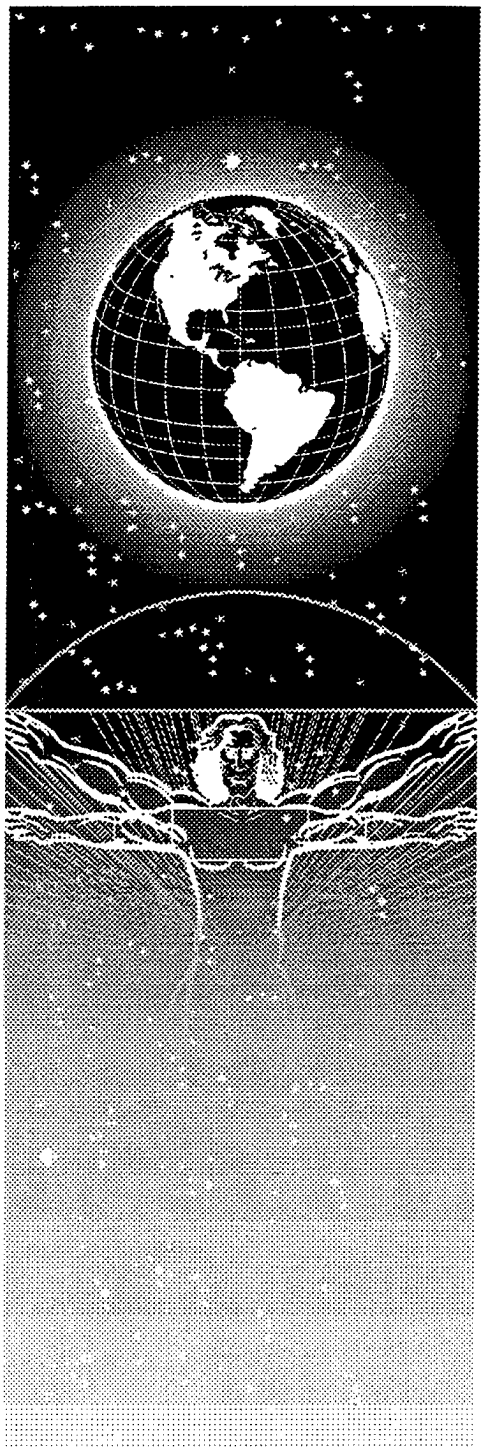
AL/HR-TR-1997-0058



UNITED STATES AIR FORCE ARMSTRONG LABORATORY

Transferability of Skills: Convergent, Postdictive, Criterion-Related, and Construct Validation of Cross-Job Retraining Time Estimates

Michael J. Kavanagh

State University of New York at Albany
Albany, New York 12222

Charles E. Lance

Organizational Research & Development, Inc.
390 Radner Run
Lawrenceville, Georgia 30243

Larry O'Brien

Dynamics Research Corporation
60 Frontage Road
Andover, MA 01810

Robert B Stennett
Robert McMillen
Andrew L. Solomonson

The University of Georgia
Athens, Georgia 30602

Doris E. Black

HUMAN RESOURCES DIRECTORATE
COGNITION and PERFORMANCE DIVISION
7909 Lindbergh Drive
Brooks AFB, TX 78235-5352

October 1997

AIR FORCE MATERIEL COMMAND
ARMSTRONG LABORATORY
HUMAN RESOURCES DIRECTORATE
7909 Lindbergh Drive
Brooks Air Force Base, TX 78235-5352

NOTICES

When Government drawings, specifications, or other data are used for any purpose other than in connection with a definitely Government-related procurement, the United States Government incurs no responsibility or any obligation whatsoever. The fact that the Government may have formulated or in any way supplied the said drawings, specifications, or other data, is not to be regarded by implication, or otherwise in any manner construed, as licensing the holder, or any other person or corporation; or as conveying any rights or permission to manufacture, use, or sell any patented invention that may in any way be related thereto.

The Office of Public Affairs has reviewed this paper, and it is releasable to the National Technical Information Service, where it will be available to the general public including foreign nationals.

This paper has been reviewed and is approved for publication.

DORIS BLACK
Project Scientist

R. BRUCE GOULD
Technical Director
Cognition and Performance Division

WILLIAM E. ALLEY
Chief
Cognition and Performance Division

Please notify this office, AL/HRPP, 7909 Lindbergh Drive, Brooks AFB TX 78235-5352, if your address changes, or if you no longer want to receive our technical reports. You may write or call the STINFO office at DSN 240-3877 (or 240-2295) or commercial (210) 536-3877 (or 536-2295).

☐ W99-05-0941 copies are being forwarded. Indicate whether Statement A, B, C, D, E, F, or X applies.

☑ DISTRIBUTION STATEMENT A:
APPROVED FOR PUBLIC RELEASE: DISTRIBUTION IS UNLIMITED

☐ DISTRIBUTION STATEMENT B:
DISTRIBUTION AUTHORIZED TO U.S. GOVERNMENT AGENCIES ONLY; (Indicate Reason and Date). OTHER REQUESTS FOR THIS DOCUMENT SHALL BE REFERRED TO (Indicate Controlling DoD Office).

☐ DISTRIBUTION STATEMENT C:
DISTRIBUTION AUTHORIZED TO U.S. GOVERNMENT AGENCIES AND THEIR CONTRACTORS; (Indicate Reason and Date). OTHER REQUESTS FOR THIS DOCUMENT SHALL BE REFERRED TO (Indicate Controlling DoD Office).

☐ DISTRIBUTION STATEMENT D:
DISTRIBUTION AUTHORIZED TO DoD AND U.S. DoD CONTRACTORS ONLY; (Indicate Reason and Date). OTHER REQUESTS SHALL BE REFERRED TO (Indicate Controlling DoD Office).

☐ DISTRIBUTION STATEMENT E:
DISTRIBUTION AUTHORIZED TO DoD COMPONENTS ONLY; (Indicate Reason and Date). OTHER REQUESTS SHALL BE REFERRED TO (Indicate Controlling DoD Office).

☐ DISTRIBUTION STATEMENT F:
FURTHER DISSEMINATION ONLY AS DIRECTED BY (Indicate Controlling DoD Office and Date) or HIGHER DoD AUTHORITY.

☐ DISTRIBUTION STATEMENT X:
DISTRIBUTION AUTHORIZED TO U.S. GOVERNMENT AGENCIES AND PRIVATE INDIVIDUALS OR ENTERPRISES ELIGIBLE TO OBTAIN EXPORT-CONTROLLED TECHNICAL DATA IN ACCORDANCE WITH DoD DIRECTIVE 5230.25, WITHHOLDING OF UNCLASSIFIED TECHNICAL DATA FROM PUBLIC DISCLOSURE, 6 Nov 1984 (Indicate date of determination). CONTROLLING DoD OFFICE IS (Indicate Controlling DoD Office).

☐ This document was previously forwarded to DTIC on _____ (date) and the AD number is _____.

☐ In accordance with provisions of DoD instructions, the document requested is not supplied because:

☐ It will be published at a later date. (Enter approximate date, if known).

☐ Other. (Give Reason)

DoD Directive 5230.24, "Distribution Statements on Technical Documents," 18 Mar 87, contains seven distribution statements, as described briefly above. Technical Documents must be assigned distribution statements.

SHIRLEY WALKER
Print or Type Name

Shirley Walker
Authorized Signature/Date 30 Mar 99

240-3877
Telephone Number

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. AGENCY USE ONLY (Leave blank)	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
	October 1997	Final July 1993- February 1996

4. TITLE AND SUBTITLE

Transferability of Skills: Convergent, Postdictive, Criterion-Related, and Construct Validation of Cross-Job Retraining time Estimates

5. FUNDING NUMBERS

C - F41624-92-C-5007
PE - 62205F
PR - 1123
TA - A7
WU - 04

6. AUTHOR(S)

Kavanagh, Michael J. Stennett, Robert B. Black, Doris E.
Lance, Charles E. McMillen, Robert
O'Brien, Larry Solomonson, Andrew L.

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)

State University of New York at Albany, Albany, NY 12222
Organizational Research & Development, Inc., 390 Radner Run
Lawrenceville, Georgia 30243
Dynamics Research Corporation 60 Frontage Road, Andover, MA 01810
University of Georgia, Athens, Georgia 30602

8. PERFORMING ORGANIZATION

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)

Armstrong Laboratory (AFMC)
Human Resources Directorate
Cognition and Performance Division
7909 Lindbergh Drive
Brooks AFB TX 78235-5352

10. SPONSORING/MONITORING

AL/HR-TR-1997-0058

11. SUPPLEMENTARY NOTES

Armstrong Laboratory Technical Monitor: Doris E. Black, (210) 536-3551

12a. DISTRIBUTION/AVAILABILITY STATEMENT

Approved for public release; distribution is unlimited.

12b. DISTRIBUTION CODE

13. ABSTRACT *(Maximum 200 words)*

The purpose of this project was to validate estimates of cress-job transferability of skills among enlisted speciality in the US Air Force (USAF). A sample of retrainees, their supervisors and peers, and a sample of nonretrainees were surveyed on a Transferability of Skills Questionnaire (TSQ), which included that (a) cross-job retraining time estimates (XJRTEs) exhibited significant convergent validity with other AFS-level predictors of retraining ease (job learning difficulty and cross-AFS differences in aptitude requirements), (b) XJRTEs exhibited some postdictive validity when evaluated against Airman Retraining Program Survey retraining ease criteria, (c) XJRTEs exhibited significant criterion-related validity against time-to-proficiency (but not job performance) criteria, and (d) although retraining climate predicted some aspects of retraining success, it did not consistently moderate the XJRTE-training success relationship as was predicted. Results are discussed in terms of implications for USAF restructuring and retraining policy.

14. SUBJECT TERMS

Cross-job retraining
Retraining assignment
Retraining time
Skills transfer
Task taxonomy
Transfer of training

15. NUMBER OF PAGES
143

16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
Unclassified	Unclassified	Unclassified	UL

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

Figure Page

PREFACE

This research and development effort was conducted under Contract No. F41624-92-C-5007 Job Structuring Technology. The authors thank Bruce Gould, Malcolm Ree, and Jacobina Skinner for their technical assistance and helpful comments at various stages in this project.

TRANSFERABILITY OF SKILLS: CONVERGENT, POSTDICTIVE, CRITERION-RELATED, AND CONSTRUCT VALIDATION OF CROSS-JOB RETRAINING TIME ESTIMATES

INTRODUCTION

General Background

The Armstrong Laboratory (AL) has been engaged in a large-scale research project concerned with the estimation of the manpower, personnel, and training needs in new and modified weapons systems, and the support of strategic Pentagon decisions for existing weapon systems. All of these concerns have been driven by the need to accomplish mission requirements with reduced troop strength compared to earlier years.

Technology may assist the Air Force in reaching desired troop strength reductions. As recent international clashes (e.g., the Gulf War) have shown, technology sophistication is of paramount importance in the battle field for all the U.S. forces, but most particularly for the U.S. Air Force (USAF). The impact of this demand for sophisticated technology is the creation of new, or at least expanded, jobs in the USAF. Thus, new jobs, particularly in the electronics field, must often be created to handle these demands. The quandary the USAF must face is how to maintain these weapon systems with limited numbers of new enlisted personnel (accessions) as well finding qualified "first-termers" (re-enlistees) who can be transferred to these jobs.

A second but equally important issue is how to retain the brightest of the airmen who continue beyond their first term of enlistment. Some of these fit into the technology transfer quandary described in the previous paragraph. Some do not. Plus, there may be a shortfall of people capable of filling the new technology jobs for a variety of reasons: (a) some of the enlisted personnel lack the skills and abilities to do the electrical/electronic tasks required in the new technology environment; and (b) some of these enlisted personnel do not want to transfer since they are in line for promotion in their specialty. Furthermore, as the USAF becomes more technology intensive, it is expected to become less people intensive, and due to the overall downsizing of troop strength, there will be a shifting of enlisted personnel across Air Force Specialties (AFSs) for a variety of reasons. Given these reasons and challenges, guidelines are needed, based on research results, to help solve the problem of reassignment of enlisted personnel.

In general from our literature review it seems that changes in organizational size in terms of total employees, whether it is an increase or decrease, invariably affect the organizational structure. Organizational structure includes the numbers and kinds of people as well as the management hierarchy necessary to accomplish the mission of the organization in an effective and efficient manner. Thus, in instances involving changes of the numbers of employees, due either to increased or decreased demand for services, re-alignment of the organizational structure is necessary.

Specific Background for Transferability of Skills Project

At the heart of this research project is an attempt to validate scientifically a procedure to estimate the transferability of skills among the approximately 180 enlisted AFSs that will allow the creation of an ease-of-movement matrix (EOMM) that will show the ease of transferring task skills from one AFS to any other. Central to this project has been the development of a procedure to estimate retraining time when an airman transfers from one AFS to a new one. The staffing and training (or cross-training) requirements created as the USAF acquires new technology or has significant changes in force size may mean restructuring of AFSs, major re-assignments of personnel, or both. These changes may result in a need to identify the optimum occupational classification structure to meet the needs of the USAF. It is therefore crucial that the Air Force be able to estimate how easy (or difficult) it is to transfer enlisted personnel across various AFSs in different job families.

Before proceeding, some definitions are needed. Consistent with the literature (Harvey, 1991), a position is the basic structural entity of the organization, and it represents a collection of work tasks. A job is an "organizational abstraction," representing a collection of positions within any organization. A job family is a "collection of jobs similar enough in terms of their important work activities to be grouped together and treated as interchangeable for a given personnel purpose (Harvey, 1991, p. 79). Frequently, job families within an organization are also referred to as career fields, and thus, we will use these two terms interchangeably. Finally, an occupational classification structure shows all of the job families necessary to fulfill the mission of the organization. In the USAF, the occupational classification structure is represented by the system of officer and enlisted Air Force Specialty Codes, while a single Air Force Specialty (AFS) defines a specific job family within the system. An enlisted job within the Air Force is thus defined by its complete 7-character AFS code (i.e., including prefix, skill level, and suffix).

Returning to the specific research issue of this project, estimation of retraining times will result in a large number of estimated values, considering there are approximately 180 enlisted AFSs. The EOMM containing retraining time values has also been termed the "transferability of skills (TOS) matrix," and these two terms will be used interchangeably in this report. This EOMM would contain values showing the estimated time it would take to retrain moving from one AFS to any other included in the matrix. This matrix would be 180 X 180 with the "FROM" AFSs listed as rows and the "TO" AFSs as columns. The values above and below the diagonal of the matrix would represent the estimated retraining time of job transfers or enlisted reassignments. Thus, by examining this matrix, one could see the ease of movement or transferability of task skills, as quantified in terms of retraining time, from any "target" AFS to any specified set of other AFSs. This would allow one to rank order which one of the set of possible transfers for an airman would be the easiest in terms of transferability of task skills as measured by estimated retraining time.

Kavanagh and Lance (1990) developed a questionnaire methodology to estimate cross-job retraining times, and have established convergent validity for this methodology. However, the predictive validity of the estimates has not been demonstrated due to lack of adequate on-the-job criterion data. One of the primary objectives of this research is the creation of a data base of on-the-job criterion measures against which the estimates of cross-job retraining times can be empirically validated.

From a scientific viewpoint, this research is important because it will produce a methodology that can estimate cross-job retraining times <u>across jobs in differing job families</u>. Although transferability of skills has received some attention in the literature (Byrne, 1975; Downs, 1985; Fine, 1957a, 1957b; Fossum, Arvey, Paradise, & Robbins, 1986; Gopher, Weil, & Baraket, 1994; Magnum & Ball, 1987; Rumberger, 1981), there is very little empirical evidence supporting a method to estimate transferability across jobs in different job families. There has been considerable research focused on transfer, or progression, within career or job families, but little across job families. In order to meet the overall purpose of the TOS program, there must be a way to estimate ease-of-movement across enlisted AFSs in different occupational or career fields. This need is particularly salient for airmen completing their first term and being reassigned to a new AFS. These retrainees were the target group for this research. Next, we present the specific hypotheses, project goals, and tasks necessary to complete this project.

Project Goals, Hypotheses, and Tasks

The overall and major purpose of this research project was to provide criterion-related validity for cross-job retraining times estimates (XJRTEs). This was a critical step for the USAF to have an operational TOS matrix of retraining time estimates for the approximately 180 enlisted AFSs.

Consistent with the goal of helping to develop a methodology to establish a "transferability of skills matrix" for enlisted AFSs, this research project tested three general hypotheses. The hypotheses were as follows:

H1: AFS-level XJRTEs will be related to measures of time to achieve proficiency and performance in the new AFS.

This hypothesis is based on previous research, to be cited below, relating to cross-job retraining and transfer of training which indicates that (a) interjob similarity facilitates cross-job retraining ease, (b) old versus new job differences in job learning times inhibit cross-job transferability of skills, and (c) similarity between the pre-training and training environments to the post-training environment facilitates transfer to on-the-job performance of learned behaviors.

H2: Organizational structures, policies, and climate, and supervisory and peer behaviors which are supportive of retraining transfer will be positively related to criteria relating to time to achieve proficiency following retraining and performance in the new AFS.

This hypothesis is based on literature indicating that variations in organizational structure, climates which are supportive of post-training transfer, and efforts on the part of retrainees' supervisors and co-workers to support the transfer of previously acquired knowledges and skills, are related to the ease with which retrainees can adapt to the post-training environment more readily achieving proficiency in the new assignment.

H3: The relationship between XJRTEs and criteria relating to performance and time to achieve proficiency in the new AFS will be stronger within organizational settings that are more (versus less) supportive of training transfer.

H3 proposes an interaction effect between predicted cross-job retraining ease and the supportiveness of the retraining climate in the new AFS. The general rationale for H3 is that organizational structures and climates that are more supportive of training transfer will permit the full range of training transfer to be realized in the post-training environment. On the

other hand, less supportive structures and climates in the post-training environment will have a detrimental (restrictive) impact on retraining.

As is explained later, these three general hypotheses were tested in a number of ways in three different data sets corresponding to (a) a convergent validation of cross-job retraining time estimates against other predictors of retraining ease, (b) a postdictive validation of cross-job retraining time estimates against retraining criteria obtained as part of the Airman Retraining Program Survey (Skinner, 1981), and (c) a construct- and criterion-related validity study using data collected in 1994 from retrainees, their supervisors, and peers, and a sample of nonretrainees.

As is evident from these hypotheses, cross-job retraining time ease is conceptualized as involving both a transfer of task skills and unit or organizational climate factors that might add or impede the ease of movement. Because of the inclusion of these multiple factors, the literature review for this project was fairly extensive. However, before examining this literature, it will help to understand better this research project if the specific project tasks are described.

In order to test these hypotheses and to complete the goals of this project, the research effort was sub-divided into four tasks. These were:

Task 1: Validation of common task taxonomy for all AFSs.

Task 2: Exploration of alternative methodologies for estimating cross-job retraining times.

Task 3: Linking of retraining time estimates to measures of actual retraining time success.

Task 4: Development of cross-level linkages for XJRTEs.

Task 1 was necessary to obtain estimates of retraining ease across tasks within a generic task taxonomy. Much of the work on the development of a common task taxonomy had been done in previous research (Lance, Mayfield, Kavanagh, & Gould, 1995). In terms of Task 2, convergent validity evidence (Lance, Kavanagh, & Gould, 1993), as well initial postdictive validity evidence (Lance, Mayfield, & Gould, 1993) has been established for the procedure used in this research project. There were no alternative methodologies to examine empirically since this problem of transferability across job families has not been well addressed in the empirical or conceptual literature.

Task 3 was the central purpose of this research project and the hypotheses are focused on this task. However, it was

necessary to complete Tasks 1 and 2 in order to test the hypotheses properly and complete Task 3. Task 4 is a more complex undertaking and requires hypothesized, generalizable extensions of the XJRTE methodology. Task 4 will be covered in the "Discussion" section of this report.

LITERATURE REVIEWS

Transferability of Skills

Transferability of skills has been defined as "the continuous use of acquired knowledge and abilities when moving from one job to another" (Fine, 1957a, 1957b, p. 938), or "in terms of the ease which individuals trained to proficiency in one job can apply acquired knowledge and skills in learning another job" (Lance, Kavanagh, & Gould, 1993, p. 68). As has been noted earlier by Lance and colleagues (Lance, Kavanagh, & Gould, 1993; Lance, Mayfield, & Gould, 1993; Lance, Mayfield, Gould, & Lynskey, 1991), there exist large bodies of literature on topics related to cross-job transferability of skills such as transfer of training to on-the-job performance, curriculum development, job socialization, human resource planning for career mobility, and employee turnover. However, surprisingly little literature exists on the transferability of skills across jobs in different job families.

Among the few empirical studies on cross-job transferability of skills, Gordon and Fitzgibbons (1982) and Gordon, Cofer, and McCullough (1986) found that interjob similarity related positively to cross-job skill transfer. However, they studied transfer of a limited range of skills in a small number of sewing machine operator jobs. Sparrow (1989) also found that interjob similarity related positively to skill transfer, but his findings also were confined to a small range of experimentally derived job tasks.

The most comprehensive set of empirical studies on cross-job transferability of skills has been conducted in recent years by the USAF. In the first of these, Lance, Kavanagh and Gould (1993) reported on a methodology for estimating cross-job retraining time across 41 different AFSs in diverse career fields. This methodology involved systematic comparisons of profiles of job learning times across a comprehensive taxonomy of job tasks. They demonstrated the convergent validity of cross-job retraining time estimates against other predictors of retraining success, including differences in job general learning difficulties and aptitude requirements.

In a second study, Lance, Mayfield, Gould and Lynskey (1991) demonstrated the convergent validity of analytically derived cross-job retraining estimates (i.e., using the methodology

developed by Lance, Kavanagh, & Gould, 1993) with global estimates provided by subject matter experts (SMEs). These findings supported the viability of estimating cross-job transferability of skills from SME global judgments. Third, Lance, Mayfield, and Gould (1993) demonstrated the validity of cross-job retraining time estimates in predicting retrospective measures of retraining success. Thus, although this was a retrospective study, results supported the validity of cross-job retraining time estimates in predicting criteria related to actual retraining ease.

Finally, Lance, Mayfield, Foster, Stokes, and Mecham (1991) and Henderson (1993) demonstrated that the methodology described by Lance, Kavanagh, and Gould (1993) for estimating cross-job retraining times is valid in civilian, as well as in military contexts.

Despite these research findings, there still exists a need for a large-scale validation of cross-job retraining time estimates (i.e., estimates of the relative transferability of skills) across a diverse set of jobs against criteria indicative of actual retraining ease. This was one of the primary objectives of the present research. However, the importance of this review of earlier work is that the methodology for deriving XJRTEs has been well established and will be used in this research project. Next, we examine the literature related to the organizational structure, transfer of training, and unit and organizational climate that could affect ease of transfer. Therefore, the next two sections of this literature review will be concerned with identifying variables that can be used to measure the organizational and unit variables that are hypothesized (H2 and H3) to affect time to proficiency among retrainees.

