sign the informed consent form inside this package.

3. Read the survey questions and enter your responses on the red computer answer sheet using a #2 pencil.

4. The success of this project depends on you. Please be as accurate as possible. Your responses will be kept confidential.

Rank: _____ Name: _____

DAFSC: _____

Squadron/Duty Section: _____

Duty Phone: _____

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FOR OFFICIAL USE ONLY

## INFORMATION
## ABOUT THE WORK PERFORMANCE RESEARCH STUDY

Thank you for participating in this research project. Your participation is strictly VOLUNTARY. Your contribution to this research project is extremely important.

Description of the study: The goal of this study is to learn how personality factors and feelings and beliefs about work are related to different ways of contributing to unit effectiveness.

How your responses will be used: Over time, this research may help the Air Force to better match new recruits' skills and interests with the requirements of their career fields by considering differences in personality, feelings and beliefs about work. The present purpose of this research is to investigate the links between these factors and various types of performance.

Confidentiality of your responses: This research will not affect anyone presently on active duty in any way. This information is being collected for research purposes only. No one in your unit, base, or MAJCOM will EVER be allowed to see your responses. You are welcome to discuss this questionnaire with anyone you choose.

## PRIVACY ACT STATEMENT

In accordance with AFR 12-35, paragraph 8, the following information is provided as required by the Privacy Act of 1974.

Authority: 10 U.S.C. 8012, Secretary of the Air Force; powers and duties; delegation by; implemented by AFR 30-23, Air Force Personnel Survey Program.

Purpose: To obtain information regarding the influence of individual differences on different types of work performance.

Routine Use: To increase understanding of factors related to various types of work performance. Elements identifying specific individuals will be stripped from the data as soon as data obtained from subjects and supervisory personnel are merged. Data will be grouped prior to analysis. No analyses of individual responses will be conducted and only members of the research team will be permitted access to the raw data. Reports summarizing trends in large groups of people may be published.

Participation: Participation is VOLUNTARY. No adverse action will be taken against any member who does not participate in this survey or who does not complete any part of the survey.

---

PARTICIPANTS INFORMED CONSENT FORM

---

(Please read and sign)

I am voluntarily participating in this study. I understand that I will be asked to provide background/biographical data and that aspects of my work performance may be evaluated for research purposes.

I understand that my participation in this study should take less than 30 minutes. I understand that no compensation will be provided for my participation in this study. I understand that participation or non-participation will not affect my pay, promotions, or work assignments in any way, and that I may withdraw at any time. I understand that I do not have to answer any questions I do not want to.

I further understand that my responses to this survey will be treated as confidential, and will be safeguarded in a manner appropriate for classified or sensitive information. I understand that my name will be removed from the data collected in this study before any analyses are conducted.

I read and understood the description of the study's procedures. I agree to participate in the study. I have received a copy of this description.

Name: _____ Date: _____

## BACKGROUND INFORMATION

Please answer the following questions about your background and job experience. Your responses will be kept completely confidential. This information will be used to determine how well the participants in this study represent the Air Force in general.

ENTER YOUR RESPONSES ON THE RED ANSWER SHEET USING A #2 PENCIL

1. What is your sex?
   (1) Male
   (2) Female

2. What is your race?
   (1) White
   (2) Black
   (3) Hispanic
   (4) Asian
   (5) Other

3. What is your age in years?
   (1) under 21 years
   (2) 21 to 23 years
   (3) 24 to 26 years
   (4) 27 to 30 years
   (5) over 30 years

4. Highest education level completed? (Please darken only one circle)
   (1) Did not complete High School
   (2) High School Diploma or GED
   (3) More than High School but less than 2 years of college.
   (4) 2-Year College Degree
   (5) 4-Year College Degree or higher.

5. What is your grade?
   (1) E-2
   (2) E-3
   (3) E-4
   (4) E-5

6. What is your skill level?
   (1) Less than 3-Level
   (2) 3-level
   (3) 5-level
   (4) 7-level

7. How many formal technical courses have you attended?
   (1) None
   (2) One
   (3) Two
   (4) Three or more

8. How many management or human relations courses have you attended?
   (1) None
   (2) One
   (3) Two
   (4) Three or more

9. About how long have you worked in your present work center?
   (1) Less than one year
   (2) One year
   (3) Two years
   (4) Three years
   (5) Four or more years

10. How many years have you been in the Air Force?
   (1) 1-2 years.
   (2) 3-4 years.
   (3) 5-6 years.
   (4) 7-8 years.
   (5) more than 8 years.

11. Where do you work?
   (1) Mainly on the flight line.
   (2) Mainly in a maintenance shop.

---

For the most part, items 12-114 were obtained from recent research articles. The conscientiousness, agreeableness, and extroversion scales from Costa and McCrae's (1989) Five Factor Inventory are an exception. They were used with special permission of Psychological Assessment Resources, Inc., 16204 North Florida Avenue, Lutz, Florida 33549. All other materials were in the public domain and can be obtained through the references cited in this paper.

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SAMPLE JOB KNOWLEDGE TEST
45274 TACTICAL AIRCRAFT MAINTENANCE TECHNICIAN

115. What directives are used to perform maintenance procedures?
   a. Tech orders, handbooks, CDCs.
   b. Tech Manuals, CDCs, handbooks.
   c. Tech Orders, tech manuals, CDCs.
   d. Tech manuals, Tech orders, handbooks.

116. What category of information is in a technical order when the number begins with 00?
   a. Indexes.
   b. Alphabetical indexes.
   c. Methods and procedures.
   d. List of applicable publications.

117. What type of TCTO is issued for a safety condition which could result in a fatal or serious injury to personnel?
   a. Record.
   b. Urgent action.
   c. Routine action.
   d. Immediate action.

118. Which bolt should you use in a high-tension application?
   a. Stud.
   b. Hexhead.
   c. Eyebolt.
   d. Internal wrenching.

119. Where is the key and keyway located on a cannon plug?
   a. Adjacent to the A or 1 pin.
   b. Adjacent to the B or 2 pin.
   c. At the 6 o'clock position on cannon plug halves.
   d. At the 12 o'clock position on cannon plug halves.

120. What cleaning solution is used to clean aircraft tires?
   a. O-A-451.
   b. P-D-410.
   c. P-D-680.
   d. O-D-0451.

121. Generally, how should wheel chocks be placed in relationship with the aircraft tires?
   a. Fore and aft of the MLG; extending across the full width of the tread.
   b. Fore and aft of the NLG; extending across the full width of the tread.
   c. Forward of the NLG and aft of the MLG; extending beyond the full width of the tires.
   d. Aft of the NLG and forward of the MLG; extending beyond the full width of the tires.

122. What causes air to be deflected when an airfoil moves through the air?
   a. Barometric pressure.
   b. Atmospheric conditions.
   c. Airfoil shape and angle-of-attack.
   d. Velocity and relative wind direction.

123. Movement about an aircraft's longitudinal axis is called
   a. yaw.
   b. roll.
   c. pitch.
   d. lateral turning.

124. What's the purpose of the stability augmentation system?
   a. Automatically maintains inverted flight characteristics.
   b. Coordinates turns and improves handling characteristics.
   c. Enhances handling characteristics outside the flight envelope.
   d. Automatically maintains the aircraft at a constant barometric altitude.

125. What volume of liquid will be displaced when an 8 square inch piston moves 5 inches within a cylinder?
   a. 4,000 cubic inches.
   b. 400 cubic inches.
   c. 40 cubic inches.
   d. 4 cubic inches.

126. What's measured to determine the wear of segmented rotor brakes?
   a. Each individual rotor.
   b. Each individual stator.
   c. The exposed part of the adjusting pin.
   d. The width of the combined brake assembly.

127. What's the purpose of the anti-skid system?
   a. Reduce friction between the wheel and tire.
   b. Increase friction between the wheel and tire.
   c. Prevent wheel skid by applying pressure to the skidding wheel.
   d. Prevent wheel skid by releasing pressure from the skidding wheel.

128. What's the maximum air pressure you can obtain from a MC-2A low-pressure air compressor?
   a. 100 psi.
   b. 200 psi.
   c. 300 psi.
   d. 400 psi.

129. What component of the ACES II ejection system allows for vertical adjustment of the seat?
   a. Jack screw.
   b. Adjustment actuator.
   c. Mechanical guide rail.
   d. Track roller assembly.

130. Radiation hazards vary based on
   a. input power.
   b. strength of emission.
   c. time of exposure and amount of training.
   d. strength of emission and time of exposure.

131. A turnbuckle with left-hand threads has a
   a. knurl beside the fork.
   b. knurl beside the pin eye.
   c. groove by the cable eye.
   d. groove on the end of the barrel.

132. One disadvantage of a sliding gate valve is that it
   a. is large and heavy.
   b. cannot withstand extreme pressures.
   c. cannot control a large flow of fuel.
   d. tends to restrict fuel flow when open.

133. What component allows for changes in fuel density in the capacitance type fuel indicating system?
   a. Inductor.
   b. Capacitor.
   c. Compensator.
   d. Potentiometer.

134. The electrical component used to charge a nickel-cadmium battery is a
   a. charging motor.
   b. special T-R unit.
   c. charging generator.
   d. transformer-rectifier.

135. Where should expansion joints be used in bleed air systems?
   a. Ram air ducting.
   b. Long runs of ducting.
   c. Short runs of ducting.
   d. Low-temperature/low-pressure ducting.

136. What is the air source for cabin pressure regulator operation?
   a. Ram air.
   b. Cabin air.
   c. Ambient air.
   d. Primary heat exchanger air.

137. The economizer unit of the LOX converter assembly is the
   a. pressure relief valve.
   b. buildup and vent valve.
   c. pressure-closing valve.
   d. pressure-opening valve.

138. Inspection workcards are
   a. abbreviated TOs.
   b. technical manuals.
   c. methods and procedures TOs.
   d. aircraft scheduled inspection and maintenance requirements manuals.

139. What type of inspection is required if an aircraft is idle for 90 days?
   a. Phase.
   b. Special.
   c. Calendar.
   d. Acceptance.

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I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

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