Organizational Structure

Although the structure of any organization exists on paper, it has profound effects on the people within the organization. Most employees would not be able to identify the overall structure of their organization but they can relate to the climate or culture permeating their work unit. Certainly, as seen in hypotheses 2 and 3 above, the structure of the organization is important to understanding ease of movement across jobs in the USAF. Therefore, an extensive review of the literature on organizational structure was completed for this project. The pertinent aspects of this review for this project are included here, and the complete review is available from the first author.

In 1947 the German sociologist Max Weber introduced the term "bureaucracy" to describe a new organizational structure that was

becoming widespread in the modern world. Unlike the feudal states and monarchies that preceded them, bureaucracies operated according to hierarchical chains of command and established rules and procedures spelling out the official function of each member. In this manner, tight coordination and control was realized that far surpassed any previous organizational structure. In Weber's view, this new form was so efficient that it would eventually become dominant.

What followed Weber's initial ideas was a variety of attempts to find the "best" organizational structure in terms of organizational effectiveness. According to Robbins (1993), organizational structures vary along three main dimensions: complexity, formalization, and centralization. In addition to these three main dimensions, researchers have identified five other structural variables that impact effectiveness: division of labor, unity of command, authority and responsibility, span of control, and departmentalization. Our review showed that each of these aspects of organizational structure were important, and thus, may be important for our questionnaire.

The literature review also included contingency approaches to organizational structure (e.g., Burns & Stalker, 1961, Davis & Lawrence 1977, Robbins, 1993) as well as resource dependency theory (Pfeffer & Salancik, 1978), economic theories (Moe, 1984), and institutional theory (Meyer & Rowan, 1977; DiMaggio & Powell, 1983). We also examined in detail the literature on organizational culture (Martin, 1992; Schein, 1992; Smircich; 1983) and the related literature on total quality management (Walton, 1986).

Several observations seem warranted from this review. First, organizational structure, which is the formal definition of line and staff authority relationships, and the occupational classification structure, which is the arrangement of job families within an organization, are related. It is not that one causes the other, but rather, that they are mutually causative. Second, even though the USAF exists as a bureaucracy, there is considerable latitude within individual units, at whatever level or size, to implement many of the features of other structures described in this section. This leads to the conclusion that there could be considerable variance in the type of organizational structure an airman experiences as s/he is transferred from one job to another in a new unit. Third, within a given organizational structure, (e.g., bureaucracy), there can be variance in the degree of intensity or rigidity in which it is applied across organizational units.

These considerations led us to conclude that differences in experienced organizational structure could affect the ease of movement from one AFS to another. Underlying this conclusion is the belief that organizational structure is a perceptual

experience as a function of the physical reality. Thus, it is the airman's perception of the structure of the new unit into which he or she has been transferred which will affect ease of movement. Due to these considerations, we decided to include measures of the perceptions of structure in the "climate" section of the questionnaire developed for this project. This aspect of the questionnaire will be discussed more fully in a later section of this report.

Transfer of Training

Although we saved this literature until last, we believe it is the most important. Since this project focuses on the transfer of airmen from one AFS to a new one, with some intervening training, the transfer of training literature is the most pertinent place to look for variables that might impact on this transfer. Although it is clear that transfer of training and ease of movement within the TOS matrix are different events, it was felt that some of the processes would be similar. This section of this report is based on a lengthy review of the transfer of training literature (Ruge & Kavanagh, 1994).

The problem of transfer has been well known to industrial and organizational psychology for quite some time (McGehee & Thayer, 1961). Transfer involves applying what has been learned in training to the actual work environment. Since the training environment can differ multidimensionally from the work environment, the transfer problem is a difficult one that has yet to be fully defined. Yet many variables have been identified which could lead to a more positive transfer of learned knowledge and skills back on the job (see Baldwin & Ford, 1988; Goldstein, 1986; Tracey, Tannenbaum, & Kavanagh, 1995; Wexley & Latham, 1981).

Much of the past research in training mainly focuses on individual level variables. However, there is a growing body of research suggesting that transfer of training is affected by organizational level variables (Clark, Dobbins, & Ladd, 1993; Morrison & Brantner, 1992; Roullier & Goldstein, 1991; Tracey, 1992). This revelation necessitates an analysis based on organizational levels. Each organizational level requires a different approach to training. Yet, as these levels together constitute a whole organization, the relations between these training approaches must also constitute an integrated whole. Previous treatments of training transfer have recognized and subsequently called for research on the problem that levels of analysis present (Baldwin & Ford, 1988). For this review, we have identified the following levels: individual, supervisor, work group, and organizational factors.

Viewing training as a three-stage process has been commonly accepted in the literature since McGehee and Thayer's (1961) book. These three stages consist of the pre-training stage, the training stage, and the post-training stage. Most of the pre-training variables that have been studied to date have been control variables such as demographic or motivational characteristics. Thus, pre-training interventions have been under-utilized in previous treatments of training. Most of the research on the training stage has focused on the timing and format of the training itself, and how each intervention affects individuals.

Finally, while research on the post-training stage has been directed towards multiple levels of analysis, it has centered on environmental control variables rather than interventions. While there have been some exceptions to this rule (e.g., behavioral self-management, relapse prevention), the vast majority of work at this stage of training has been more concerned with predicting transfer rather than manipulating it. We recognize that manipulations may not always be cheap or easy to implement, however, we also recognize that relying on prediction of future transfer may not help managers in situations where transfer is predicted to be poor. So while we realize that measuring control variables in order to predict positive transfer is important, we also realize that managers will ultimately need treatments to ameliorate negative transfer situations.

Consideration of training as a three stage process and the different organizational levels allowed us to focus the literature search on variables that could impact on cross-job retraining times for retrainees. This approach assumes that transfer problems are different at each level of analysis (individual, supervisor, work group, and organization) and at each stage of the training process (pre-training, training, and post-training). It should be noted that our review (Ruge & Kavanagh, 1994) focused mainly on studies which have been conducted since Baldwin and Ford's (1988) often cited review on transfer of training. However, we did examine the Baldwin and Ford review for variables with potential use in this research project.

Implications for Research Project

As indicated earlier, the review of the literature on transferability of skills enabled us to identify a methodology for XJRTEs (Lance, Kavanagh, & Gould, 1993). The reviews of the literature on organizational structure and transfer of training helped us identify a number of variables that could be used to measure organizational and unit climate/culture hypothesized to affect time to proficiency of retrainees. These variables included: performance constraints, organization and unit

structure, transfer of training climate, continuous learning climate, goal setting, procedural and distributive justice, interaction with supervisor and co-workers, performance feedback, and existence of performance norms. This enabled us to hypothesize a large number of variables that should be included in the "climate" section of the questionnaire developed for this research project. The final variables that constituted the unit climate measure of the research questionnaire will be discussed in the Method section.

Project Summary and Methodological Approach

Before proceeding to a detailed description of the research methodology used, we will first summarize the major purpose of this project. In addition, we will provide a general description of the methodological approach used since it is not the traditional approach used in criterion-related validity studies.

The overall and major purpose of this research project was to provide criterion-related validity for XJRTEs. It is important to understand that we are providing validity for the use of a specific methodology (Kavanagh & Lance, 1990) to estimate cross-job retraining times (XJRTs). The validity of any methodology is always intimately tied to the use of that methodology. Thus, this does not mean that this methodology would automatically be valid for use in estimating training requirements, although it may be extended to that purpose. However, subsequent validity research would be required before the methodology for estimating XJRTs could be applied to a new situation. The primary purpose of establishing the validity of this methodology was to meet the goal of developing a means by which a "TOS matrix" for enlisted AFSs could subsequently be constructed.

The traditional scientific approach to establishing criterion-related validity is to measure the relationship between predictor variables, in this case - XJRTEs, and criterion variables, in this case, job performance and retraining ease information. The traditional approach may involve one or more type of both predictor and criterion information, but generally only one source of measurement for both predictors and criterion data. For example, in determining the criterion-related validity for the Armed Services Vocational Aptitude Battery (ASVAB) for selection and placement of USAF accessions, the ASVAB scores are the predictors and training school performance is the criterion (Wilbourn et al, 1984). In this research project, we have multiple sources of measurement for predictor and criterion variables as well as for the organizational climate variables. The research variables were measured using responses from the retrainee, his or her supervisor, and a co-worker or peer selected by the supervisor. This multiple measurement source

approach to empirical research has been termed multitrait-multimethod (MTMM) (Campbell & Fiske, 1959), and has been used in estimating the construct validity of measures (Kavanagh, MacKinney, & Wolins, 1971). We will briefly explain this approach in general, and provide more details in the Method section.

The MTMM approach was created as a research design and a procedure for operationally assessing the construct validity of measures of research variables (Campbell & Fiske, 1959). It requires both multiple measures of each variable or trait and multiple traits. Thus, for example, in the Kavanagh et al. (1971) study, there were 20 job performance dimensions (the traits) being rated by three methods, namely, supervisor, subordinate, and self ratings. This resulted in 60 X 60 matrix of correlations between method-trait measures. Campbell & Fiske (1959) provided judgmental rules for examining this matrix in order to determine the construct validity of the measures in terms of their convergent and discriminant validities. Kavanagh et al. (1971) provided a quantitative approach using an analysis of variance procedure (ANOVA) as a way to simplify and summarize the evidence for validity contained in the matrix. However, for this project, the procedures for estimating construct validity are not the central issue, but rather that by using the MTMM approach in this criterion-related validity study, it is possible to estimate and account for measurement error in the assessment of the research variables. In this way, the establishment of criterion-related validity can be better evaluated, and if present, provides greater certainty in the value of the empirical results.

Using the MTMM design in this project provided a better test of the project's hypotheses and allowed us to make stronger recommendations about the validity and usefulness of the XJRTE procedure. Further details of the MTMM design will be covered in the Method section, but it is important that the reader bear in mind that we had three sources or methods of measurement with multiple variables or traits -- a true MTMM design.

METHOD

Survey Development and Variable Measurement

Background

Survey development in this project was based on reviews of relevant literature presented earlier, including literature relating to organizational structure, transferability of skills, transfer of training and retraining climate.

Survey development was also driven by conceptual models developed in earlier work (Lance, Kavanagh, & Gould, 1993) in which cross-job retraining time estimates were modeled as a function of differences in jobs' task overlap and task learning times.

Survey Development

It is important to understand the history of this "transferability of skills matrix" project in order to understand the rationale for the development of the Transferability of Skills Questionnaire (TSQ) in this project. As will be discussed later in this section, the sampling plan included sending surveys to (a) the retrainee, who is the target of this research, (b) his or her supervisor, and (c) a co-worker (peer) of the retrainee.

This triangular sampling was intended to capture both the job performance of the retrainee as well as the organizational climate of the unit. Rather than describing each questionnaire, we will discuss the sections of the survey sent to the retrainee, with reference to the parts that were included in the supervisor and co-worker surveys. Copies of the Retrainee, Supervisor/Peer, and Nonretrainee versions of the TSQ are included at Appendix A.

The retrainee survey was designed to include (a) one item measuring months in the present assignment; (b) the measurement of transferability of skills used in earlier research (Lance, Kavanagh, & Gould, 1993); (c) measures of the actual time-to-proficiency of the retrainee; (d) measures of the current job performance of the retrainee; and (e) measures of the organizational climate of the unit in which the retrainee was located.

The literature searches described earlier in this report identified variables that could potentially impact on retraining ease. The potential list of variables was reduced by examining the validity and importance of each variable and its measurement. An additional practical goal was to limit the surveys to a manageable length.

Survey Content

Biographical Information. Various computer files containing biographical information on the retrainees (e.g., Uniform Airman Record data containing aptitude scores, data relating to training success, demographic data, performance review and base assignment history) were made available for this research project. From a lengthy list of potential personal variables, we selected information such as age, gender, family status, etc., as well as data on abilities and training such as ASVAB scores and training

score experiences, including final technical school grades, number of hours of remedial instruction, etc. The only additional information we collected from the survey was the length of time, in months, the retrainee had been in the present assignment.

AFS Skills/Knowledges. This section of the survey was designed along similar lines as the Skills and Knowledges Questionnaire (SKQ) used in earlier research (Lance, Kavanagh, & Gould, 1993; Lance, Mayfield, & Gould, 1993). The SKQ described AFSs' task contents and learning times in reference to a common taxonomy of tasks performed by enlisted airmen.

Since the late 1980s, Lance and Kavanagh and associates have conducted a stream of research aimed at developing a task taxonomy specifically for the purpose of USAF R&D on cross-job transferability of skills. In one study, Lance, Mayfield, Kavanagh, and Gould (1995) reviewed the literature on existing work taxonomies and described the development of a task taxonomy to support R&D on transferability of skills which was based on (a) previous USAF job categorization work (Bell & Thommason, 1984), (b) job analysis data collected from over three thousand subject matter experts, and (c) previous work taxonomy literature. They also demonstrated the taxonomy's reliability in terms of interrater reliability of SME judgments of task category learning times, and its validity in forming job clusters having homogeneous ability requirements. Kavanagh and Lance (1990) also demonstrated the usefulness of this taxonomy for SME allocation of tasks to task categories, and Lance, Mayfield, and Gould (1993) demonstrated its usefulness for supporting cross-job retraining time estimates. Nevertheless, review of this taxonomy indicated the need for its revision along the lines of increased specificity in the description of more highly technical tasks (i.e., electronic- and mechanically-oriented tasks).

With this in mind, the taxonomy was revised to develop more precise specifications of the domain of mechanical and electronic tasks thought to be critical in retraining across more highly specialized technical AFSs. Briefly, the revised task taxonomy was developed according to the following nine steps:

(a) A complete listing of all enlisted Air Force Specialty codes (AFSCs) and titles was obtained in order to identify those AFSs which had Mechanical and/or Electronic (M/E) entry-level aptitude requirements, or which might otherwise be primarily mechanically- or electronically-oriented. These are referred to as M/E AFSs.

(b) Occupational Survey duty areas (titles of collections of similar tasks which are grouped together for job analysis purposes) were obtained for each of the M/E AFSs defined in step (a). The goal here was to identify task content

descriptors of intermediate specificity, that is, more general than the task level, but more specific than the level of general job dimensions, for the purpose of generating generic task statements for a multiple-AFS work survey.

(c) Duty area descriptions were translated into generic, intermediate-level task statements intended to be applicable across a number of M/E AFSs. Some duty areas were judged too broad to be appropriate for translation (e.g., "training," "supervision") while others were excluded from retranslation on the basis that they referred to specific pieces of equipment or specific actions taken toward specialized equipment. A total of 314 generic task statements was written.

(d) These task statements were reviewed and edited for redundancy, readability, generality (i.e., across several of the targeted AFSs), and toward comprehensiveness in representing the domain of work performed by the M/E AFSs whose Occupational Survey duty areas had been obtained. A total of 180 task statements was retained after editing.

(e) The 180 edited task statements were assembled into a Classification System Inventory (CSI see Lance, Gould, Stennett, O'Brien, Solomonson, McMillen, Mallard, Mayfield, Stewart, & Jadrich, in press).

(f) The CSI was mailed to over 3,000 supervisors and superintendents of 5-skill level (i.e., journeyman) incumbents in the M/E AFSs in the fourth quarter of 1993. Respondents were asked to indicate the extent to which each of the 180 tasks was "Part of" a typical 5-skill level job in their AFS (1 = Very Small Amount to 9 = Very Large Amount). A total of 2223 respondents in 93 different M/E AFSs returned completed CSIs.

(g) Principal components analyses were conducted on correlations among the 180 items' "Part of Job" ratings. Three decision rules were used to determine the number of components to retain and interpret: (i) Cattell's (1966) Scree test, (ii) Horn's (1965) parallel analysis criterion, and (iii) interpretability of the solution. Based on these criteria, a 29-component solution was determined to best define the domain of M/E tasks represented by the 180 CSI items.

(h) Components were interpreted according to the generic task statements having the highest component loadings toward defining taxons (i.e., taxonomic categories) in a revised USAF enlisted task taxonomy. Two components of the 29-component solution were deleted as uninterpretable, and two others were added rationally to address content deficiencies

(see Lance et al., in press).

(i) Taxon descriptions were developed to define tasks included within resulting M/E task categories which dovetailed with the remaining task categories to complete the revised enlisted task taxonomy. The complete revised enlisted task taxonomy is shown at Appendix B.

Development and evaluations of this taxonomy are more fully described by Lance et al. (1995).

This revised 45-category task taxonomy furnished the basis for the portion of the TSQ which defined retrainees' AFS skills/knowledge requirements. Retrainees were asked to make a total of five ratings with respect to each of the 45 task categories. Retrainees' supervisors and peers also made the same five ratings on corresponding versions of the TSQ. As in previous research, the retrainee was asked to rate each task category as to: (a) whether it is part of a 5-level job for a typical airman in the retrainee's AFS; (b) how much time is spent on that task category for a typical 5-level airman in the retrainee's AFS (1 = Very small amount to 9 = Very large amount); and (c) how many months it takes a newly assigned, 3-level, airman to become proficient at the 5-level on this task category (1 = 0-1 month to 9 = 9 or more months). TSQ instructions also asked retrainees to rate: (a) upon retraining, how many months it took them to become proficient (1 = 0-1 month to 9 = 9 or more months), and (b) their current performance level (1 = Very much below average to 9 = Very much above average), on each of the 45 task categories.

Note that the first three of these ratings have as the rating target a typical airman in the retrainee's AFS. The last two ratings changed this focus to the particular retrainee targeted for research participation and whose name appeared as part of the research packet given to the retrainee's Supervisor and Peer.

Our primary criterion for the validation study described more fully later was the time required by the retrainee to achieve proficiency in the new AFS following retraining. Thus the fourth rating asked retrainees to rate how long it took them to become fully proficient (1 = 0-1 month to 9 = 9 or more months) on tasks included within task categories endorsed as "part of" their job.

Since we also were concerned with the current job performance of the retrainee, we asked them to respond, using the subset of the 45 task categories they chose, in terms of their current task performance. Specifically, the fifth rating asked retrainees to rate their own current performance level (1 = Very much below average to 9 = Very much above average) with respect

to each task category endorsed as "part of" their job.

Finally, a version of the TSQ that contained only the first three task category ratings (i.e., part of job, time spent and months to proficiency for a typical airman) was developed for the nonretrainee sample.

Global Ratings. This section of the TSQ contained three rating items patterned after global ratings developed as part of the Joint Service Job Performance Measurement Project (Hedge & Teachout, 1986). These were overall ratings of the retrainee's Technical Proficiency (Global Technical Proficiency, 1 = Never meets acceptable level of proficiency to 9 = Always exceeds acceptable level of proficiency), Interpersonal Proficiency (Global Interpersonal Proficiency, 1 = Never meets acceptable level of proficiency to 9 = Always exceeds acceptable level of proficiency), and Time to Proficiency (Global Time-to-Proficiency, 1 = 0-1 month to 9 = 9 or more months). These three ratings appeared only on the Retrainee, Supervisor, and Peer versions of the TSQ and not the Nonretrainee survey.

Organizational Climate. This section of the TSQ assessed the organizational climate of the retrainee's job. The retrainee, the supervisor, and the co-worker were asked to respond to the items in this climate questionnaire, including: (a) the learning environment; (b) supportive organizational structure and policies; (c) encouragement of new ideas and transfer of training; (d) goal setting; (e) performance constraints; (f) co-worker support; and, perhaps most important, (g) supervisory behaviors.

Sample

Consistent with our triangulation approach to the measurement of factors related to retraining ease, we targeted recent retrainees, their supervisors, retrainees' peers, as well as a sample of non-retrainees for survey data collection.

Initially, the identities of 26,826 retrainees for FY 90-94 were obtained from the Air Force Personnel Center. We decided to focus on recent retrainees (i.e., MAY 92 through MAR 94) at the E-3 to E-6 grade level, who had retrained into AFSs in which at least 100 airmen had retrained. Retrainees in grades E-3 to E-6 comprise the bulk of the retrainee population; persons in grades lower than E-3 typically are ineligible for retraining and persons in grades higher than E-6 are typically serving in supervisory positions. This led to the identification of 3,000 retrainees who were targeted for survey administration. An additional 1,500 nonretrainees (also at the E-3 to E-6 level) were identified from an enlisted master personnel file (i.e., the Uniform Airman Record (UAR) file), for survey participation.

Nonretrainees were deliberately selected to represent AFSCs from which many of the retrainees had retrained.

Each targeted retrainee's supervisor was sent by mail a packet of materials containing (a) an instruction sheet, (b) a Transferability of Skills Questionnaire (TSQ) to be completed by the supervisor, (c) a TSQ to be completed by a peer of the retrainee, (d) a TSQ to be completed by the retrainee, (d) computer scanable answer sheets for each of the survey booklets, and (e) return mail envelopes. Each retrainee's supervisor was asked in the instructions to complete his/her version of the TSQ, to distribute the retrainee version to the retrainee for completion, and to distribute the Peer version of the TSQ to one peer of the retrainee to complete. Each of the TSQs were to be returned separately. Nonretrainee questionnaires were mailed directly to targeted participants who were asked to complete the surveys and return them separately also.

Total sample sizes (and response rates) were as follows: 937 Retrainees (31%), 968 Supervisors (32%), 661 Peers (22%), and 531 Nonretrainees (35%). With the exception of the Peer sample, these response rates are somewhat lower than that in previous transferability of skills studies (i.e., 50% to 58%, see Lance, Kavanagh, & Gould, 1993; Lance, Mayfield, & Gould, 1993), perhaps owing to the complexity of the TSQ.

Data Editing

Answer sheets were scanned and four separate data sets were prepared, each containing TSQ survey responses along with data retrieved from existing data bases (i.e., UAR and Military Entrance Processing Station (MEPS) files). These correspond to data for (a) retrainees, (b) retrainees' supervisors, (c) retrainees' peers, and (d) the nonretrainee sample. Initially, each data set was edited to insure that all data elements were correctly input and that values of all data elements fell within expected ranges (e.g., that no "9's" occur for data fields which should only range between 1 and 5), by computing frequency distributions and descriptive statistics for all data fields. The few "out-of-range" values that were detected were recoded as missing data.

Data Merging

Next, all four data sets were merged into a single data set containing retrainee, supervisor, peer, and nonretrainee data. Data were merged using the case control number coded on the surveys. Thus each data record corresponded to either a targeted retrainee (and his/her supervisor and peer if complete responses were obtained) or nonretrainee participant (in which case no

supervisor or peer data appeared).

Selection of Data for Analysis

The number of respondents by respondent group for all AFSs surveyed is shown in Table 1. Some AFSs (e.g., AFSC 242x0) had no Nonretrainee respondents as these are AFSs into which many airmen retrain and thus Nonretrainees were not targeted for data collection. Other AFSs (e.g., AFSC 304x2) had only Nonretrainee respondents as these AFSs more often serve as sources for airman retraining.

Table 1

Number of Respondents for All AFSCs Surveyed

AFSC	Title	RETR	PEER	SUPER	NONRET	MAGE	OLD
113X0	Flight Engineer	36	23	42	19	G	91
114X0	Aircraft Loadmaster	19	10	26	8	G	115
201X0	Intelligence Operations	22	22	23	17	G	102
201X1	Target Intelligence	4	3	3		G	102
205X0	Electronic Intelligence	7	5	6		G	102
241X0	Safety Specialist	8	9	7		G	105
242X0	Disaster Preparedness	10	7	10		G	105
251X0	Weather Specialist	12	8	11		G-E	83
271X2	Operations Resources Mgt	13	13	20	14	A	89
272X0	Air Traffic Control	38	27	38	11	G	98
274X0	Command & Control	7	9	6		G	95
277X0	Space Systems Operations	15	9	18	9	E	126
304X2	Meteorological & Navigation Sys				12	E	123
304X4	Ground Radio Communications	18	19	18		E	123
304X5	Television Systems	7	7	6		E	132
304X6	Satellite Communications Sys	5	4	4		E	127
305X4	Elec Computer & Switching Sys	27	27	28		E	120
306X6	Secure Communications Sys				13	E	123
361X0	Antenna Systems				8	M	124
361X1	Communcations Cable Sys	15	12	14	10	M	119
391X0	Maintenance Data Sys Analysis	12	8	8		G	107
392X0	Maintenance Scheduling	12	9	12	17	G	89
452X4	Tactical Aircraft Maintenance	18	13	22	36	M	120
454X0A	Aerospace Propulsion, Jet Eng				14	M	141
454X1	Aerospace Ground Equipment				5	M-E	124
454X6	Airlift Elect & Envir Sys	11	7	6		M-E	118
455X1	Avionics Guidance & Control Sys	18	15	19	14	E	126
455X2	Communication & Navigation Sys	17	16	18	20	E	126
457X0	Strategic Aircraft Maintenance	26	16	27	20	M	129
457X2	Airlift Aircraft Maintenance	31	23	33	14	M	130
462X0	Aircraft Armament Sys				11	M-E	122
472X4	Vehicle Maintenance Cnl & Analy	7	9	16	13	A	80
491X1	Comm-Computer Sys Operator	20	11	18	14	G	91
491X2	Comm-Computer Sys Programmer	65	46	64	15	G	91
493X0	Comm-Computer Sys Control	19	13	19		E	126
496X0	Comm-Computer Sys Plng & Prg Mgt	17	8	19	17	G	91

Table 1 (continued)

AFSC	Title	RETR	PEER	SUPER	NONRET	MAGE	OLD
602XX	Freight Packaging & Traffic Mgmt	39	38	43	11	A	81
603X0	Vehicle Operator/Dispatcher	13	8	11	18	M	78
605X5	Air Transportation				17	M-A	96
645X0	Inventory Management				11	A-G	79
645X1	Materiel Storage & Distribution	12	13	14		G	70
645X2	Supply Systems Analysis	8	9	13	13	A	91
661X0	Logistics Plans	25	9	25		A	125
672X1	Financial Management	5	6	3	12	A	100
672X2	Financial Services	8	11	8	6	A	87
674X0	Financial Analysis	28	17	24		G	91
702X0	Information Management	49	20	46		A	67
731X0	Personnel Sys Management	4	3	2		G	80
732X0	Personnel	57	33	65	11	A	80
734X0	Social Actions	28	11	18	8	A-G	86
734X0B	Social Actions, Substance Abuse				12	A-G	86
751X0	Education Specialist	5	7	1		G	96
751X1	Training Systems	41	23	41	19	G	96
811XX	Security/Law Enforcement				15	G	94
881X0	Paralegal	40	26	45	18	G	77
906X0	Health Services Management	25	19	22	10	G	77
	Total	923	661	942	512		

Note. AFSC = Air Force Specialty Code, RETR = Retrainee, Peer = Co-worker/Peer, SUPER = Supervisor, NONRET = Nonretrainee, MAGE = MAGE aptitude area assignment, OLD = Occupational learning difficulty.

As Table 1 shows, there were several AFSs from which relatively few respondents returned TSQs (e.g., AFSC 201x1). Since many of the analyses reported below were based on AFS-level aggregate data, we needed to insure that the aggregate-level indices were estimated reliably. Earlier, Kavanagh and Lance (1990) showed that approximately 10 subject matter experts (SMEs) was a sufficient sample size to insure reliable aggregate-level estimates based on ratings of the type collected here. Thus, we limited further analyses to those AFSs that had at least 10 Nonretrainee respondents, or an average of 10 Retrainee, Supervisor, and Peer respondents, or at least 10 raters from two of the Retrainee, Supervisor, and Peer respondent groups. Sample sizes for AFSs thus retained for study are shown in Table 2.

The two right-most columns in Tables 1 and 2 provide information used in analyses described later on each AFS's aptitude area assignment and occupational learning difficulty (OLD). The USAF bases accession and classification decisions in part on four aptitude composites formed from ASVAB subtests: Mechanical, Administrative, General, and Electronics (MAGE)

Table 2

Number of Respondents for AFSCs Selected for Study

AFSC	Title	RETR	PEER	SUPER	NONRET	MAGE	OLD
113X0	Flight Engineer	36	23	42	19	G	91
114X0	Aircraft Loadmaster	19	10	26		G	115
201X0	Intelligence Operations	22	22	23	17	G	102
242X0	Disaster Preparedness	10	7	10		G	105
251X0	Weather Specialist	12	8	11		G-E	83
271X2	Operations Resources Mgt	13	13	20	14	A	89
272X0	Air Traffic Control	38	27	38	11	G	98
277X0	Space Systems Operations	15	9	18		E	126
304X2	Meteorological & Navigation Sys				12	E	123
304X4	Ground Radio Communications	18	19	18		E	123
305X4	Elec Computer & Switching Sys	27	27	28		E	120
306X6	Secure Communications Sys				13	E	123
361X1	Communcations Cable Sys	15	12	14	10	M	119
392X0	Maintenance Scheduling	12	9	12	17	G	89
452X4	Tactical Aircraft Maintenance	18	13	22	36	M	120
454X0A	Aerospace Propulsion, Jet Eng				14	M	141
455X1	Avionics Guidance & Control Sys	18	15	19	14	E	126
455X2	Communication & Navigation Sys	17	16	18	20	E	126
457X0	Strategic Aircraft Maintenance	26	16	27	20	M	129
457X2	Airlift Aircraft Maintenance	31	23	33	14	M	130
462X0	Aircraft Armament Sys				11	M-E	122
472X4	Vehicle Maintenance Cnl & Analy	7	9	16	13	A	80
491X1	Comm-Computer Sys Operator	20	11	18	14	G	91
491X2	Comm-Computer Sys Programmer	65	46	64	15	G	91
493X0	Comm-Computer Sys Control	19	13	19		E	126
496X0	Comm-Computer Sys Plng & Prg Mgt	17	8	19	17	G	91
602XX	Freight Packaging & Traffic Mgmt	39	38	43	11	A	81
603X0	Vehicle Operator/Dispatcher	13	8	11	18	M	78
605X5	Air Transportation				17	M-A	96
645X0	Inventory Management				11	A-G	79
645X1	Materiel Storage & Distribution	12	13	14		G	70
645X2	Supply Systems Analysis	8	9	13	13	A	91
661X0	Logistics Plans	25	9	25		A	125
672X1	Financial Management				12	A	100
674X0	Financial Analysis	28	17	24		G	91
702X0	Information Management	49	20	46		A	67
732X0	Personnel	57	33	65	11	A	80
734X0	Social Actions	28	11	18		A-G	86
734X0B	Social Actions, Substance Abuse				12	A-G	86
751X1	Training Systems	41	23	41	19	G	96
811XX	Security/Law Enforcement				15	G	94
881X0	Paralegal	40	26	45	18	G	77
906X0	Health Services Management	25	19	22	10	G	77
	Total	840	582	882	468		

Note. AFSC = Air Force Specialty Code, RETR = Retrainee, Peer = Co-worker/Peer, SUPER = Supervisor, NONRET = Nonretrainee, MAGE = MAGE aptitude area assignment, OLD = Occupational learning difficulty.

(Department of Defense, 1984). Each enlisted AFS is classified as drawing primarily upon one (or more) of the four MAGE aptitude areas (Alley, Treat, & Black, 1988). Those aptitude area assignments are reported in Tables 1 and 2 for the AFSs in the present study. OLD values in Tables 1 and 2 are a measure of the general learning difficulty of enlisted AFSs using methodology developed by the USAF (Mead & Christal, 1970; see a review and construct validation by Mumford, Weeks, Harding, & Fleishman, 1987). As of Oct 93 benchmarked OLDs, which range theoretically between 25 and 250 (Ramage, 1987) had been derived for 322 AFSs.

Validation of Revised Task Taxonomy

The major goal of this study, the calculation and validation of estimates of cross-job retraining times, rests on the assumption that a valid taxonomy is available to support cross-AFS comparisons of task content and learning times. Whereas earlier we briefly described the development of the taxonomy used in this study, its validity needed to be established prior to the computation of cross-job retraining time estimates. Also as mentioned earlier, a full description of the taxonomy's evaluation is presented elsewhere (Lance et al., in press). However, two aspects of the taxonomy's evaluation are particularly relevant here.

First, several of the taxonomy's categories were endorsed too infrequently as "part-of" the job to warrant additional analysis. Table 3 shows the percentage of Retrainees (R), Peers (P), Supervisors (S), and Nonretrainees (N) who endorsed each task category as "part of" the job. Note that most of the difference between percentages within rows (i.e., AFSs) is between Nonretrainees and the other three rater groups. For example, relatively fewer Nonretrainees endorsed the PERSONNEL, ORAL/WRITTEN COMMUNICATION, and PLANNING/PROBLEM SOLVING categories as part of their job, as compared to the Retrainee, Supervisor, and Peer groups. On the other hand, Nonretrainees relatively more often endorsed the PHYSICAL/MANUAL LABOR, PNEUDRAULIC SYS INSPECT, and PROPULSION AND ENGINE SYS task categories. This is to be expected, since the Retrainees, Supervisors, and Peers all were describing the Retrainees' jobs, while the Nonretrainees alone were describing their own jobs.

Table 3 also lists for each task category a representative AFS that had one of the highest percentages of incumbents endorsing the category as "part of" the job, to document the taxonomy's face validity. For example, and as would be expected, Personnel Specialists often endorsed PERSONNEL tasks as "part of" their job; Health Services Management Specialists often endorsed MEDICAL - PATIENT CARE, and Weather Specialists often endorsed the task category METEOROLOGICAL EQUIPMENT MAINT. Note however that many of the task categories were infrequently endorsed,

Table 3

TSQ Task Category "Part of Job" Rating Percentages with Representative AFSCs

Task Category	Respondent Group Pctg				Representative AFSC with High Percentage "Part of Job" Rating	
	R	P	S	N	AFSC	Title
Clerical	89	89	88	87	702x0	Information Management
Personnel	44	43	42	35	732x0	Personnel Specialist
Maintain Inventories/Records	55	55	53	59	645x1	Materiel Storage & Distr
Mathematical	65	68	63	64	113x0	Flight Engineer
Physical/Manual Labor	49	48	48	58	645x1	Material Storage & Distr
Manufacturing/Fabricating	5	7	6	10	361x1	Communications Cable Sys
Construction	3	4	3	7	361x1	Communications Cable Sys
Medical - Patient Care	1	.9	.9	3	906x0	Health Services Manage
Medical - Technical	1	.5	.5	.6	751x1	Training Systems
Oral/Written Communication	87	89	90	81	201x0	Intelligence Operations
Planning/Problem Solving	81	82	84	76	272x0	Air Traffic Control
Science/Engineering	28	29	26	32	251x0	Weather Specialist
Artistic - Audio/Visual	17	13	11	18	304x5	Television Systems
Food Preparation	1	.8	2	2	114x0	Aircraft Loadmaster
Animal Care	.2	.6	.2	2	811x2	Law Enforcement
Fabric/Rope Work	2	.9	.8	3	114x0	Aircraft Loadmaster
Managing Others	61	65	62	68	455x2	Comm & Navigation Sys
Training	75	78	73	79	242x0	Disaster Preparedness
Surveillance	8	9	7	11	272x0	Air Traffic Control
Cryptographic Equipment Maint	6	6	5	7	304x6	Satellite Comm Sys Equip
Flight Control/Navig Sys Maint	8	7	9	12	455x1	Avionics Guidance Control
Munitions Handling	4	4	4	6	454x6	Airlift Elect & Envir Sys
Test/Meas/Diagnostic Equip	5	6	5	8	304x4	Ground Radio Comm
Pneudraulic Sys Inspect/Maint	11	9	11	18	452x4	Tactical Aircraft Maint
Computer Sys Maintenance	14	17	15	15	305x4	Elec Computer Switch Sys
Ground Based Comm Sys Maint	5	6	5	6	304x4	Ground Radio Comm
Aircraft Structure Inspection	.5	.5	.1	.8	455x2	Comm & Navigation Sys
Aircraft Instrumentation Maint	6	5	6	9	455x1	Avionics Guidance Control
Meteorological Equipment Maint	1	1	.6	3	251x0	Weather Specialist
Aircraft Armament Delivery Sys	2	1	2	5	457x0	Strategic Aircraft Maint
Takeoff/Landing Sys Maint	1	2	1	2	304x4	Ground Radio Comm
Aircraft Navig & Weapon Radar	3	2	3	7	455x2	Comm & Navigation Sys
Malfunction/Recording Control	4	3	3	4	455x1	Avionics Guidance Control
Telephone Sys Maint	10	9	8	5	361x1	Communications Cable Sys
Aircraft Electr Sys Maint	10	9	10	13	454x6	Airlift Elect & Envir Sys
Equip Circuit Component Maint	2	1	1	3	454x6	Airlift Elect & Envir Sys
Navigational Aids Maint	4	4	3	8	455x2	Comm & Navigation Sys
Satellite/Missile Sys Insp	2	3	2	4	455x2	Comm & Navigation Sys
Airborne Telemetry Monitoring	.6	.3	.4	.4	205x0	Elect Intell Operations
Security Perimeter Maint	.7	.6	.5	.6	304x5	Television Systems Spec
Avionics Test Equip Maint	2	3	2	6	455x1	Avionics Guidance Control
Quality Control	22	25	23	32	251x0	Weather Specialist
Data Retrieval & Storage Sys	4	2	2	2	391x0	Maint Data Sys Analysis
Space-based Assets Control	3	3	3	2	277x0	Space Sys Operations
Propulsion and Engine Sys	7	8	8	15	452x4	Tactical Aircraft Maint

Note. R = Retrainee, P = Peer, S = Supervisor, N = Nonretrainee.

particularly the more specialized technical task categories which were defined from Lance et al.'s (in press) revision of an earlier task taxonomy. This too would be expected though, given the goal of increasing the specificity with which these task categories were defined in the revised taxonomy. But which categories had too few respondents to justify analysis?

We used the same rule of thumb discussed earlier of 10 respondents per category to achieve sufficiently reliable aggregate ratings to exclude task categories from further analysis due to infrequent endorsement. Specifically, there was a total sample size of 2,772 among those AFSs retained for study in Table 2, or an average of 693 per rater group. An average of 1.4% part of job endorsements (across rater groups) (i.e., 1.4% of 693) established an approximate minimum sample size of 10 raters per rater group. Thus we adopted the criterion of a minimum average of 1.4% "part of job" endorsements across rater groups to identify task categories with insufficient endorsement. As a result, five task categories (MEDICAL - TECHNICAL, ANIMAL CARE, AIRCRAFT STRUCTURE INSPECTION, AIRBORNE MONITORING TELEMETRY, and SECURITY PERIMETER MAINT) were not included in analyses reported below.

The other aspect of the evaluation of the taxonomy which deserves mention here is interrater reliability in its use in describing enlisted AFSs. Table 4 shows Spearman-Brown corrected interrater reliabilities (i.e., $\underline{r}_{kk}$s) for the AFSs retained for analysis. With few exceptions, the $\underline{r}_{kk}$s are uniformly very high, supporting the interrater reliability of ratings with respect to the task taxonomy.

Measurement of Retraining Climate

Principal components analysis was performed on the 27 climate items. Separate analyses were conducted on each rating source: supervisor, peer, and retrainee. Several criteria were used to determine the number of components to retain. First, Kaiser's (1958) criterion was used. With this technique, components with eigenvalues greater than unity are retained. Second, scree plots were examined for breaks in the plot slopes (Cattell, 1966). A break in the slope of eigenvalues indicates the number of components to retain. Third, Horn's (1965) parallel analysis was performed. This procedure involves analyzing a randomly generated data set with the same structure as the sample data set. The scree plot for the random data set is superimposed over the scree plot for the sample data. The place where the two scree plots intersect represents the number of components that should be retained. Fourth, interpretability of the components based on the item sources in the literature (Peters & O'Connor, 1980; Tracey, 1992; Tracey et al., 1995) was used as a major criterion to determine the final components to measure organizational climate.

Table 4

Spearman-Brown Corrected Mean Pairwise Interrater Correlations

AFSC	Title	Retrainee	Supervisor	Peer	Nonretrainee
113X0	Flight Engineer	.97	.97	.95	.91
114X0	Aircraft Loadmaster	.97	.97	.96	--
201X0	Intelligence Operations	.97	.96	.97	.97
242X0	Disaster Preparedness	.95	.95	.95	--
251X0	Weather Specialist	.95	.96	.88	--
271X2	Operations Resources Mgt	.95	.98	.94	.90
272X0	Air Traffic Control	.98	.98	.82	.94
277X0	Space Systems Operations	.83	.95	.93	--
304X2	Meteorological & Navigation Sys	--	--	--	.94
304X4	Ground Radio Communications	.97	.97	.97	--
305X4	Elec Computer & Switching Sys	.98	.97	.98	--
306X6	Secure Communication Sys	--	--	--	.94
361X1	Communications Cable Sys	.94	.96	.94	.92
392X0	Maintenance Scheduling	.96	.96	.93	.79
452X4	Tactical Aircraft Maint	.94	.97	.95	.91
454X0A	Aerospace Propulsion, Jet Eng	--	--	--	.92
455X1	Avionics Guidance & Control Sys	.93	.92	.92	.92
455X2	Communication & Navigation Sys	.91	.91	.89	.93
457X0	Strategic Aircraft Maintenance	.96	.97	.94	.88
457X2	Airlift Aircraft Maintenance	.95	.97	.95	.85
462X0	Airlift Armament System	--	--	--	.95
472X4	Vehicle Maintenance Cnl & Analy	.94	.98	.94	.95
491X1	Com-Computer Sys Operator	.96	.97	.93	.94
491X2	Com-Computer Sys Programmer	.98	.99	.97	.96
493X0	Com-Computer Sys Control	.94	.96	.94	--
496X0	Com-Computer Plng & Prg Mgt	.97	.97	.96	.99
602XX	Freight Packaging & Traffic Mgt	.78	.96	.98	.93
603X0	Vehicle Operator/Dispatcher	.93	.91	.90	.96
605X5	Air Transportation	--	--	--	.97
645X0	Inventory Management	--	--	--	.89
645X1	Materiel Storage & Distribution	.94	.95	.95	--
645X2	Supply Systems Analysis	.92	.95	.88	.94
661X0	Logistics Plans	.96	.98	.96	--
672X1	Financial Management	--	--	--	.96
674X0	Financial Analysis	.99	.98	.96	--
702X0	Information Management	.99	.99	.98	--
732X0	Personnel	.99	.99	.69	.96
734X0	Social Actions	.98	.98	.98	--
734X0B	Social Actions, Substance Abuse	--	--	--	.97
751X1	Training Systems	.95	.99	.98	.98
811XX	Security/Law Enforcement	--	--	--	.95
881X0	Paralegal	.99	.99	.98	.97
906X0	Health Services Management	.97	.74	.96	.90

Note: Two dashes (--) denote cells with insufficient sample sizes.

Based on these criteria, three components were retained in the final analyses. Thre three component solution for the three rating sources were compared, and items common to the three components were identified for inclusion in the final climate scales. Table 5 contains the items and component loadings for the final three scales for Supervisors, Peers, and Retrainees. The item numbers in the table refer to the original item numbers of the SKQs in Appendix A.

Since the SKQ items for all three rating sources are the same, examining the items within the components in Table 5 for the retrainees provides meaning for the three organizational climate components identified through these analyses. The first component, Situational Constraints, is characterized by factors in the work unit that can affect an individual airman's job performance like "a lack of qualified people in my unit," "Too much 'red tape'," and "inconsistent policies, procedures, and instructions." This organizational climate variable is very similar to situational constraints factors found in earlier studies (Peters & O'Connor, 1980). The second organizational climate component, Organizational Support for Continuous Improvement, is characterized by components in the work unit that create a climate that encourages innovation and continuous learning. This organizational climate is established by multiple signals like "coworkers are willing to listen to new ideas," "coworkers tell each other about new information that can be used to increase job performance," "supervisors openly express their support of continuous learning on the job," and "my work unit is highly innovative." This organizational climate variable is quite similar to the one found by Tracey et al. (1995) in their study of transfer of training in a sample of supermarket managers. The third component, Supervisor Support for Transfer of Training, focuses specifically on factors that foster transfer of training for the retrainee. The support in the work unit for transfer of training comes from multiple sources such as "there is excellent on-the-job training," "supervisors set goals for newly retrained airmen which encourage them to apply training on the job," and "training aids are available on the job to support what newly trained airmen learned in retraining." Again, this organizational climate component is similar to those identified in the previous literature (Tracey, 1992; Tracey et al., 1995).

The internal consistency estimates (Cronbach's alphas) for the climate scales for each source were: (a) Retrainees: Situational Constraints - .84, Organizational Support for Continuous Improvement - .81, Supervisor Support for Transfer of Training - .72; (b) Peers: Situational Constraints - .85, Organizational Support for Continuous Improvement - .77, Supervisor Support for Transfer of Training - .69; and (c) Supervisors: Situational Constraints - .85, Organizational Support for Continuous Improvement - .73, Supervisor Support for Transfer of Training - .68. Thus, all climate subscales had

Table 5

Factor Analysis Results of Organizational Climate Items by Rating Source

SUPERVISOR				PEER				RETRAINEE			
	FACTOR				FACTOR				FACTOR		
ITEM NO.	1	2	3	ITEM NO.	1	2	3	ITEM NO.	1	2	3
SITUATIONAL CONSTRAINTS											
80.	.71	-.15	-.21	80.	.69	-.26	-.13	66.	.67	-.10	-.27
71.	.68	-.03	-.06	67.	.68	-.23	-.08	70.	.67	-.03	-.07
77.	.67	-.03	-.18	71.	.68	.02	-.15	71.	.64	-.06	-.00
67.	.66	-.07	-.07	77.	.65	-.11	-.00	78.	.64	-.20	-.22
82.	.65	-.12	-.09	82.	.64	-.02	-.24	85.	.64	-.15	-.12
74.	.61	-.06	-.19	74.	.64	-.07	-.31	65.	.61	-.11	-.28
90.	.61	.06	-.19	84.	.60	.00	-.26	79.	.60	-.08	-.13
65.	.60	-.09	-.13	90.	.58	-.08	-.10	87.	.60	.08	-.09
75.	.59	-.19	.01	66.	.58	-.31	-.07	67.	.57	-.26	-.23
84.	.51	-.15	-.07	75.	.54	-.23	.01	74.	.50	-.16	-.16
69.	.51	-.27	-.02	65.	.52	-.31	-.07	84.	.50	-.22	-.03
86.	.31	-.25	.18	86.	.28	-.14	.17	72.	.36	-.20	.18
ORGANIZATIONAL SUPPORT FOR CONTINUOUS IMPROVEMENT											
89.	-.14	.67	.11	78.	-.23	.74	.10	89.	-.18	.74	.09
88.	.02	.66	.04	79.	-.09	.72	.22	90.	-.20	.71	.16
87.	-.17	.63	.16	91.	-.09	.68	.29	83.	-.07	.65	.28
85.	-.04	.60	.07	87.	-.09	.65	.15	91.	-.20	.63	.35
91.	-.17	.56	.34	68.	-.20	.61	.06	82.	-.08	.60	.15
79.	-.14	.56	.33	73.	-.24	.61	.14	81.	-.15	.58	.28
73.	-.13	.54	.19	89.	-.19	.58	.18	92.	-.23	.56	.37
68.	-.12	.51	.22	70.	-.08	.56	.33	86.	-.03	.50	.04
				83.	-.04	.54	.47				
SUPERVISOR SUPPORT FOR TRANSFER OF TRAINING											
70.	-.09	.24	.67	81.	-.23	.19	.65	76.	-.28	.22	.73
83.	-.13	.35	.63	72.	-.10	.16	.61	77.	-.17	.32	.70
72.	-.16	-.03	.62	76.	-.08	.09	.60	69.	-.13	.23	.69
66.	-.15	.19	.59	66.	-.24	.23	.58	68.	-.19	-.01	.66
81.	-.23	.13	.56	88.	-.06	.23	.57	80.	-.12	.33	.64
76.	.03	.20	.54	85.	-.06	.21	.55	73.	-.00	.28	.50
78.	-.17	.43	.48					75.	-.20	.42	.46

Note: Item number refers to the TSQ contained in the Appendix A.

acceptable reliabilities and were consistent with the literature sources used for item selection. However, the one note of caution for these results is that the reliabilities were based on the scales after taking advantage of the principal component solutions, and thus, should be subjected to subsequent verification on a new sample.

Calculation of XJRTEs

We used an adaptation of the methodology described by Lance, Kavanagh, and Gould (1993) to derive cross-job retraining time estimates (XJRTEs). The adaptation was necessary due to the AFSs represented by the Retrainee (and Supervisor and Peer) versus Nonretrainee samples in this study. As has been shown earlier (e.g.,. Lance, Mayfield, & Gould, 1993) retraining frequencies across various AFSs are asymmetric, with some AFSs (e.g., Security Specialist and many of the mechanical AFSs) much more often serving as "sources" for retraining, and others (e.g., administrative and personnel AFSs) serving as "recipients" or "targets" for retraining. Thus in the present sample, the Retrainees (and Supervisors and Peers) represented the "Into-AFSs" in the sense of retraining from one AFS into another, but they underrepresented the "From-AFSs." On the other hand, the Nonretrainee sample was deliberately chosen to represent those AFSs that most typically represent the source AFSs for retraining, or the "From-AFSs." Thus, Lance, Kavanagh, and Gould's (1993) profile comparison methodology was adapted here by using Nonretrainee rating profiles to describe the "From-AFSs" and Retrainee, Supervisor, and Peer rating profiles to describe the "Into-AFSs" for the purpose of computing XJRTEs.

Specifically, mean Month-to-Proficiency (MTP, i.e., the third task category rating on the TSQ) rating profiles were computed for each respondent group for each AFS across the 40 task categories retained for analysis. To compute cross-job retraining time estimates, mean MTP profiles (e.g., X1 and X2, for AFS1 and AFS2, respectively) were compared element-wise across the 40 task categories to calculate: (a) sums of differences between X1 and X2 values for which X1 values are larger (indicating task skills to be acquired in retraining from AFS2 into AFS1), and (b) sums of differences between X1 and X2 values for which X2 values are larger, indicating task skills to be acquired in retraining from AFS1 into AFS2 (see Figure 1 and Lance, Kavanagh, & Gould, 1993; Lance, Mayfield, Gould, & Lynskey, 1991). Note that three sets of XJRTEs were calculated on the basis of profile comparisons between Nonretrainee MTP mean profiles representing the "From-AFSs" and (a) Retrainee, (b) Supervisor, and (c) Peer mean MTP profiles each representing the "Into-AFSs." Note also that this methodology generates XJRTEs which (a) reflect the cross-job retraining times across (perhaps widely) different jobs, (b) are asymmetric with respect to

Mean Months to Proficiency Profile Differences:

Job 1 ⟶ Job 2 = 2 units
Job 2 ⟶ Job 1 = 4 units

Figure 1. Calculation of Cross-Job Retraining Time Estimates

retraining across different jobs (e.g., retraining from Surgeon to Nurse would be estimated to be easier than from Nurse to Surgeon), and (c) are relative in the sense that no attempt is made to estimate actual retraining times.

Construction of Input Data Sets for Analysis

As we mentioned earlier, the three general hypotheses outlined above were evaluated in a number of ways using three independent data sets corresponding to (a) a convergent validation study, (b) a postdictive validation study, and (c) a construct- and criterion-related validation study of XJRTEs. This section describes the construction of these three data sets.

Convergent Validation Data Set

The convergent validation data set was designed to replicate results presented earlier by Lance, Kavanagh, and Gould (1993) at the AFS-level of analysis. Lance, Kavanagh, and Gould (1993) argued that XJRTEs should be related to two other AFS-level variables, occupational learning difficulty (OLD) and the AFS's aptitude area assignment.

Lance, Kavanagh, and Gould's (1993) hypotheses were that XJRTEs (a) would relate positively to the occupational learning difficulty (OLD) of the "Into-AFS," under the rationale that achieving proficiency in a new AFS should generally take longer into AFSs that are generally more difficult to learn, (b) generally should be higher for retraining across AFSs that have different, versus the same aptitude requirements, and (c) that the positive XJRTE - OLD relationship should be stronger for retraining movements across, versus within, aptitude areas.

Each row of the AFS-level data set constructed to evaluate these hypotheses contained (a) three XJRTEs for retraining <u>from</u> AFS_i <u>to</u> AFS_j ($i \neq j$), based on profile comparisons between Nonretrainee mean MTP profiles and Retrainee, Supervisor, and Peer mean MTP profiles, (b) the OLD for AFS_i (the "From-AFS"), (c) the OLD for AFS_j (the "Into-AFS"), (d) a code number indicating the MAGE-area assignment for AFS_i (M=1, A=2, G=3, E=4), (e) a similar code indicating the MAGE-area assignment for AFS_j, and (f) a binary variable ("MAGE-F/T") indicating whether AFS_i and AFS_j were assigned to the same (=0) or different (=1) MAGE aptitude areas.

Postdictive Validation Data Set

The second data set was designed to replicate results presented earlier by Lance, Mayfield, and Gould (1993). They

conducted a postdictive validation of XJRTEs against criteria related to retraining success that were collected as part of the Airman Retraining Program Study (ARPS) in the late 1970s (see Lance, Mayfield, & Gould, 1993; Skinner, 1981, 1982, 1983; Skinner & Alley, 1980, 1984 for fuller descriptions of the ARPS). ARPS criteria included Retrainee and Supervisor ratings of (a) the extent to which the technical skills learned in the retrainee's previous specialty were helpful in their new (current) specialty ("Previous Skill Utilization"), and (b) the retrainee's technical skills and abilities ("Current Skill/Ability"). Also, Supervisors rated the Retrainee's current amount and quality of work performance ("Performance Effectiveness").

Recognizing that the enlisted USAF specialty structure had changed many times over the last 20 years, we tracked the AFSCs of the AFSs retained for analysis in this study to determine whether comparable specialties existed at the time of the ARPS (i.e., c. 1978). Surprisingly, many of the 1994 AFSCs were identical to those in 1978. Others had simply changed AFS codes. Still others had changed so radically that it was impossible to identify 1978 AFSCs that corresponded to 1994 AFSCs. In the end, we retained ARPS data only for those retrainees whose "From-AFSCs" and "Into-AFSCs" were traceable to comparable AFSCs in the 1994 enlisted USAF structure and which were included in the present study. As is reported more fully later in Table 10, 1,940 ARPS retrainees with complete retrainee and supervisor criterion data were retained for this analysis.

Thus, the final postdictive validation data set consisted of the three sets of XJRTEs (i.e., based on Retrainee, Supervisor, and Peer MTP ratings) computed from the present TSQ data (which were matched to comparable From- and Into-AFS retraining movements that had occurred in the late 1970s) and ARPS criteria described earlier. Note that in this data set the XJRTEs are computed at the AFS-level of analysis, whereas criteria are measured at the individual retrainee-level of analysis.

Construct and Criterion Related Validation Data Set

This data set, discussed in part already, consisted of TSQ data collected specifically for this study in 1994 from the sample of Retrainees, their Supervisor and a Peer, and from a sample of Nonretrainees. Each data record corresponded to a Retrainee or a Nonretrainee. Both Retrainee and Nonretrainee records were augmented with personnel data (e.g., ASVAB scores) obtained from additional computer files (e.g., UAR and MEPS data). Retrainees' records also contained matched Supervisor and Peer data (when available), as well as AFS-level data including: (a) the three sets of XJRTEs described earlier, (b) OLDs of the Retrainee's previous and current specialty, and (c) codes

indicating the Retrainee's previous and current AFSs' MAGE area assignment. Five additional variables were computed from Retrainee, Supervisor, and Peer TSQ data for analyses:

"Decomposed" Time-to-Proficiency. Recall that in addition to the global estimates of retrainee time to achieve proficiency in the new specialty, Retrainees, Supervisors, and Peers also rated retrainee time-to-proficiency with respect to each of the 40 task categories on the TSQ that were relevant for the Retrainee's AFS. We computed a "decomposed" time-to-proficiency (DTTP) measure for each rating source as the simple sum of these ratings across the relevant task categories (i.e., those task categories that were endorsed as "part of" the job). Conceptually, DTTP measures reflect a composite estimate of total time to achieve job proficiency as an additive function of achieving proficiency on individual job elements.

"Decomposed" Job Performance. The fifth TSQ task category rating completed by Retrainees, Supervisors, and Peers was of the Retrainee's performance effectiveness with respect to each relevant task category. We computed a "decomposed" job performance (DPERF) measure for each rating source on the basis of these ratings as a simple sum of the ratings across relevant task categories (i.e., those task categories that were endorsed as "part of" the job) divided by the number of task categories endorsed. Dividing by the number of task categories endorsed guarded against the possibility of Retrainees achieving higher performance scores simply because more task categories were endorsed as relevant. Thus DPERF reflects retrainee performance averaged across relevant task categories.

Retraining Climate Variables. Finally, retraining climate scores were calculated for each rating source based on the principal components analyses reported earlier. Three composites reflecting Situational Constraints, Supervisor Support, and Organizational Support were calculated as the mean score across relevant scale items.

In summary, and consistent with the triangulation measurement approach mentioned earlier, Retrainee, Supervisor, and Peer measures each were obtained for:

Retraining criteria:

(a) Global Technical Proficiency (TP);
(b) Global Interpersonal Proficiency (IP);
(c) Global Time-to-Proficiency (TTP);
(d) Decomposed Time-to-Proficiency (DTTP), and;
(e) Decomposed Performance (DPERF).

Retraining predictors:

(a) Cross-job Retraining Time Estimates (XJRTEs);
(b) Retraining Climate - Situational Constraints (SITCON);
(c) Retraining Climate - Supervisor Support (SUPSUP); and
(d) Retraining Climate - Organizational Support (ORGSUP).

Two additional predictors of retraining success were Retrainee Armed Forces Qualification Test (AFQT) scores and AFS-level OLDs. AFQT scores (a) are formed as composites of the ASVAB Word Knowledge, Paragraph Comprehension, Arithmetic Reasoning, and General Science subtests (see, e.g., Earles & Ree, 1992), (b) are regarded as strong indicators of general cognitive ability (Department of Defense, 1984), and (c) were obtained from MEPS data. AFS-level benchmarked OLDs were obtained from AL.

RESULTS

Convergent Validation of XJRTEs

Recall that the goal of the convergent validation of XJRTEs was to assess relationships of XJRTEs with other AFS-level predictors of retraining ease. Table 6 shows correlations between the three sets of XJRTEs (based on analysis of Nonretrainee versus Retrainee, Supervisor, and Peer TSQ mean MTP profiles) and (a) the OLDS of the "Into-AFSCs" represented in the TSQ data set, (b) OLDS of the "FROM-AFSCs," and (c) the MAGE-F/T variable indicating whether retraining was within (=0) or across

Table 6

Convergent Validation - Descriptive Statistics and Correlations with Cross-Job Retraining Time Estimates

Variable	Mean	SD	Correlation with XJRTEs		
			Retrainee	Supervisor	Peer
Into-AFS OLD	101.10	18.51	.267**	.152**	.164**
From-AFS OLD	104.07	20.13	.087**	.126**	.107**
MAGE-F/T	.75	.43	.068**	.062**	.058**

Note. N = 2046 for all correlations.

**p < .01

different (=1) aptitude areas. Thus correlations in Table 6 are at the AFS-level of analysis.

As predicted, XJRTEs correlated positively with OLDs of the "Into-AFSs" (top row of Table 6) supporting the idea that attaining proficiency in a new assignment should take longer in new jobs that are generally more difficult to learn. Unexpectedly, XJRTEs also correlated positively with OLDs of the "From-AFSs." We expected this relationship to be negative under the rationale that it would be easier to retrain from AFSs that are generally more (as compared to less) difficult to learn. On the other hand, the positive relationship may reflect the nongeneralizability of specific technical task areas that are associated with AFSs having higher OLDs.

Finally, although the correlations are small, the positive correlations between MAGE-F/T and the XJRTEs (bottom row of Table 6) indicate a tendency for XJRTEs to be higher for From- and Into-AFS combinations that have different, versus the same, aptitude requirement areas. This was as predicted. Another way of looking at this finding is in terms of the From-AFS MAGE x Into-AFS MAGE (M=1, A=2, G=3, E=4) interaction with XJRTEs as the dependent variable. We analyzed this interaction by conducting three 2-way analyses of variance (ANOVAs) each with From-AFS MAGE and Into-AFS MAGE areas as the main effects factors and the three XJRTEs (i.e., based on Retrainee, Supervisor, and Peer MTP ratings) as the respective dependent measures. Table 7 shows these results.

The first two rows in Table 7 show that there are significant

Table 7

Convergent Validation - Analysis of Variance Results for Cross-Job Retraining Time Estimates

			F-Values		
	Source	df	Retrainee	Supervisor	Peer
1.	From-AFS MAGE (F)	3	18.00**	23.46**	18.13**
2.	Into-AFS MAGE (T)	3	87.01**	29.49**	20.13**
3.	F x T	9	3.62**	4.88**	3.39**
4.	Residual	2030	---	---	---

**p < .01

differences in XJRTEs both as a function of the From-AFS's MAGE area (i.e., it is more difficult to retrain FROM some AFS MAGE areas than others) and the To-AFS's MAGE area (i.e., it is more difficult to retrain INTO some AFS MAGE areas than others). The third row in Table 7 confirms the interaction effect for all three sets of XJRTEs. Table 8 shows the cell means (and cell ns) for XJRTEs based on Supervisor ratings. To facilitate interpretation of the interaction, these cell means are plotted in Figure 2.

Note that the "G" curve in Figure 2 is generally higher than the others, indicating that retraining is predicted to be more difficult from AFSs having General aptitude requirements as compared to AFSs with other MAGE area assignments. Also, the mean heights of the curves over the "M" and "E" points on the abscissa of the plot indicate that retraining is predicted to be generally more difficult into Mechanical and Electronic than into Administrative and General AFSs. These patterns illustrate the main effects found in Table 7: retraining is generally more difficult from "G" jobs and into "M" and "E" jobs.

The predicted interaction was one in which the lowest value above each point on the abscissa corresponded to the curve for the same aptitude area, indicating that it is easiest to retrain into an AFS in a particular aptitude area from another AFS in the same aptitude area than from an AFS in another aptitude area. This was confirmed for the Administrative and Electronic From-/To-AFS combinations, but not for the Mechanical and General aptitude areas. That is, as predicted, the lowest points above the "A" and "E" points on the abscissa were for retraining from "A" jobs and "E" jobs, respectively. Counter to predictions, retraining was found to be easiest into "M" jobs from "E" jobs, and into "G" jobs from "A" jobs.

Finally, we predicted that the positive XJRTE - OLD relationship would be stronger for retraining movements across, rather than within, aptitude areas. We tested this hypothesis using moderated regression (Cohen & Cohen, 1975) by first regressing XJRTEs on the Into-Job OLDs (O) and the MAGE-F/T (M) variables and, in a second step, the MxO cross-product term. In addition to showing the standardized regression weights for the full equations (i.e., the equations including the cross-product term), Table 9 shows that the inclusion of the cross-product term resulted in a significant increase in R^2 for Retrainee-based and Supervisor-based XJRTEs (but not for Peer XJRTEs). We analyzed the form of the significant interactions by calculating predicted values for XJRTEs (see Jaccard, Turrisi, & Wan, 1990) at the lowest and highest OLD values observed in the retrainee-populated AFSs included here (i.e., 67 and 130, see Table 2). For illustrative purposes, the interaction effect calculated on the basis of Supervisor-based XJRTEs is shown in Figure 3.

Table 8

Convergent Validation - Analysis of Variance Cell Means (and Number of Observations) for XJTREs Based on Supervisor Ratings

	To-AFS MAGE			
From-AFS MAGE	Mechanical	Administrative	General	Electronic
Mechanical	6.30 (94)	6.46 (160)	6.27 (352)	7.21 (128)
Administrative	7.56 (66)	4.87 (102)	4.93 (242)	6.98 (88)
General	8.36 (78)	6.60 (130)	6.36 (275)	8.38 (104)
Electronic	5.73 (30)	6.04 (50)	5.61 (110)	6.00 (37)

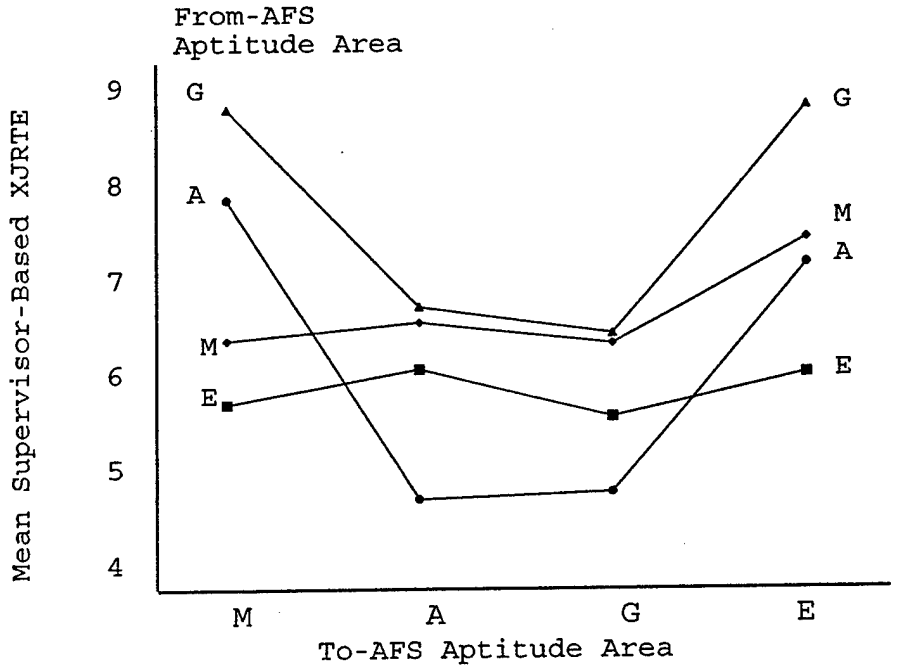


Figure 2. Interaction Effect of From- and To-AFS Aptitude Areas on Supervisor-Based XJRTEs.

Table 9

Convergent Validation - Moderated Regression Results

Source	Standardized Regression Weights		
	Retrainee	Supervisor	Peer
1. MAGE-F/T (M)	-.301*	-.305*	-.171
2. To-AFS OLD (O)	.222**	.106**	.135**
3. M x O	.364**	.369**	.227
R^2 change	.004**	.004**	.002

Note. N = 2046 for each equation.

* p < .05; **p < .01

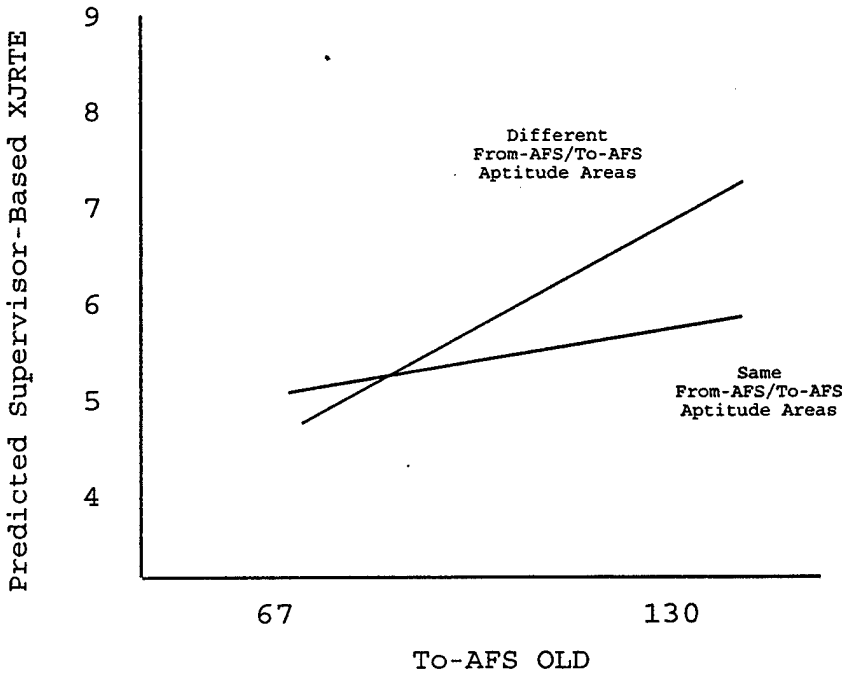


Figure 3. Similarity of From- vs To-AFS Aptitude Area as a Moderator of the Relationship Between To-AFS OLDS and XJRTEs

Figure 3 shows that, as predicted, a positive relationship was supported between XJRTEs and OLDs for retraining across different MAGE aptitude areas, whereas the relationship was negligible for retraining across different AFSs within the same aptitude area.

Summary. Results of the convergent validation indicated that, as predicted, XJRTEs correlated with two other theoretical predictors of actual cross-job retraining ease: (a) the general occupational learning difficulty of the new job and (b) movement into a new job with different aptitude requirements than the old job. Additionally, the idea that the general learning difficulty of the new job is more important in determining retraining ease to the extent that the new job also entails different aptitude requirements than did the old job was also supported.

Postdictive Validation of XJRTEs

The purpose of this part of the validation effort was to link XJRTEs calculated on the basis of data collected in 1994 to criteria related to retraining ease collected in the late 1970s as part of the Airman Retraining Program Study (ARPS). Recall that we tracked the identity of AFSCs very closely across several revisions of the enlisted USAF structure to ensure that 1994 XJRTEs referred to substantially the same AFSs we retained from the ARPS data set for validation. Table 10 shows the number of research participants in each of the AFSs we were able to include from the ARPS data set for postdictive validation. Entries in the columns labelled "From-" and "Into-AFS" show the number of ARPS respondents who indicated they had retrained from and into these AFSs, respectively. Thus these data show again that some AFSs are much more often "sources" for retraining (e.g., AFSCs 452X4, 462X0, and 811X0) while others are more often "targets" for retraining (e.g., AFSCs 242X0, 251X0, and 661X0).

Table 11 shows correlations between XJRTEs (calculated from 1994 TSQ data) and ARPS criterion measures (obtained from ARPS retrainees and their supervisors). These results provide weak support for the hypothesized relationship between XJRTEs and ARPS retraining and performance criteria. All three XJRTEs correlated significantly (though not strongly) with ARPS Retrainee self-ratings of the extent to which skills learned on the previous job were utilized in the new job. Only the Retrainee-based XJRTE correlated significantly with a similar Supervisory rating of retrainee previous skill utilization. No correlations between XJRTEs and performance criteria were significantly different from zero. However, as Lance, Mayfield, and Gould (1993) pointed out, and as we will reinforce later in this report, XJRTEs are not intended to predict performance in the new assignment as much as they are intended to predict time to achieve proficiency in the new assignment. Thus findings in Table 11 indicating that XJRTEs

correlate significantly only with criteria measuring the extent to which the new job draws upon skills that were learned previously in the old job are not unexpected.

Table 10

Postdictive Validation - AFSs Surveyed and Number of Research Participants

AFSCs	Title	ARPS Retrainees	
		From-AFS	Into-AFS
113X0	Flight Engineer	14	75
114X0	Aircraft Loadmaster	9	84
201X0	Intelligence Operations Specialist	20	0
207X1	Morse Systems Operator	0	2
242X0	Disaster Preparedness	2	109
251X0	Weather Specialist	8	113
272X0	Air Traffic Control Operator	80	84
277X0	Space Systems Operations Specialist	0	2
304X4	Ground Radio Communications Specialist	36	21
305X4	Elec Computer & Switching Systems Spec.	20	56
306X6	Secure Communications Systems Specialist	32	41
361X1	Communication Cable Systems Specialist	3	13
392X0	Maintenance Scheduling Specialist	3	99
452X4	Tactical Aircraft Maintenance Specialist	316	29
454X0	Aerospace Propulsion Specialist	141	54
455X1	Avionics Control Specialist	71	16
455X2	Avionics Communications Specialist	19	5
457X0	Strategic Aircraft Maintenance Specialist	11	0
462X0	Aircraft Armament Systems Specialist	113	10
472X4	Vehicle Maintenance Specialist	0	16
496X0	Comm-Computer Sys Plng & Prg Specialist	1	22
645X0	Inventory Management Specialist	133	51
645X1	Materiel Storage & Distribution Specialist	125	24
645X2	Supply Systems Analysis Specialist	4	73
661X0	Logistics Plans Specialist	0	109
672X1	Financial Management Specialist	8	38
672X2	Financial Services Specialist	19	26
674X0	Financial Analysis Specialist	9	63
702X0	Administration Specialist	390	212
732X0	Personnel Specialist	50	158
734X0	Social Actions Specialist	16	115
751X1	Training Systems Specialist	1	1
811X0	Security Specialist	207	39
811X2	Law Enforcement Specialist	62	62
881X0	Paralegal Specialist	3	67
906X0	Medical Administrative Specialist	14	51
	Total	1940	1940

Table 11

Postdictive Validation - Correlations Between XJRTEs and ARPS Criteria

ARPS Criteria	Retraining Time Estimates		
	Retrainee	Supervisor	Peer
Retrainee Ratings:			
Previous Skill Utilization	-.183**	-.113**	-.098**
Current Skill/Ability	-.002	.015	-.025
Supervisor Ratings:			
Previous Skill Utilization	-.086**	-.049	.003
Current Skill/Ability	-.004	.030	.014
Performance Effectiveness	-.011	-.020	.012

Note. N = 1940 for all correlations.

**p < .01

Construct and Criterion-Related Validation of XJRTEs

This section presents the core findings from this study. Results from the convergent and postdictive validation efforts substantially replicate and thereby corroborate earlier findings (Lance, Kavanagh, & Gould, 1993; Lance, Mayfield, & Gould, 1993). However, previous studies on transferability of skills and the validation of cross-job retraining time estimates have repeatedly identified the need for construct validation of XJRTEs and linkages between XJRTEs and measures of actual retraining success following reassignment. Results presented in this section address these research needs.

Recall that data from the TSQ were used to operationalize several retraining-related constructs (i.e., predictors of retraining success as well as retraining criteria) each from three different measurement sources (i.e., Retrainee, Supervisor, and Peer ratings). As such, the triangulation data collection strategy effected here permits an application of the multitrait-multimethod (MTMM, Campbell & Fiske, 1959) approach to the analysis of multiple retraining-related constructs, each assessed by multiple measurement methods/sources. This permits the analysis of relationships among retraining latent variables, while simultaneously controlling for measurement source effects in observed measures. Figure 4 shows the general MTMM structure employed here.

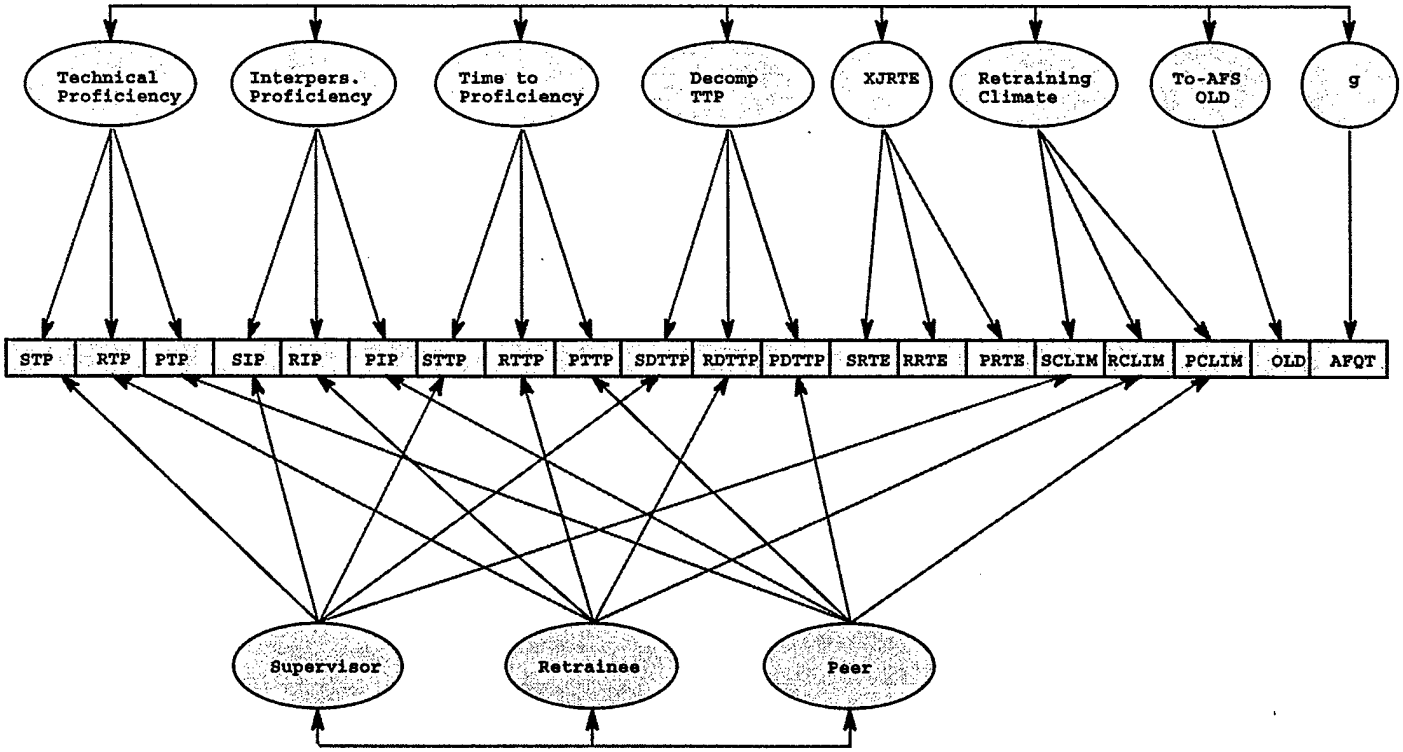


Figure 4. MTMM Approach to Analysis of Relationships Between Retraining-Related Constructs and Method Factors

Boxes in (the center of) Figure 4 represent observed measures. Here, the prefixes S, R, and P, refer to the measurement source (Supervisor, Retrainee, and Peer, respectively), and the remainder of the acronym refers to the construct being assessed, that is:

TP - Global Technical Proficiency
IP - Global Interpersonal Proficiency
TTP - Global Time-to-Proficiency
DTTP - Decomposed Time-to-Proficiency
RTE - Retraining Time Estimate (i.e., XJRTEs)
CLIM - Retraining Climate Variables

Thus each box represents a "trait-method unit" or a particular construct as operationalized by a particular measurement method/source. For simplicity of presentation, DPERF - Decomposed Performance and the specific Retraining Climate measures (i.e., Situational Constraints, Supervisory Support, and Organizational Support) are not shown in Figure 4, but should be included implicitly. Also, OLD represents the Into-AFS's occupational learning difficulty, and AFQT represents the Retrainee's Armed Forces Qualification Test score composite, a strong indicator of general cognitive ability (g).

The circles (and ellipses) at the top of Figure 4 represent latent retraining-related constructs (common factors), whereas those at the bottom of the Figure refer to common factors representing measurement source (method) effects. Curved, double-headed arrows represent correlations among the retraining constructs and among the measurement source latent variables. Finally, straight, single-headed arrows indicate inferred causal effects from the latent variables to the observed measures. Thus each observed measure (e.g., STP) is presumed to reflect variance relating to the latent retraining construct it was intended to measure (e.g., Global Technical Proficiency - TP) as well as variance attributable to the particular measurement source (e.g., Supervisor rating - S) by which the construct was operationalized. Not shown for the sake of clarity, is a third source of variance attributable to nonsystematic measurement error.

A number of approaches to the analysis of MTMM data have been proposed since Campbell and Fiske's (1959) introduction of the MTMM matrix. Although debate continues over the most appropriate parameterization, confirmatory factor analysis (CFA) is still widely accepted as the method of choice for the analysis of MTMM data. This is the approach we chose here to estimate relationships between the observed measures and the retraining-related and measurement source latent variables, and among the latent variables themselves. The advantages of this approach over more traditional regression-related approaches include (a) disattenuation in correlation and regression parameter estimates

for measurement error, (b) statistical estimation of convergent and discriminant validity of observed measures, (c) analysis of relationships among constructs rather than particular realizations (operationalizations) of them, and (d) disentangling of effects attributable to constructs of interest from those due to measurement sources/methods.

We used LISREL-8 for PC (Jöreskog & Sörbom, 1993) to estimate the MTMM "measurement model" implied by Figure 4. The complete covariance matrix included covariances among nine constructs (Global Technical Proficiency, Global Interpersonal Proficiency, Global Time-to-Proficiency, Decomposed Time-to-Proficiency, Decomposed Performance, XJRTEs, and the three Retraining Climate variables: Situational Constraints, Supervisory Support, and Organizational Support) each as measured by three measurement methods (i.e., Supervisor, Retrainee, and Peer ratings), plus two additional variables corresponding to the "Into-AFS's" OLD, and the retrainee's AFQT score. Thus the input matrix was a 29 x 29 covariance matrix. Specifically, we fit an adaptation of the additive CFA Model 3C described by Widaman (1985) in which we specified eleven "trait" factors corresponding to the nine retraining-related constructs plus AFQT, and Into-AFS OLD factors, and three "method" factors corresponding to the three rating sources.

The LISREL program reached a convergent maximum likelihood (ML) solution for the measurement model in 64 iterations with Chi-square(296) = 772.43 ($p<.01$). Although the model could be rejected statistically (as is usually the case with large models and large samples), alternative overall goodness-of-fit indices, including Jöreskog and Sörbom's Goodness-of-Fit Index (GFI=.91), Bentler's (1990) Comparative Fit Index (CFI=.89), the Tucker-Lewis index (TLI=.84), the standardized root mean squared residual (RMSR=.049), Browne and Cudeck's (1993) root mean squared error of approximation (RMSEA=.054) and the associated probability of close fit (p-close = .075) indicated reasonably acceptable model fit.

ML estimates for measurement model factor loadings are shown in Table 12. Variables' loadings on "trait" factors (first nine columns) and "method" factors (last three columns) can be interpreted as partial evidence for convergent validity and the presence of method effects, respectively. The first five columns of Table 12 show measured variables' loadings on latent Global Technical Proficiency (TP), Global Interpersonal Proficiency (IP), Global Time To Proficiency (TTP), Decomposed Time To Proficiency (DTTP), and Decomposed Performance (DPERF) criterion variables. Statistically significant factor loadings indicate significant convergent validity for all measures. Note that loadings for Retrainee measures have the lowest factor loadings (convergent validities) in each case. This is consistent with previous findings on convergence among alternative rating sources

Table 12

Transferability of Skills Measurement Model - Factor Loadings

Variable	Factor													
	GLBL TECH PROF	GLBL INTP PROF	GLBL TTP	DCMP TTP	DCMP PERF	XJRTE	SIT CONST	SUP SUPRT	ORG SUPRT	To-AFS OLD	RETR AFQT	SUPR METH	RETR METH	PEER METH
Super- TP	.48**	-	-	-	-	-	-	-	-	-	-	.73**	-	-
Retr - TP	.27**	-	-	-	-	-	-	-	-	-	-	-	.28**	-
Peer - TP	.78**	-	-	-	-	-	-	-	-	-	-	-	-	.26**
Super- IP	-	.48**	-	-	-	-	-	-	-	-	-	.63**	-	-
Retr - IP	-	.27**	-	-	-	-	-	-	-	-	-	-	.31**	-
Peer - IP	-	.81**	-	-	-	-	-	-	-	-	-	-	-	.23**
Super- TTP	-	-	.48**	-	-	-	-	-	-	-	-	-.30**	-	-
Retr - TTP	-	-	.18**	-	-	-	-	-	-	-	-	-	-.04	-
Peer - TTP	-	-	.75**	-	-	-	-	-	-	-	-	-	-	-.16**
Super- DTTP	-	-	-	.54**	-	-	-	-	-	-	-	-.22**	-	-
Retr - DTTP	-	-	-	.45**	-	-	-	-	-	-	-	-	-.09	-
Peer - DTTP	-	-	-	.68**	-	-	-	-	-	-	-	-	-	-.01
Super- DPERF	-	-	-	-	.45**	-	-	-	-	-	-	.54**	-	-
Retr - DPERF	-	-	-	-	.17**	-	-	-	-	-	-	-	.16**	-
Peer - DPERF	-	-	-	-	.65**	-	-	-	-	-	-	-	-	.25**
N/S - XJRTE	-	-	-	-	-	.84**	-	-	-	-	-	-.05	-	-
N/R - XJRTE	-	-	-	-	-	.77**	-	-	-	-	-	-	.05	-
N/P - XJRTE	-	-	-	-	-	.79**	-	-	-	-	-	-	-	.11**
Super- SITCON	-	-	-	-	-	-	.64**	-	-	-	-	-.06	-	-
Retr - SITCON	-	-	-	-	-	-	.30**	-	-	-	-	-	-.55**	-
Peer - SITCON	-	-	-	-	-	-	.32**	-	-	-	-	-	-	-.54**
Super- SUPSUP	-	-	-	-	-	-	-	.98**	-	-	-	.12*	-	-
Retr - SUPSUP	-	-	-	-	-	-	-	.20**	-	-	-	-	.76**	-
Peer - SUPSUP	-	-	-	-	-	-	-	.28**	-	-	-	-	-	.75**
Super- ORGSUP	-	-	-	-	-	-	-	-	.78**	-	-	.16**	-	-
Retr - ORGSUP	-	-	-	-	-	-	-	-	.17**	-	-	-	.69**	-
Peer - ORGSUP	-	-	-	-	-	-	-	-	.16**	-	-	-	-	.74**
To-Job OLD	-	-	-	-	-	-	-	-	-	1.00@	-	-	-	-
Retr AFQT	-	-	-	-	-	-	-	-	-	-	1.00@	-	-	-

* p < .05; ** p < .01; @ = Fixed parameter

(e.g., Harris & Schaubroeck, 1988) which has shown that peers' and supervisors' performance ratings converge more strongly with each other than either does with incumbent self-ratings. The sixth column shows convergence among XJRTEs in terms of their loadings on the latent Retraining Time Estimate (XJRTE) factor. These are among the highest in the factor pattern matrix, indicating strong convergence among sources in estimating cross-job retraining times. The next three columns show convergent validity evidence in measuring climate for retraining in terms of climate measures' factor loadings on the three Retaining Climate latent variables. Again, factor loadings were statistically significant in all cases. Interestingly, factor loadings were highest for Supervisor climate variables, suggesting that they have a broader perspective on retraining climate than do either the retrainees or their peers.

The last three columns show measures' loadings on rating source factors. Most of these are statistically significant, and can be interpreted as indicating that most measures reflect significant "method" effects. Alternately, these effects can be interpreted as unique, source-specific perspectives on the constructs being rated (Lance, Teachout, & Donnelly, 1992). Regardless of their interpretation, the XJRTEs' very low loadings on these factors indicate their freedom from influence of method/source effects.

In general, results in Table 12 indicate (a) significant convergent (measurement) validity for each of the measures in representing the underlying retraining-related latent variables, (b) significant, but uneven measurement method/source effects on measures, and (c) the high fidelity with which XJRTEs were operationalized.

Confirmatory factor intercorrelations are shown in Table 13. First, note that the performance-related factors (i.e., GLBL TECH PROF, GLBL INTP PROF, and DCMP PERF) are all strongly and significantly intercorrelated ($\underline{r}$s range from .77 to .95). This supports the idea that all three factors reflect slightly different aspects of retrainee general performance effectiveness in the new assignment. Second, note that GLBL TTP and DCMP TTP are significantly intercorrelated (i.e., $\underline{r}$ = .50, $\underline{p}$<.01). This indicates convergence between two very different methods of estimating time for retrainees to achieve proficiency in the new assignment (i.e., global vs. decomposed estimation). Third, note that correlations among the three retraining climate factors also are relatively high and statistically significant ($\underline{r}$s range from |.56| to |.69|). This supports the idea that although Situational Constraints, Supervisor Support, and Organizational Support are distinguishable aspects of climate for retraining, they might also relate to a more generalized perception of the climate's supportiveness of retraining (e.g., a Retraining

Table 13

Transferability of Skills Measurement Model - Factor Correlations

Factor	GLBL TECH PROF	GLBL INTP PROF	GLBL TTP	DCMP TTP	DCMP PERF	XJRTE	SIT CONST	SUP SUPRT	ORG SUPRT	To-AFS OLD	RETR AFQT	SUPR METH	RETR METH	PEER METH
GLBL TECH PROF	1.00													
GLBL INTP PROF	.85**	1.00												
GLBL TTP	-.61**	-.33**	1.00											
DCMP TTP	-.22**	-.11	.50**	1.00										
DCMP PERF	.95**	.77**	-.44**	-.37**	1.00									
XJRTE	-.04	.05	.22**	.25**	-.03	1.00								
SIT CONST	-.09	-.06	.05	.20*	.03	.07	1.00							
SUP SUPRT	.02	-.04	-.05	-.05	-.13*	.00	-.56**	1.00						
ORG SUPRT	.08	.05	-.02	-.05	.00	.04	-.69**	.66**	1.00					
To-AFS OLD	.22**	.13*	.03	.42**	.06	-.13*	.21**	-.05	-.04	1.00				
RETR AFQT	.12*	.00	-.05	.01	.10	-.07	-.02	-.08	.00	.04	1.00			
SUPR METH	-	-	-	-	-	-	-	-	-	-	-	1.00		
RETR METH	-	-	-	-	-	-	-	-	-	-	-	.23**	1.00	
PEER METH	-	-	-	-	-	-	-	-	-	-	-	.01	.26**	1.00

* $p < .05$; ** $p < .01$

Climate PC_g, see James & James, 1989). Finally, note that correlations among the three source factors (i.e., SUPR, RETR, and PEER METH factors) are low (although two are statistically significant). These lend some support to Lance et al.'s (1992) hypothesis that the source factors represent unique perspectives on the constructs being rated, rather than "method effects" per se.

The most important correlations in Table 13 for the purposes of criterion-related validation are between the XJRTE factor and performance and retraining criteria. As expected, XJRTE correlated significantly with both criterion factors reflecting time to achieve proficiency in the new assignment (i.e., GLBL TTP and DCMP TTP). It is important to remember that these correlations are among the retraining time estimate and time to proficiency latent variables. While these correlations are not strong (r = .22 and .25, respectively), they do support the idea that job-level similarities and differences in knowledge and skill requirements are important in determining cross-job retraining success. These correlations also provide the link, at the level of latent variables, between estimates of cross-job retraining ease and actual retraining ease following retrainee reassignment, thus answering calls from previous research for empirical linkages between retraining ease predictions and measures of actual retraining ease.

Correlations between XJRTE and performance criteria (i.e., GLBL TECH PROF, GLBL INTP PROF, and DCMP PERF) were not significantly different from zero. This is not surprising, as XJRTEs were intended to predict the ease with which retrainees learn to perform their job in the new assignment, not necessarily their level of performance once they have learned the new job.

Regarding other predictors of retraining ease criteria (GLBL TTP and DCMP TTP), retraining climate did not consistently relate to retraining ease, contrary to predictions. The only statistically significant relationship was a positive correlation (r=.20) between Situational Constraints (SIT CONST) and Decomposed Time-to-Proficiency (DCMP TTP). As predicted, the general learning difficulty of the new job related to retraining ease, but only for Decomposed TTP measures. Unexpectedly, airman aptitude (RETR AFQT) was unrelated to either retraining success factor, though it was related to overall technical proficiency.

In summary, correlations among retraining-related factors support the following conclusions: (a) XJRTEs are valid predictors of actual retraining ease following reassignment, (b) XJRTEs are valid predictors of retraining success, but not of performance in the new job per se, (c) retrainee aptitude seems to play a larger role in determining performance rather than new job learning, and (d) climate for retraining is not strongly

related to retraining success.

The finding that climate for retraining did not relate consistently to retraining success runs counter to the limited literature on this topic and to our second general hypothesis. This raises the question of whether climate for retraining might be better conceived as a moderator of the relationship between old/new job similarities and differences in task content and learning times (as captured by the XJRTEs developed here) and retraining success.

To test this idea (our third general hypothesis), we conducted a series of analyses among the latent retraining factors that are analogous to hierarchical regression analyses at the level of observed measures. Until recently, testing interactions among latent variables was nearly an intractable problem. However, Jaccard and Wan (1995) showed how latent interaction terms can be implemented in the LISREL-8 program by including (a) cross-products among manifest indicators of latent variables which have inferred interactive effects on other latent variables, and (b) a complex series of inequality constraints on the latent interaction terms' variances, and cross-product terms' factor loadings and residual variances.

We implemented Jaccard and Wan's (1995) approach here to test for the possible moderating effects of the three retraining climate latent variables on the relationships between XJRTE and the two TTP latent dependent variables. As in moderated regression we compared the fits of models which included only linear terms linking a dependent variable (e.g., GLBL TTP) to XJRTE and a retraining climate factor (e.g., SIT CONST) to a second model which also included the latent interaction term (e.g., XJRTE * SIT CONST). Differences in model fit were evaluated by the change in χ^2 from the reduced to the full model. Table 14 shows the results.

The top half of Table 14 shows tests of interaction hypotheses between XJRTEs and each of the retraining climate latent variables on the Decomposed TTP latent variable. The bottom half shows similar results for the Global TTP dependent variable. Only one interaction received statistical support, between XJRTEs and Situational Constraints in the prediction of Decomposed TTP. Thus with the exception of this one interaction effect, the third general Hypothesis was not supported.

Nevertheless, to determine the pattern of the one interaction that was supported, we extended Jaccard et al.'s (1990) procedure for depicting interaction effects among measured variables to the analysis of latent interaction effects. Standard deviations of the XJRTE and SIT CONST latent variables

were computed from the square roots of the appropriate diagonal elements in the matrix of covariances among latent variables provided by the LISREL program. Predicted values of Decomposed TTP were computed from substituting high and low values (i.e., ±2 SDs) of XJRTE and SIT CONST into the unstandardized full regression equation (i.e., that included latent linear and interaction terms). The resulting plot is shown in Figure 5.

Although the interaction shown in Figure 5 was the only one that was statistically significant out of the six tested, its form was as predicted. Time-to-proficiency (i.e., difficulty of retraining) was predicted to be uniformly high under constraining climates (i.e., High Situational Constraints). However, in unconstrained climates, XJRTEs were strongly and positively related to retrainee time-to-proficiency. Generally, in climates characterized by situational constraints, old/new job similarities and differences in task contents and learning times

Table 14

Tests of XJRTE x Retraining Climate Interactions in Predicting TTP

Dependent Variable: Decomposed TTP								
	Linear Only			Linear Plus Interactive			Change in Fit	
Climate Variable:	df	χ^2	R^2	df	χ^2	R^2	$\Delta\chi^2$	ΔR^2
Situational Constraints	57	182.78	.12	56	177.18	.18	5.60*	.06
Supervisor Support	57	219.59	.12	56	218.92	.12	.67	.00
Organizational Support	57	266.10	.09	56	263.72	.13	2.38	.04
Dependent Variable: Global TTP								
	Linear Only			Linear Plus Interactive			Change in Fit	
Climate Variable:	df	χ^2	R^2	df	χ^2	R^2	$\Delta\chi^2$	ΔR^2
Situational Constraints	57	172.36	.05	56	169.47	.07	2.89	.02
Supervisor Support	57	197.78	.06	56	197.68	.06	.10	.00
Organizational Support	57	251.14	.05	56	249.54	.06	1.60	.01

* $p < .01$

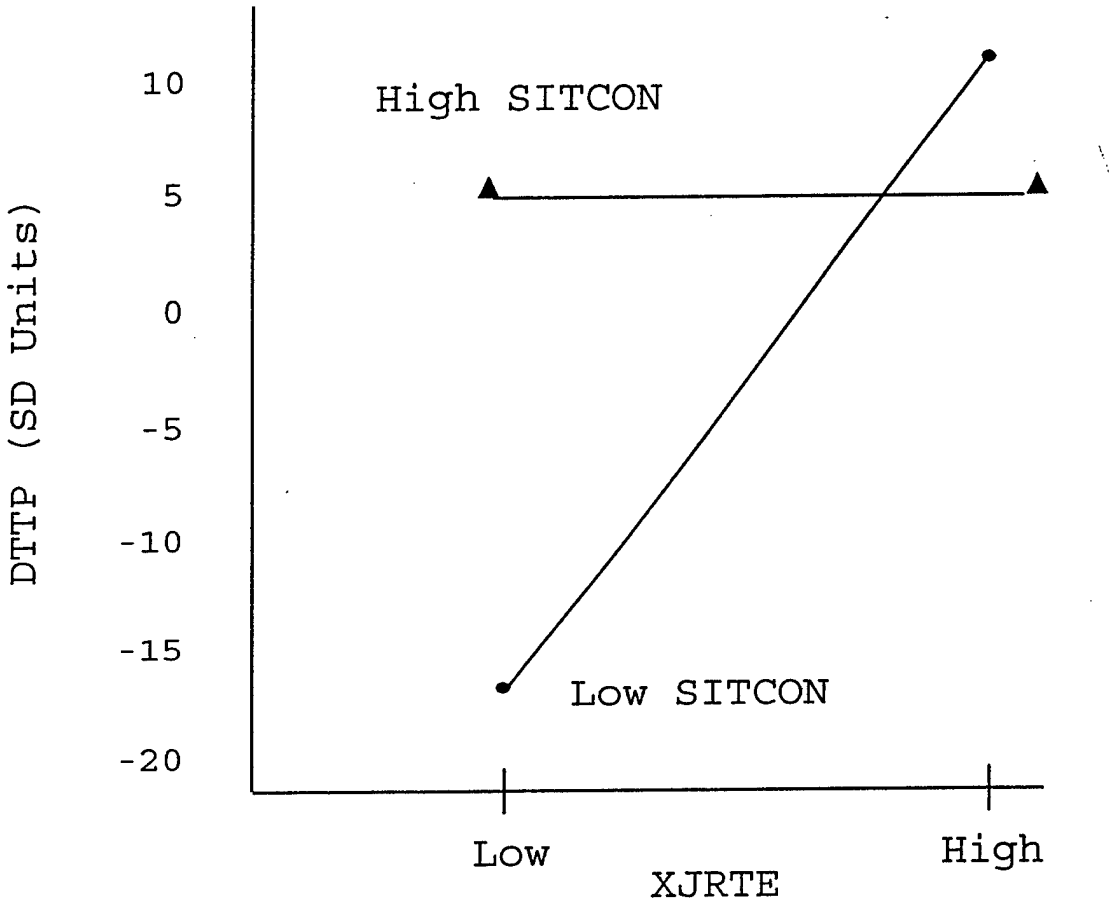


Figure 5. Situational Constraint (SITCON) x XJRTE Interaction Effect on Decomposed TTP

make little or no difference in the ease of retraining - retraining is difficult for all. It is in situations in which there are fewer constraints on learning and performance that the relationship between old/new job differences and retraining ease itself is less restricted, and tends to be strongly positive.

DISCUSSION

Overall Project Objective

The overall and major purpose of this research project was to provide criterion-related validity for the methodology for estimating cross-job retraining times (XJRTEs). This was a critical step for the USAF to have an operational capability to develop a "transferability of skills matrix" of retraining time estimates for the approximately 180 enlisted AFSs. The empirical results of this project clearly indicate success in meeting this major objective of providing criterion-related validity for the use of this methodology in estimating XJRTEs. Further, the use of the MTMM design (Campbell & Fiske, 1959) and related analyses should provide added confidence in the results.

Tests of Hypotheses and Completion of Task Activities

Consistent with the goal of developing a methodology to establish a "transferability of skills matrix" for enlisted AFSs, this research project tested three general hypotheses. We discuss the results for each hypothesis in this section.

In terms of our first general hypothesis, the criterion-related validity results obtained in the MTMM design (see Figure 4) provided strong evidence that XJRTEs are valid predictors of actual retraining ease following reassignment. The significant relationships reported in Table 13 between XJRTEs and both of the criterion variables measuring time to achieve proficiency in the new assignment support hypothesis 1, and indicate the methodology used to estimate and calculate cross-job retraining times can be used operationally with confidence in the Air Force.

The fact that the XJRTEs were not significantly related to the job performance criteria should not be interpreted as limiting their usefulness. Most of the sample of retrainees had been on their new jobs for some time before our data collection occurred. Since there are multiple influences on job performance after the initial learning period on a new job, our results are not surprising. Perhaps the most important aspect of performing on a new job during the first few weeks is the ease and speed of becoming proficient in the job tasks. Certainly, this is the

critical aspect of the reassignment and training programs within the Air Force. Thus, our results in validly predicting time-to-proficiency in new assignments may be interpreted as the most important job performance criteria to be used in the evaluation of enlisted reassignment program.

The second general hypothesis of this research project was not consistently supported as can be seen in Table 13. It may be that the organizational climate variables included in this research, with one exception, are not critical to ease of movement to a new assignment for enlisted personnel. However, these results may reflect one of the inescapable dilemmas of field survey research -- the timing of the measurement of the variables. Organizational Support for Continuous Improvement, Supervisor Support for Transfer of Training, and Situational Constraints may be important influences on ease of movement into a new job in the very early stages, for example, within the first two weeks to a month; but not as important after that point in time. In an ideal longitudinal design that would allow precise testing of our hypotheses, we would be able to monitor and measure all research variables continuously. In this project, this ideal design would have meant continuous measurement, for example, daily or weekly, of the research variables from the initial reassignment date through the first six months in the new job. Obviously, this is not feasible for a number of reasons, and therefore, we must be satisfied with a data collection design that may be insensitive to timing of organizational events and introduces some error into the data collection and analyses.

The argument in the previous paragraph is important because of the significant relationship found between Situational Constraints and the Decomposed Time-To-Proficiency criterion measure. This criterion measure was based on a summation of the ratings of time-to-proficiency on each of the relevant task categories (those checked as "part of job"), and was computed for all three sources -- Retraineees, Peers, and Supervisors. It is likely that retrainees, who may have received formal training in a relatively "constraint-free" environment, would react negatively when faced with a real job environment containing constraints on performance. This initial shock would most likely influence early job performance in the new assignment, and thus, time-to-proficiency on tasks. The possible implications of this finding on formal and on-the-job training (OJT) will be discussed in a later section.

Underscoring this finding of a significant relationship between Situational Constraints and Decomposed Time-To-Proficiency is the one significant interaction result (see Figure 5) that provides some support for the third hypothesis. Estimated cross-job retraining time was found to be uniformly high in unit assignments high in situational

constraints. On the other hand, in unit assignments with a low amount of situational constraint, XJRTEs were strongly and positively related to retrainee time-to-proficiency. It would appear that situational constraints, as measured in this project, are affecting the learning and job performance of recently reassigned airmen to some extent. This finding suggests that future research should examine how these situational constraints influence time-to-proficiency in new job assignments, and investigate ways to modify formal and on-the-job training to counteract these potential negative effects or enhance the positive effects of creating unit environments relatively free of these constraints.

Implications for the Air Force

Cross-job Retraining Time Estimates Methodology

The major payoff from this research is a XJRTE methodology for developing a "transferability of skills matrix." It should now be possible to construct a matrix for a set of "FROM" and "TO" enlisted AFSs containing matrix cell values representing ease of movement (EOM) out of and into the targeted AFSs. The cells of the transferability of skills matrix corresponding to significant numbers of transfers (either into or from) based on historical data are of most interest. However, it may also be possible to provide estimate EOM values for important AFSs with low historical frequencies of transfers, or small numbers of airmen populating them.

In order to illustrate the use of the XJRTEs based on this methodology, a "FROM" and "TO" matrix of values for eight AFSs sampled in this project was created in Table 15. Interpreting this matrix may be aided by referring to Figure 1 and our discussion of it earlier. In Table 15, we show a matrix of XJRTEs based on profile comparisons between Nonretrainee and Retrainee mean MTP profiles.

Two things should be noted about this matrix. First, the values indicate "relative difficulty of retraining" from one AFS to another. For example in Table 15, a reassignment from AFSC 113X0 to AFSC 277X0 (4.47) would be easier than a reassignment from AFSC 277X0 to AFSC 113X0 (9.44). In general, the higher the values in Table 15, the more difficult the retraining reassignment. Second, as can be seen from the "XXX" values under the 811XX column, there is little, if any transfer into this AFS. This is consistent with the reality of the AFS reassignment program.

However, there are cautions one must observe in interpreting the values in this table. First, although we established

Table 15

XJRTEs Example for Eight AFSs Using Nonretrainee and Retrainee MTP Profiles

From AFS:	Into - AFSs 113X0	277X0	452X4	455X4	457X0	602XX	732X0	811XX
113X0	XX.XX	4.47	6.65	12.09	9.09	8.86	11.77	XX.XX
277X0	9.44	XX.XX	5.77	13.78	10.26	7.07	7.69	XX.XX
452X4	6.24	2.48	XX.XX	10.01	4.89	3.42	8.11	XX.XX
455X2	7.74	3.65	6.51	XX.XX	8.35	5.57	10.05	XX.XX
457X0	8.99	3.24	4.75	12.30	XX.XX	5.22	9.40	XX.XX
602XX	8.05	2.29	5.20	13.02	6.67	XX.XX	6.98	XX.XX
732X0	10.14	3.08	7.77	17.25	11.12	6.77	XX.XX	XX.XX
811XX	13.44	6.67	9.38	18.98	13.69	9.83	11.40	XX.XX

Note. XJRTE values are relative measures of months-to-proficiency (MTP) for retraining out of ("From") and into the indicated AFSs.

criterion-related validity for the XJRTE methodology in this project, the validity coefficient was only .22. That is, our validity was not perfect. Second, when one considers the potential problems introduced by sampling errors, it would be best to consider the values in Table 15 as estimates of the retraining difficulty between AFSs. This project was concerned with validating the XJRTE methodology, not producing a "transferability of skills matrix" per se. Third, the values in Table 15 represent, at best, an ordinal ranking of ease of movement among those AFSs sampled. That is, one could not assume that it would be twice as difficult to move from AFSC 277X0 to AFSC 113X0 (9.44) than vice-versa from AFSC 113X0 to AFSC 277X0 (4.47) even though the numbers would indicate this. The numbers come from Months-to-Proficiency ratings across 45 task categories that are, in all likelihood, different for different AFSs. Thus, comparisons with interval or ratio measurement are inappropriate.

With these cautions in mind, what can be done? With proper sampling, a transferability of skills matrix for the approximately 180 AFSs could be created. Perhaps this data collection effort could be combined with other data collections routinely conducted by the Air Force Occupational Measurement Squadron. However, it would be advisable that the first attempt

to collect these data and establish this "transferability of skills matrix" be a research effort to ensure that the necessary sampling procedures are followed and that the reliability of the procedure be ascertained. It would also be possible to create reassignment software to handle re-enlistment assignments of first-term airmen. Naturally, this would require data collection using the TSQ with the common task taxonomy from all AFSs to be included in the reassignment software. It would also require the calculation of XJRTEs be embedded in the software. This software development is a significant application effort, however, and importantly, it is now feasible given the validity evidence for the XJRTE methodology found in this project and previous validity research efforts already cited.

Other research and operational use implications of the results of the validation of XJRTES are discussed in more detail in later sections of this report.

Organizational or Unit Climate

There are two important implications for the USAF on the basis of the results we found for the organizational climate variables. The first one has been alluded to earlier in this report; that is, the implications for formal training and OJT of the significant results of the Situational Constraints variable. It appears that situational constraints affect time-to-proficiency for retrainees, and under unit conditions with little or no constraints, XJRTEs are strongly and significantly related to retrainee time-to-proficiency. Taken together, these results indicate that situational constraints are affecting the ease-of-movement of retrainees into their new assignments. We suspect and hypothesize that the effects of situational constraints on ease-of-movement, particularly in terms of time-to-proficiency on relevant task performance, are most important at the early stage of the new assignment -- within the first month.

The hypothesized effect of these situational constraints on time-to-proficiency early in the reassignment needs further empirical investigation. However, the findings of this project provide guidance to the training community in regards to the design of formal training programs as well as OJT. Evaluation of training programs using subsequent job performance in terms of a time-to-proficiency variable, should consider the units' situational constraints as a possible moderating variable. Situational constraints might be systematically embedded in training programs such that airmen transferring into a new AFS would have some experience with task performance in less than optimal unit conditions. Further, designers of OJT programs should be cognizant of the potential influence of situational

factors on task learning and performance for retrainees.

The second implication is the identification of three reliable measures of unit or organizational climate from retrainees, their supervisors and their peers. There are numerous measures of organizational culture and climate available in the literature (Schneider, 1990), however, to our knowledge, all were developed using a single data source for the psychometric analyses to establish the reliability and validity of the measures. In this case, we have used three sources to identify three scales with items in common to measure unit or organizational climate.

The three climate scales can be useful in future research. They have immediate applicability for projects in which unit or organizational climate is included as a research variable, such as those addressing leadership, team or group effectiveness, or any organizational change effort. The situational constraints measure appears especially relevant to research on individual or team performance measurement. Finally, as indicated above, these measures are pertinent to transfer of training research. In short, the climate scales could be incorporated in any research project with unit climate or culture as a critical variable.

Cross-level Issues and Applications

"Broadly defined, cross-level inference occurs when relations among variables at one level are inferred from analyses performed at a different level" (Mossholder & Bedeian, 1983, p. 547). Empirically, cross-level linkages are made between variables operationalized at one level of analysis (e.g., the job or the organization) and some other level (e.g., the individual) (see, e.g., Lance, Hedge, & Alley, 1989; Rousseau, 1978; 1985; Schneider & Bowen, 1985; Sutton & Rousseau, 1979; Wallace, 1983).

XJRTEs developed here (and in previous research, e.g., Lance, Kavanagh, & Gould, 1993; Lance, Mayfield, & Gould, 1993; Lance, Mayfield, Gould, & Lynskey, 1991) were formed at the AFS-level of analysis. Recall that XJRTEs were based on mean subject matter expert judgments of time required by a typical airman to become proficient on task areas defined by the taxonomy shown in Appendix B. Thus XJRTEs were designed to index the average relative difficulty of retraining from AFS_i to AFS_j and vice versa, irrespective of individual-level retrainee characteristics (e.g., aptitude, motivation to retrain, etc.).

Much of the earlier validation research on XJRTEs was also conducted at the AFS-level of analysis. For example, in their convergent validation study, Lance, Kavanagh, and Gould (1993) found that, as predicted, XJRTEs correlated with old-new AFS

differences in general occupational learning difficulties and aptitude requirements. AFS-level convergent validity evidence also was reported earlier in this report in our replication of Lance, Kavanagh, and Gould's (1993) study. Also, Lance, Mayfield, Gould, and Lynskey (1991) found that "decomposed" job-level XJRTEs (such as those reported here) exhibited significant convergent validity with "global" XJRTEs based on SMEs' overall judgments of retraining times across a number of AFSs.

Lance, Mayfield, and Gould's (1993) postdictive validation study of XJRTEs represents the first cross-level study on transferability of skills. In this study they validated AFS-level XJRTEs against individual-level criteria related to the actual ease with which retrainees had achieved proficiency in a new assignment. The postdictive validation section of this report substantially replicated these findings. Further, the construct and criterion-related validation evidence we reported earlier is cross-level in the sense that linkages are made between AFS-level XJRTEs and individual-level retraining success criteria. However, there are other levels-of-analysis issues, and potential applications of the methodology supporting the estimation of cross-job retraining times (XJRTs) that have not yet been addressed.

Theoretically, there are potentially multiple levels of analysis to which this methodology might be applied. These range from the very micro level of discrete task steps, to tasks, to task modules, to job dimensions, to organizational positions, to jobs, to job families, and perhaps entire organizations. We operated at the level of the AFS in estimating XJRTs, and at the level of the AFS and position (individual) in validating XJRTEs. But in principle, the methodology of estimating XJRTs could be extended to any level of analysis and across (at least adjacent) levels. The following are six cross-level extensions that we envision.

Job placement. In this scenario, AFS-level months-to-proficiency (MTP) profiles would be available for all, or a substantial majority of AFSs from, for example, an AFS-wide survey using an adaptation of the Nonretrainee version of the TSQ. Then as part of an airman's assessment for placement into the first job assignment, the airman would complete a similar inventory of the airman's present skill level with respect to the same task categories that comprise the job-level MTP profiles. Using a computational algorithm similar to the one we employed to estimate XJRTs, the airman could be presented with a list of possible placement assignments ordered by predicted ease of entry based on the match between the new airman's current skill mix and the eligible AFSs' skill requirements. Thus this would represent a situation in which the "From-Job" is actually an individual, whose individual skill profile is assessed against (normative)

AFS-level profiles for the purpose of assessing potential person-job fit. Of course, the same methodology would be applicable to subsequent job assignments (e.g., at the time a re-enlistment decision is made), for example, in supporting cross-job retraining decisions.

Retraining options. The levels-of-analysis paradigm is the same for this potential application as it is for the job placement scenario - assessment of individuals' skill profiles against (normative) job-level skill requirement profiles. However, the application is in the retraining arena, and is relevant to airmen desiring retraining, airmen affected by the elimination of their AFS, or airmen targeted for retraining due to personnel overages. Here, inventories of individuals' skills profiles could be assessed against AFS-level skills requirements profiles in order to specify retraining options based on projections of the relative ease with which individuals might retrain into selected retraining AFSs. Thus this application could be useful to individual airmen in choosing among retraining options and to the USAF in allocating retraining decisions to minimize retraining costs.

AFS consolidation. XJRTEs as they are presently implemented have direct implications for AFS consolidation - AFSs would more readily be candidates for consolidation to the extent that retraining across AFSs is predicted to be easier. This is a levels-of-analysis issue in the sense that in combining AFSs a higher level "new" AFS is created. Thus the methodology of estimating XJRTs should be useful in making "aggregation" decisions, or decisions to consolidate more specific entities (i.e., AFSs) into higher-level entities (i.e., AFS families) so that retraining for performance in the newly aggregated AFSs is minimized.

Manpower, personnel and training (MPT) forecasting. The XJRTE methodology described and validated here also could be applied to jobs that do not yet exist. For example, if forecasts can be made for the kinds of tasks that would be performed on proposed weapons systems, estimates of the learning difficulties of these tasks can be obtained, and the configurations of tasks into positions and AFSs can be manipulated, then the taxonomy in Appendix B (or some version of it) could be useful in (a) organizing tasks into broader task categories, (b) assessing the relative difficulties of projected AFSs, (c) assessing personnel and (re)training implications based on projected AFS structures, and (d) possibly making weapons systems design modifications based on personnel and training implications.

Synthetic validation. Finally, the methodology for estimating XJRTs is adaptable to support synthetic validation. The concept of synthetic validation (or job component validity;

Balma, 1959; Guion, 1965; Hollenbeck & Whitener, 1988; Lawshe, 1952; Mossholder & Arvey, 1984) is not popular today with current emphasis on general cognitive ability (e.g., Herrnstein & Murray, 1994) and broad personality factors (e.g., Hogan, 1991). Nevertheless, there may be situations, for example where sample sizes are insufficient or when the jobs do not yet exist, which preclude more traditional validation studies. Using a combination of the task taxonomic approach described here (e.g., Appendix B) and validation strategies described by Guion (1965), Hollenbeck and Whitener (1988) and Mossholder and Arvey (1984), synthetic validation would be supported by analyzing (projected) AFSs into components, estimating validities for job components, and aggregating component validities into overall AFS-level test validity estimates.

Implications for the Scientific Community

From a scientific viewpoint, this research is of considerable importance for two major reasons. First, as noted in the introduction of this report, although transferability of skills has received some attention in the literature (Byrne, 1975; Downs, 1985; Fine, 1957a, 1957b; Fossum et al., 1986; Magnum & Ball, 1987; Rumberger, 1981), there has been no empirical evidence supporting a method to estimate transferability across jobs in different job families. This research has produced a scientifically reliable and valid methodology to estimate relative retraining times across jobs in differing career fields. This is the first time this has been accomplished, and the implications for research in the fields of selection, job transfer, career planning, company mergers, and organizational downsizing are tremendous. The complete specification of all of the research and organizational implications goes beyond the boundaries of this project and will not be discussed.

The second major importance of this research is the use of the multitrait-multimethod (MTMM) design (Campbell & Fiske, 1959) for predictors, climate measures, and criteria in this validity study. Close reading of the original description of the MTMM approach (Campbell & Fiske, 1959) reveals that, from a philosophy of science perspective, the authors were referring to the use of latent variables based on multiple sources as the "correct and true" approach to measurement and research in the behavioral sciences. The primary use of the MTMM approach has been to establish the construct validity of measures of single constructs or variables, and the literature is filled with research studies (e.g., see Kavanagh et al., 1971) exemplifying this approach. However, we are unaware of any studies that have used the MTMM design to establish the construct validity of (latent) variables, and then, examined the relationships among these variables.

This criterion-related validity study, which includes a measure of organizational climate as a potential (latent) moderator variable, is the only one of which we are aware in the scientific literature to date. Clearly, this effort provides a demonstration that the "true" approach to MTMM, as envisioned by Campbell and Fiske (1959), can be done. This is both a challenge and opportunity for the scientific community, and we hope our effort leads to better use of the MTMM approach in the future.

Conclusions

The most important conclusion of this research is that the methodology for estimating XJRT has demonstrated predictive validity for time-to-proficiency of retrainees and, combined with the other validity studies completed, provides a powerful tool for the USAF to use in the future. As illustrated in Table 15, this methodology can be used to generate a "transferability of skills matrix" for enlisted AFSs.

The second major conclusion is that the success of this research project provides more opportunities for the use of this methodology by the USAF. We have covered some initial ideas in this section, however, there will most likely be other opportunities to extend and use this methodology with the enlisted classification system. We feel highly confident in recommending its use in the future.

REFERENCES

Alley, W. E., Treat, B. R., & Black, D. E. (1988). Classification of Air Force jobs into aptitude clusters. (AFHRL-TP-88-14). Brooks AFB, TX: Air Force Human Resources Laboratory, Manpower and Personnel Division.

Baldwin, T. T., & Ford, J. K. (1988). Transfer of training: A review and directions for future research. Personnel Psychology, 41, 63-105.

Balma, M. J. (1959). The concept of synthetic validity. Personnel Psychology, 12, 395-396.

Bell, J., & Thommason, M. (1984). Job categorization project. Randolph AFB, TX: USAF Occupational Measurement Center.

Bentler, P. M. (1990). Comparative fit indices in structural models. Psychological Bulletin, 107, 238-246.

Browne, M. W., & Cudeck, R. (1993). Alternative ways of assessing fit. In K. A. Bollen & J. S. Long (Eds.), Testing structural equation models (pp. 136-162). Newbury Park, CA: Sage.

Burns, T., & Stalker, G. M. (1961). The Management of Innovation. London: Tavistock.

Byrne, J. J. (1975). Occupational mobility of workers. Monthly Labor Review, 98(2), 53-59.

Campbell, D. T., & Fiske, D. W. (1959). Convergent and discriminant validation by the multitrait-multimethod matrix. Psychological Bulletin, 56, 81-105.

Cattell, R. B. (1966). The scree test for the number of factors. Multivariate Behavioral Research, 1, 256-276.

Clark, C. S., Dobbins, G. H., & Ladd, R. T. (1993). Exploratory field study of training motivation: Influence of involvement, credibility, and transfer climate. Group and Organization Management, 18, 292-307.

Cohen, J., & Cohen, P. (1975). Applied multiple regression/ correlation analysis for the behavioral sciences. New York: Wiley.

Davis, S. M., & Lawrence, P. R. (1977). Matrix. Reading, MA: Addison Wesley.

Department of Defense (1984). Test manual for the Armed Services Vocational Aptitude Battery. North Chicago, IL: United States Military Entrance Processing Command.

DiMaggio, P. J., & Powell, W. W. (1983). The iron cage revisited: Institutional isomorphism and collective rationality in organizational fields. American Sociological Review, 48, 147-160.

Downs, S. (1985). Retraining for new skills. Ergonomics, 28, 1205-1211.

Earles, J. A., & Ree, M. J. (1992). The predictive validity of the ASVAB for training grades. Educational and Psychological Measurement, 52, 721-725.

Fine, S. A. (1957a). A reexamination of "transferability of skills" - Part I. Monthly Labor Review, 80, 803-810.

Fine, S. A. (1957b). A reexamination of "transferability of skills" - Part II. Monthly Labor Review, 80, 938-948.

Fossum, J. A., Arvey, R. D., Paradise, C. A., & Robbins, N. E. (1986). Modelling the skills obsolescence process: A psychological/economic integration. Academy of Management Review, 11, 362-374.

Goldstein, I. L. (1986). Training in work organizations: Needs assessment, development, and evaluation. Monterey, CA: Brooks/Cole.

Gopher, D., Weil, M., & Baraket, T. (1994). Transfer of skill from a computer game trainer to flight. Human Factors, 36, 387-405.

Gordon, M. E., Cofer, J. L., & McCullough, P. M. (1986). Relationships among seniority, past performance, interjob similarity, and trainability. Journal of Applied Psychology, 71, 518-521.

Gordon, M. E., & Fitzgibbons, W. J. (1982). Empirical test of seniority as a factor in staffing decisions. Journal of Applied Psychology, 67, 311-319.

Guion, R. M. (1965). Personnel testing. New York: McGraw-Hill.

Harris, M. M., & Schaubroeck, J. (1988). A meta-analysis of self-supervisor, self-peer, and peer-supervisor ratings. Personnel Psychology, 41, 41-62.

Harvey, R. J. (1991). Job analysis. In M. D. Dunnette & L. M. Hough (Eds.), Handbook of industrial and organizational psychology (2nd ed.) (Vol. 2, pp. 71-164). Palo Alto, CA: Consulting Psychologists.

Hedge, J. W., & Teachout, M. S. (1986). Job performance measurement: A systematic program of research and development. (AFHRL-TP-86-37). Brooks AFB, TX: Air Force Human Resources Laboratory, Training Systems Division.

Henderson, R. K. (1993). A criterion-related validation of time estimates of cross-job retraining times within and across job sub-families. Unpublished doctoral dissertation, University of Georgia, Athens.

Herrnstein, R. J., & Murray, C. (1994). The bell curve: Intelligence and class structure in American life. New York: Free Press.

Hogan, R. T. (1991). Personality and personality measurement. In M. D. Dunnette & L. M. Hough (Eds.), Handbook of industrial and organizational psychology (2nd ed.) (Vol 2, pp. 71-164). Palo Alto, CA: Consulting Psychologists.

Hollenbeck, J. R., & Whitener, E. M. (1988). Criterion-related validation for small sample contexts: An integrated approach to synthetic validity. Journal of Applied Psychology, 73, 536 -544.

Horn, J. L. (1965). A rationale and test for the number of factors in factor analysis. Psychometrika, 30, 179-185.

Jaccard, J., Turrisi, R., & Wan, C. K. (1990). Interaction effects in multiple regression. Newbury Park, CA: Sage.

Jaccard, J., & Wan, C. K. (1995). Measurement error in the analysis of interaction effects between continuous predictors using multiple regression: Multiple indicator and structural equation approaches. Psychological Bulletin, 117, 348-357.

James, L. A., & James, L. R. (1989). Integrating work environment perceptions: Explorations into the measurement of meaning. Journal of Applied Psychology, 74, 739-751.

Jöreskog, K. G., & Sörbom, D. (1993). LISREL-8: User's reference guide. Chicago, IL: Scientific Software.

Kaiser, H.F. (1958). The varimax criterion for analytic rotation in factor analysis. Psychometrika, 23, 187-200.

Kavanagh, M. J., & Lance C. E. (1990). Transferability of skills methodology: Reliability of ease-of-movement judgments. Final Report, Contract No. F41689 88 D-0251 (SBA #68822004), Metrica, Incorporated, San Antonio, TX.

Kavanagh, M. J., MacKinney, A. C., & Wolins, L. (1971). Issues in managerial performance: Multitrait-multimethod analyses of rating. Psychological Bulletin, 54, 145-156.

Lance, C. E., Gould, R. B., Stennett, R. B., O'Brien, L., Solomonson, A. L., McMillen, R., Mallard, A. G. C., Mayfield, D. L., Stewart, A. M., & Jadrich, J. (in press). Development and evaluation of a revised task taxonomy to support cross-AFS estimation of job requirements. (AL/HR-TP-19XX-XXXX). Brooks AFB, TX: Armstrong Laboratory, Human Resources Directorate, Manpower and Personnel Research Division.

Lance, C. E., Hedge, J. W., & Alley, W. E. (1989). Joint relationships of task proficiency with aptitude, experience, and task difficulty: A cross-level, interactional study. Human Performance, 2, 249-272.

Lance, C. E., Kavanagh, M. J., & Gould, R. B. (1993). Development and convergent validation of a methodology for estimating cross-job retraining times. Journal of Business and Psychology, 8, 67-90.

Lance, C. E., Mayfield, D. L., Foster, M. R., Stokes, G. S., & Mecham, R. C. (1991, April). Cross-job retraining time estimates based on the Position Analysis Questionnaire. Paper presented at the meeting of the Society for Industrial and Organizational Psychology, St. Louis, MO.

Lance, C. E., Mayfield, D. L., & Gould, R. B. (1993). A postdictive validation of cross-job retraining time estimates for 43 U.S. Air Force enlisted specialties. Military Psychology, 5, 173-186.

Lance, C. E., Mayfield, D. L., Gould, R. B., & Lynskey, M. C. (1991). Global versus decomposed estimates of cross-job retraining time. Human Performance, 4, 71-88.

Lance, C. E., Mayfield, D. L., Kavanagh, M. J., & Gould, R. B. (1995). Development and evaluation of a task taxonomy to support research on cross-job transferability of skills. (AL/HR-TP-1995-0003). Brooks AFB, TX: Armstrong Laboratory, Human Resources Directorate, Manpower and Personnel Research Division.

Lance, C. E., Teachout, M. S., & Donnelly, T. M. (1992). Specification of the criterion construct space: An application of hierarchical confirmatory factor analysis. Journal of Applied Psychology, 77, 437-452.

Lawshe, C. H. (1952). Employee selection. Personnel Psychology, 5, 31-34.

Mangum, S. L., & Ball, D. E. (1987). Military skill training: Some evidence of transferability. Armed Forces & Society, 13, 425-441.

Martin, J. (1992). Cultures in organizations: Three perspectives. Oxford University Press.

McGehee, W., & Thayer, P. W. (1961). Training in business and industry. New York: Wiley.

Mead, D. F., & Christal, R. E. (1970). Development of a constant standard weight equation for evaluating job difficulty. (AFHRL-TR-70-44). Lackland AFB, TX: Air Force Human Resources Laboratory, Personnel Division.

Meyer, J. W., & Rowan, B. (1977). Institutionalized organizations: Formal structure as myth and ceremony. American Journal of Sociology, 83, 340-63.

Moe, T. M. (1984). The new economics of organizations. American Journal of Political Science, 28, 739-777.

Morrison, R. F., & Brantner, T. M. (1992). What enhances or inhibits learning a new job? A basic career issue. Journal of Applied Psychology, 77, 926-940.

Mossholder, K. W., & Arvey, R. D. (1984). Synthetic validity: A conceptual and comparative review. Journal of Applied Psychology, 69, 322-333.

Mossholder, K. W., & Bedeian, A. G. (1983). Cross-level inference and organizational research: Perspectives on interpretation and application. Academy of Management Review, 8, 547-558.

Mumford, M. D., Weeks, J. L., Harding, F. D., & Fleishman, E. A. (1987). Measuring occupational difficulty: A construct validation against training criteria. Journal of Applied Psychology, 72, 578-587.

Peters, L., & O'Connor, E. (1980). Situational constraints and work outcomes: The influence of a frequently overlooked construct. Academy of Management Review, 5, 391-397.

Pfeffer, J., & Salancik, G. (1978). The external control of organizations: A resource dependence perspective. New York: Harper and Row.

Ramage, J. A. (1987). Task learning difficulty: Interrelationships among aptitude-specific benchmarked rating scales. (AFHRL-TP-86-56). Brooks AFB, TX: Air Force Human Resources Laboratory, Manpower and Personnel Division.

Robbins, S. P. (1993). Organizational behavior: Concepts, controversies, and applications. (6th Ed.). Englewood Cliffs, NJ: Prentice Hall.

Roullier, J.Z., & Goldstein, I. L. (1991). Determinants of the climate for transfer of training. Paper presented at the annual meeting of the Society for Industrial and Organizational Psychology, St. Louis, MO.

Rousseau, D. M. (1978). Characteristics of departments, positions, and individuals: Contexts for attitudes and behavior. Administrative Science Quarterly, 23, 521-540.

Rousseau, D. M. (1985). Issues of level in organizational research: Multi-level and cross-level perspectives. Research in Organizational Behavior, 7, 1-37.

Ruge, B., & Kavanagh, M. J. (1994). A multi-level, multi-stage classification model of transfer of training. Working paper, Management Department, School of Business, SUNY-Albany, Albany, NY.

Rumberger, R. W. (1981). The changing skill requirements in the U. S. economy. Industrial and Labor Relations Review, 34, 578-590.

Schein, E. H. (1992). Organizational culture and leadership. (2nd Ed.). San Francisco: Jossey-Bass.

Schneider, B., & Bowen, D. E. (1985). Employee and customer perceptions of service in banks: Replication and extension. Journal of Applied Psychology, 70, 423-433.

Schneider, B. (1990). Organizational climate and culture. San Francisco: Jossey-Bass.

Skinner, M. J. (1981). An evaluation of the Air Force airman retraining program. Proceedings of the Military Testing Association, 1109-1120.

Skinner, M. J. (1982). Retrained airmen: Volunteers versus non-volunteers. Proceedings of the Military Testing

Association, 645-651.

Skinner, M. J. (1983). Retraining program for Air Force enlisted personnel: An evaluation. (AFHRL-SR-83-31). Brooks AFB, TX: Air Force Human Resources Laboratory, Manpower and Personnel Division.

Skinner, M. J., & Alley, W. E. (1980). Performance of retrained airmen in Air Force technical schools. (AFHRL-TR-80-7). Brooks AFB, TX: Air Force Human Resources Laboratory, Manpower and Personnel Division.

Skinner, M. J., & Alley, W. E. (1984). Job aptitude requirement waivers for retrained airmen. (AFHRL-TR-83-42). Brooks AFB, TX: Air Force Human Resources Laboratory, Manpower and Personnel Division.

Smircich, L. (1983). Concepts of culture and organizational analysis. Administrative Science Quarterly, 28, 339-358.

Sparrow, J. A. (1989). The measurement of job profile similarity for the prediction of transfer of learning: A research note. Journal of Occupational Psychology, 62, 337-341.

Sutton, R. I., & Rousseau, D. M. (1979). Structure, technology, and dependence on a parent organization: Organizational and environmental correlates of individual responses. Journal of Applied Psychology, 64, 675-687.

Tracey, J. B. (1992). The effects of organizational climate and culture on the transfer of training. Unpublished doctoral dissertation, State University of New York at Albany.

Tracey, J. B., Tannenbaum, S. I., & Kavanagh, M. J. (1995). Applying trained skills on the job: the importance of the work environment. Journal of Applied Psychology, 80, 239-252.

Wallace, M. J., Jr. (1983). Methodology, research practice, and progress in personnel and industrial relations. Academy of Management Review, 8, 6-13.

Walton, M. (1986). The Deming management method. New York: Putnam.

Weber, M. (1947). The theory of social and economic organization (A. M. Henderson & T. Parsons, Trans.). New York: Oxford.

Wexley, K. N., & Latham, G. P. (1981). Developing and training human resources in organizations. Glenview, IL: Scott Foresman.

Widaman, K. F. (1985). Hierarchically nested covariance structure models for multitrait-multimethod data. Applied Psychological Measurement, 9, 1-26.

Wilbourn, J. M., Valentine, L. D., Jr., & Ree, M. J. (1984). Relationships of the Armed Services Vocational Aptitude Battery (ASVAB) Forms 8. 9. and 10 to Air Force technical school final grades. (AFHRL-TP-84-8). Brooks AFB, TX: Air Force Human Resources Laboratory, Manpower and Personnel Division.

APPENDIX A

TRANSFER OF SKILLS QUESTIONNAIRES

ARMSTRONG LABORATORY

TRANSFER OF SKILLS QUESTIONNAIRE FOR RETRAINEES

AFPT 80-SKQ-234

25 JUL 94

HUMAN RESOURCES DIRECTORATE
MANPOWER AND PERSONNEL RESEARCH

AIR FORCE MATERIEL COMMAND
BROOKS AIR FORCE BASE, TEXAS

DEPARTMENT OF THE AIR FORCE
ARMSTRONG LABORATORY (AFMC)
BROOKS AIR FORCE BASE, TEXAS

25 Jul 94

MEMORANDUM FOR AIR FORCE TRANSFER OF SKILLS STUDY PARTICIPANTS

FROM: AL/HR
7909 Lindbergh Drive
Brooks AFB TX 78235-5352

SUBJECT: Questionnaire on Transfer of Skills in Enlisted Air Force Jobs

1. You have been selected to participate in a research project conducted by Armstrong Laboratory. The project goal is to determine whether transfer and reuse of job skills across Air Force enlisted specialties (AFSs) can be measured effectively and assist in decision-making for future changes in AFSs and selection of personnel for retraining.

2. Your contribution to this project is very important. Due to the downsizing of the Air Force, as well as changes in technology and deployment concepts, the structure of AFSs has changed in the past year. There will most likely be continued reduction in the number of AFSs with consolidation of jobs. Your completion of this questionnaire will help the Air Force make better decisions about the future of jobs and retraining assignments.

3. We expect most people will need 30 - 50 minutes to complete the questionnaire. To keep this task as short as possible, you will ONLY FILL IN THE PARTS OF STEP 2 THAT APPLY in your situation. Most of Step 2 will be blank on the answer sheet for most people when they finish.

4. Please complete the questionnaire within 10 working days and return your TWO answer sheets in the preaddressed envelope through your base mail distribution. No stamp is required. For any questions, please contact our project manager Doris Black (AL/HRMJ; DSN 240-3256).

5. We thank you for taking the time to complete this questionnaire.

William J. Strickland

WILLIAM J. STRICKLAND, Col, USAF
Director
Human Resources Directorate

72

UNITED STATES AIR FORCE
TRANSFER OF SKILLS QUESTIONNAIRE

PRIVACY ACT STATEMENT

AUTHORITY: 10 USC Sec 8012, Secretary of the Air Force; powers and duties; delegation by; implemented by AFR 35-2, Occupational Analysis.

PURPOSE: Assist in defining transferability of skills and training requirements across Air Force Specialties (AFSs)

ROUTINE USES: Personnel research and management system applications.

DISCLOSURE: Completion of this questionnaire is voluntary. All completed questionnaires will be kept confidential and used for research purposes only.

INTRODUCTION

This study is critically important to the changes occurring in Air Force personnel assignments and re-assignments. This questionnaire is designed to collect information about general skills required in Air Force jobs and retraining times when changing specialties. This information will be used to enhance Air Force personnel reallocation policies in situations of workload imbalances and job restructuring. Although this questionnaire appears lengthy, you will find, from the instructions below, that we have simplified the response requirements to reduce the time needed to complete it. We consider this questionnaire to be very important for the future of Air Force jobs. Thus, we would ask that you give your utmost care in completing this questionnaire accurately.

This research examines the ease with which recently retrained airmen become effective in their new jobs. The recently retrained airman is the "Target Airman" for this study. Thus, You are the Target Airman in this research project. To collect complete information on your skills development in the new assignment, we are including both the supervisor and a peer co-worker as well as you in the research project. Thus, all three persons will be responding to separate questionnaires.

INSTRUCTIONS

You will note that you have the questionnaire as well as two green "GENERAL ANSWER SHEET TYPE B" forms. All of your answers are to be made on these forms using a #2 pencil so that we can more rapidly process your answers into our research data base. You may, of course, complete your answer first on the questionnaire itself if you find this method easier. However, your answers must then be transferred to the green answer sheets. Specific instructions on how to record your answers will be included with each part of the questionnaire. Please be certain to read the instructions for each part of this questionnaire carefully.

Step 1. Background Information

Before beginning the questionnaire, please fill in the following information grids on the front, righthand side of BOTH answer sheets:

Numeric Grid (first 4 columns starting from the left): 4-digit numeric code printed on the mailing label.

Numeric Grid (5th column from the left): Enter the number "1".

Numeric Grid (6th and 7th columns from the left): Enter how long, in months, you have been in your new AFS. Use the approximate number of months. If it has been less than 10 months, enter "0" in column 6, and the approximate number of months in column 7.

Please be certain to darken the spaces in the grid with your #2 pencil. After you complete this information on the first green answer sheet, duplicate this information in the grids on the second answer sheet. After you complete this part, go on to Step 2.

Step 2. AFS Skills/Knowledges Categories

This part of the questionnaire contains a list of 45 general categories of job tasks performed in Air Force Specialties. You will be making five types of judgments for the task categories which apply to your AFS. The first three judgments will be about a typical 5-skill level airman in your AFS. The last two judgments will be made about yourself specifically. NOTE that the frame of reference for all five judgments is your AFS.

The numbers under each space of this part of the questionnaire refer to the numbers on the green answer sheet. Thus, for the first task category, CLERICAL, your five responses should be recorded on the first green answer sheet using the first five answer spaces (#s 1 - 5). These numbers are an important guide to recording your answers on the green answer sheet, because you probably will not be responding to each of the 45 task categories. Thus, you will be leaving blanks for certain answers on the green answer sheet. If you wish, you may first enter your answers directly on the questionnaire form, but you must then transfer them to the green answer sheet.

The five judgments for each task category follow.

1. Part of 5-level Job for a Typical Airman. The first judgment indicates whether any of the tasks in a typical 5-skill level job in your AFS fall within each of the categories. If the task category is part of the job, answer "A" on the green answer sheet. For example, if a typical 5-level job in the AFS involves CLERICAL tasks as defined in the first category, you would mark an "A" on the green answer sheet for item #1. If this job does not involve CLERICAL tasks, you would simply leave this space blank, and go on to the next category - PERSONNEL. If a typical 5-level job in the AFS involves PERSONNEL, you would place an "A" on the green answer sheet for item #6. You should complete these part of job judgments for all 45 task categories first by entering an "A" or leaving a blank space. You will complete the other four judgments only for the task categories that you judge to be part of the job for a typical 5-level job in the AFS.

In completing this first set of judgments, you will notice that you will have to go to the second side of the green answer sheet after the PLANNING/PROBLEM SOLVING task category, and go to the second green answer sheet after the MALFUNCTION AND

RECORDING CONTROL SYSTEMS MAINTENANCE task category. After you have completed all 45 categories for the part of the job, go on to the second judgment.

2. Time Spent in 5-level Job. For each task category you checked as a part of the job in your AFS, make a second judgment about how much time is spent on tasks that fit into this task category. In making this rating, you should use the rating scale that appears above the second column. This rating scale allows you to make a judgment of the relative time spent on each category by a person in a typical 5-level job in the AFS. Once you make your judgment, mark the letter of the scale value on the appropriate number of the green answer sheet. Remember that the appropriate number of the green answer sheet appears under the answer space. For example, if you had decided that PERSONNEL was part of the job, and felt that the typical airman at a 5-skill level spends an "above average" amount of time on these tasks, you would mark a "G" on the answer sheet for #7. **REMEMBER,** you should only make these judgments for the task categories you checked in the first column as being a part of the job. Make these ratings now. Then go on to the third judgment.

3. Months to Proficiency. For each task category you checked as part of the job in your AFS, your third judgment will be to estimate how many months it would take a newly assigned typical airman to become proficient in performing tasks in these categories. By newly assigned we mean an airman who has just received a 3-skill level in the AFS. Use the **months to proficiency** rating scale in the third column to make your judgments. Once you make your judgment, mark the letter of the scale value on the appropriate number of the green answer sheet. For example, if you had decided that PERSONNEL was part of the job, and felt that the typical airman in this AFS takes 5 months to become proficient at the 5-skill level, you would mark a "E" on the answer sheet for #8.**REMEMBER,** you should only make these judgments for the task categories you checked in the first column as being a part of the job. Make these ratings now. Then go on to the fourth judgment.

4. Months to Proficiency: Target Airman. For this judgment and the next one, the rating focus or frame of reference shifts from the typical airman to you, the target airman in your current job. Our interest in these next two judgments is to determine how well you have performed since your reassignment. For each task category you checked as part of the job, estimate how many months you feel it has taken you to reach proficiency in performing tasks in these categories. Use the **months to proficiency** rating scale in the fourth column to make your judgments, and mark the letter of the scale value on the appropriate number of the green answer sheet. Once you make your judgment, write the letter of the scale value in the fourth column space, and enter it on the appropriate number of the green answer sheet. For example, if you had decided that PERSONNEL was part your job, and you felt that you reached proficiency in 4 months, you would mark the letter "D" on the answer sheet for #9. If your judgment is that you have not yet reached proficiency on a task category, estimate how long you feel it will take you to reach proficiency in months. Then, using the **months to proficiency** rating scale, mark the letter indicating your estimate on the green answer sheet. **REMEMBER,** you should only make these judgments for the task categories you checked in the first column as being a part of the job. Make these ratings now. Then go on to the fifth judgment.

5. Current Task Performance: Target Airman. As in the previous rating, you are the focus of this judgment concerning current job performance on the task categories. For each task category you checked as part of the job, estimate your current job performance. Use the **job performance** rating scale in the fifth column to make your judgments, and mark the letter of the scale value on the appropriate number of the green answer sheet. For example, if you had decided that PERSONNEL was part of the job, and you feel that your current job performance in this task category was "about average", you would mark the letter "E" on the answer sheet for #10. **REMEMBER,** you should only make these judgments for the task categories you checked in the first column as being a part of the job. Make these ratings now. Then go on to step 3 of this questionnaire.

AFS SKILLS/KNOWLEDGES CATEGORIES

Please make the five judgements described in the instructions on the form below.

If part of 5-level job, then place an "A" below	Time Spent 5-Level Job	Months to Proficiency
	A. Very small amount	A. 0-1
	B. Much below average	B. 2
	C. Below average	C. 3
	D. Slightly below ave.	D. 4
	E. About average	E. 5
	F. Slightly above ave.	F. 6
	G. Above average	G. 7
	H. Much above average	H. 8
	I. Very large amount	I. 9 or more

Months to Proficiency	Job Performance
A. 0-1	A. Very much below ave.
B. 2	B. Much below average
C. 3	C. Below average
D. 4	D. Slightly below ave.
E. 5	E. About average
F. 6	F. Slightly above ave.
G. 7	G. Above average
H. 8	H. Much above average
I. 9 or more	I. Very much above ave.

Typical Airman			Task Categories	Target Airman	
1	2	3	**CLERICAL:** Tasks such as filling, preparing forms, answering telephones, typing reports, and proofreading. Operating office equipment such as computers, typewriters, calculators, duplicating machines. Processing information related to military regulations, federal or state laws, contracts, and legal documents.	4	5
6	7	8	**PERSONNEL:** Processing data/information about individuals, such as employment applications, performance reviews, disciplinary reports, media releases, information, and social services.	9	10
11	12	13	**MAINTAINING INVENTORIES AND RECORDS:** Maintaining materials/ merchandise/supplies/equipment records. Ordering, receiving, maintaining, routing and accounting for inventory. Preparing, analyzing and maintaining records of financial dealings, property, assets.	14	15
16	17	18	**MATHEMATICAL:** Tasks such as adding, subtracting, multiplying, dividing. Computing statistics using formulas and equations. Locating statistics/data in graphs/ tables/charts.	19	20
21	22	23	**PHYSICAL/MANUAL LABOR:** Nontechnical manual and physical tasks such as sweeping, lifting, cleaning, sawing, lubricating, drilling, cutting, hoisting, chipping, and planing.	24	25

AFS SKILLS/KNOWLEDGES CATEGORIES

Please make the five judgements described in the instructions on the form below.

If part of 5-level job, then place an "A" below	Time Spent 5-Level Job	Months to Proficiency
	A. Very small amount	A. 0-1
	B. Much below average	B. 2
	C. Below average	C. 3
	D. Slightly below ave.	D. 4
	E. About average	E. 5
	F. Slightly above ave.	F. 6
	G. Above average	G. 7
	H. Much above average	H. 8
	I. Very large amount	I. 9 or more

Months to Proficiency	Job Performance
A. 0-1	A. Very much below ave.
B. 2	B. Much below average
C. 3	C. Below average
D. 4	D. Slightly below ave.
E. 5	E. About average
F. 6	F. Slightly above ave.
G. 7	G. Above average
H. 8	H. Much above average
I. 9 or more	I. Very much above ave.

Typical Airman			Task Categories	Target Airman	
26	27	28	**MANUFACTURING/FABRICATING:** Manufacturing things (e.g. pressing, mixing, forging, grinding) from materials such as sheet metal, metal tubing, glass, brick, plastic, rubber, paper, or lumber.	29	30
31	32	33	**CONSTRUCTION:** Building/ maintaining structures made of brick, stone, lumber, asphalt, or concrete, such as walls, floors, cabinets, houses, bridges, towers, roads, or runways.	34	35
36	37	38	**MEDICAL-PATIENT CARE:** Interacting with patients, e.g. bandaging, giving injections, applying medicines, drawing blood; Reading/interpreting medical charts, thermometer readings, test results.	39	40
41	42	43	**MEDICAL-TECHNICAL:** Performing technical procedures in a medical lab or operating room, e.g. operating X-ray machine, microscope, EKG machine, respirator, ultrasound machine.	44	45
46	47	48	**ORAL AND WRITTEN COMMUNICATION:** Reading, speaking, writing, expressing ideas, such as in letters, books, reports, phone calls, orders, directions/ instructions, and presentations.	49	50
51	52	53	**PLANNING/PROBLEM SOLVING:** Using information to anticipate/figure out/solve problems, and plan the steps and procedures required to reach a solution to the problem.	54	55

AFS SKILLS/KNOWLEDGES CATEGORIES

Please make the five judgements described in the instructions on the form below.

If part of 5-level job, then place an "A" below	Time Spent 5-Level Job A. Very small amount B. Much below average C. Below average D. Slightly below ave. E. About average F. Slightly above ave. G. Above average H. Much above average I. Very large amount	Months to Proficiency A. 0-1 B. 2 C. 3 D. 4 E. 5 F. 6 G. 7 H. 8 I. 9 or more	Months to Proficiency A. 0-1 B. 2 C. 3 D. 4 E. 5 F. 6 G. 7 H. 8 I. 9 or more	Job Performance A. Very much below ave. B. Much below average C. Below average D. Slightly below ave. E. About average F. Slightly above ave. G. Above average H. Much above average I. Very much above ave.
	Typical Airman		Task Categories	Target Airman

56	57	58	**SCIENCE AND ENGINEERING:** Using technical information such as aerial photos, weather forecasts, maps, engineering plans, blueprints, circuit diagrams, or information about people, events, places to test theories/products/equipment.	59	60
61	62	63	**ARTISTIC-AUDIO/VISUAL:** Tasks such as designing/producing photographs, movies, recordings, drawings; playing musical instruments, singing, dancing, acting; operating videotape players, slide projectors etc.	64	65
66	67	68	**FOOD PREPARATION:** Preparing/cooking food, using/producing menus, recipes, nutrition guides, food requests and estimates.	69	70
71	72	73	**ANIMAL CARE:** Caring for animals, including grooming, training, treating, exercising, or tending animals.	74	75
76	77	78	**FABRIC/ROPE WORK:** Sewing, stitching, threading, weaving, combining, or separating materials such as fabric, thread, rope, material, fiber, and string.	79	80
81	82	83	**MANAGING OTHERS:** Supervising and evaluating others, e.g. setting goals, coordinating activities, assigning work, evaluating performance, conducting meetings, settling conflicts.	84	85

AFS SKILLS/KNOWLEDGES CATEGORIES

Please make the five judgements described in the instructions on the form below.

If part of 5-level job, then place an "A" below	Time Spent 5-Level Job	Months to Proficiency	Task Categories	Months to Proficiency	Job Performance
	A. Very small amount	A. 0-1		A. 0-1	A. Very much below ave.
	B. Much below average	B. 2		B. 2	B. Much below average
	C. Below average	C. 3		C. 3	C. Below average
	D. Slightly below ave.	D. 4		D. 4	D. Slightly below ave.
	E. About average	E. 5		E. 5	E. About average
	F. Slightly above ave.	F. 6		F. 6	F. Slightly above ave.
	G. Above average	G. 7		G. 7	G. Above average
	H. Much above average	H. 8		H. 8	H. Much above average
	I. Very large amount	I. 9 or more		I. 9 or more	I. Very much above ave.
	Typical Airman			Target Airman	

86	87	88	**TRAINING:** Explaining ideas/ procedures to others, demonstrating how a task is done, monitoring learner progress, providing feedback on mistakes, preparing lesson plans, course outlines, etc.	89	90
91	92	93	**SURVEILLANCE:** Detecting, and recognizing objects that are difficult to see, tracking and pursuing moving targets, using weapons, enforcing rules or laws.	94	95
96	97	98	**CRYPTOGRAPHIC EQUIPMENT MAINTENANCE:** Maintaining synchronizers and teletypewriter, cryptographic, automatic secure voice communications fixed record communications terminal equipment.	99	100
101	102	103	**FLIGHT CONTROL AND NAVIGATION SYSTEMS MAINTENANCE:** Maintaining navigation and flight instruments, and inertial navigation, fuel savings advisory, automatic flight control, damping, quantity indicating and position indicating systems.	104	105
106	107	108	**MUNITIONS HANDLING:** Installing, testing, inspecting, maintaining, configuring, reconditioning, storing, transporting, and disposing of munitions or ordnance devices.	109	110

AFS SKILLS/KNOWLEDGES CATEGORIES

Please make the five judgements described in the instructions on the form below.

If part of 5-level job, then place an "A" below	Time Spent 5-Level Job	Months to Proficiency	Task Categories	Months to Proficiency	Job Performance
	A. Very small amount	A. 0-1		A. 0-1	A. Very much below ave.
	B. Much below average	B. 2		B. 2	B. Much below average
	C. Below average	C. 3		C. 3	C. Below average
	D. Slightly below ave.	D. 4		D. 4	D. Slightly below ave.
	E. About average	E. 5		E. 5	E. About average
	F. Slightly above ave.	F. 6		F. 6	F. Slightly above ave.
	G. Above average	G. 7		G. 7	G. Above average
	H. Much above average	H. 8		H. 8	H. Much above average
	I. Very large amount	I. 9 or more		I. 9 or more	I. Very much above ave.
	Typical Airman			Target Airman	

111	112	113	**TEST, MEASUREMENT, AND DIAGNOSTIC EQUIPMENT MAINTENANCE:** Maintaining and repairing equipment such as frequency generating and measuring, electronic precision measuring, waveform analyzing, electro-mechanical, optical precision measuring, and voltage, current, and impedance equipment.	114	115
116	117	118	**PNEUDRAULIC SYSTEMS INSPECTION AND MAINTENANCE:** Installing, removing, inspecting, maintaining and performing operational checks of hydraulic, pneudraulic systems and components.	119	120
121	122	123	**COMPUTER SYSTEMS MAINTENANCE:** Maintaining, installing and modifying keyboards, printers, central processing units, magnetic tape units, video display equipment, input/output assemblies etc.	124	125
126	127	128	**GROUND BASED COMMUNICATIONS SYSTEMS MAINTENANCE:** Maintaining receivers, transmitters, transceivers, antenna systems, ground radio and auxiliary equipment (Note: not telephone systems).	129	130
131	132	133	**NONDESTRUCTIVE AIRCRAFT STRUCTURE INSPECTION:** Performing liquid penetrant, radiographic, magnetic particle, ultrasonic, and eddy current inspections; Maintaining nondestructive inspection equipment.	134	135

AFS SKILLS/KNOWLEDGES CATEGORIES

Please make the five judgements described in the instructions on the form below.

If part of 5-level job, then place an "A" below	Time Spent 5-Level Job	Months to Proficiency	Task Categories	Months to Proficiency	Job Performance
	A. Very small amount	A. 0-1		A. 0-1	A. Very much below ave.
	B. Much below average	B. 2		B. 2	B. Much below average
	C. Below average	C. 3		C. 3	C. Below average
	D. Slightly below ave.	D. 4		D. 4	D. Slightly below ave.
	E. About average	E. 5		E. 5	E. About average
	F. Slightly above ave.	F. 6		F. 6	F. Slightly above ave.
	G. Above average	G. 7		G. 7	G. Above average
	H. Much above average	H. 8		H. 8	H. Much above average
	I. Very large amount	I. 9 or more		I. 9 or more	I. Very much above ave.
	Typical Airman			Target Airman	

136	137	138	**AIRCRAFT INSTRUMENTATION MAINTENANCE:** Preparing, installing, calibrating, aligning, removing, replacing, inspecting, testing, troubleshooting and maintaining installed aircraft instrumentation equipment.	139	140
141	142	143	**METEOROLOGICAL EQUIPMENT MAINTENANCE:** Maintaining meteorological weather radar, nonelectronic meteorological instruments and solid state barometers, and wind, temperature, visibility, and cloud weather equipment.	144	145
146	147	148	**AIRCRAFT ARMAMENT DELIVERY AND CONTROL SYSTEMS MAINTENANCE:** Inspecting, maintaining, and performing operational or functional checks on aircraft installed suspension, launch, and release systems, gun systems, aircraft armament systems, and support equipment.	149	150
151	152	153	**TAKE-OFF AND LANDING CONTROL SYSTEMS MAINTENANCE:** Maintaining RAPCON, video mapper, landing control, and ASR, PAR, or OPS trailer systems.	154	155
156	157	158	**AIRCRAFT NAVIGATION AND WEAPON RADAR MAINTENANCE:** Installing, removing and maintaining navigation, radar, digital modular avionic, and weapons release computer systems.	159	160

AFS SKILLS/KNOWLEDGES CATEGORIES

Please make the five judgements described in the instructions on the form below.

If part of 5-level job, then place an "A" below	Time Spent 5-Level Job A. Very small amount B. Much below average C. Below average D. Slightly below ave. E. About average F. Slightly above ave. G. Above average H. Much above average I. Very large amount	Months to Proficiency A. 0-1 B. 2 C. 3 D. 4 E. 5 F. 6 G. 7 H. 8 I. 9 or more	Task Categories	Months to Proficiency A. 0-1 B. 2 C. 3 D. 4 E. 5 F. 6 G. 7 H. 8 I. 9 or more	Job Performance A. Very much below ave. B. Much below average C. Below average D. Slightly below ave. E. About average F. Slightly above ave. G. Above average H. Much above average I. Very much above ave.
	Typical Airman			Target Airman	

161	162	163	**MALFUNCTION AND RECORDING CONTROL SYSTEMS MAINTENANCE:** Maintaining malfunction analysis detection and recording systems, general purpose or navigational computers, and digital modular avionic systems.	164	165

GO TO ANSWER SHEET #2

1	2	3	**TELEPHONE SYSTEMS MAINTENANCE:** Installing, repairing and maintaining key telephone systems, wiring or components, special circuits, and mobile or fixed switching center equipment.	4	5
6	7	8	**AIRCRAFT ELECTRICAL SYSTEMS MAINTENANCE:** Inspecting, maintaining and isolating malfunctions in aircraft electrical systems and circuit components.	9	10
11	12	13	**AEROSPACE GROUND EQUIPMENT CIRCUIT COMPONENT MAINTENANCE:** Maintaining heating and refrigeration systems and equipment coolers. Maintaining equipment enclosures, chassis, drives, and avionics aerospace ground equipment (AGE) such as AGE engines, motors and generators.	14	15
16	17	18	**AIR AND GROUND BASED NAVIGATIONAL AIDS MAINTENANCE:** Maintaining transponders and altimeters, and omnirange, beacon, instrument landing, long range navigation, and automatic direction finder systems.	19	20

AFS SKILLS/KNOWLEDGES CATEGORIES

Please make the five judgements described in the instructions on the form below.

If part of 5-level job, then place an "A" below	Time Spent 5-Level Job A. Very small amount B. Much below average C. Below average D. Slightly below ave. E. About average F. Slightly above ave. G. Above average H. Much above average I. Very large amount	Months to Proficiency A. 0-1 B. 2 C. 3 D. 4 E. 5 F. 6 G. 7 H. 8 I. 9 or more	Months to Proficiency A. 0-1 B. 2 C. 3 D. 4 E. 5 F. 6 G. 7 H. 8 I. 9 or more	Job Performance A. Very much below ave. B. Much below average C. Below average D. Slightly below ave. E. About average F. Slightly above ave. G. Above average H. Much above average I. Very much above ave.
	Typical Airman		Task Categories	Target Airman

21	22	23	**SATELLITE, MISSILE, AND ANTENNA SYSTEMS INSPECTION:** Preparing, installing, and maintaining antenna, missile, and satellite instrumentation systems.	24	25
26	27	28	**AIRBORNE TELEMETRY MONITORING AND MAINTENANCE:** Maintaining, monitoring, and operating airborne computer and switching systems, synchronizers, and spread spectrum systems.	29	30
31	32	33	**SECURITY PERIMETER MAINTENANCE:** Maintaining solar optical and radio observing equipment, radar transit surveillance systems, and base and installation security systems.	34	35
36	37	38	**AVIONICS TEST EQUIPMENT MAINTENANCE:** Maintaining displays and indicators, computer inertial, and radio frequency test stations, avionic system mockups, aircraft mockups and manually tested equipment.	39	40
41	42	43	**QUALITY CONTROL:** Performing quality control, quality assurance, or contract monitor functions.	44	45
46	47	48	**DATA RETRIEVAL AND STORAGE SYSTEMS MAINTENANCE:** Maintaining BRITE II, simulator PIDP systems, drum units and plotters (e.g. XY plotters).	49	50

AFS SKILLS/KNOWLEDGES CATEGORIES

Please make the five judgements described in the instructions on the form below.

If part of 5-level job, then place an "A" below	Time Spent 5-Level Job	Months to Proficiency
	A. Very small amount	A. 0-1
	B. Much below average	B. 2
	C. Below average	C. 3
	D. Slightly below ave.	D. 4
	E. About average	E. 5
	F. Slightly above ave.	F. 6
	G. Above average	G. 7
	H. Much above average	H. 8
	I. Very large amount	I. 9 or more
	Typical Airman	

Months to Proficiency	Job Performance
A. 0-1	A. Very much below ave.
B. 2	B. Much below average
C. 3	C. Below average
D. 4	D. Slightly below ave.
E. 5	E. About average
F. 6	F. Slightly above ave.
G. 7	G. Above average
H. 8	H. Much above average
I. 9 or more	I. Very much above ave.
Target Airman	

			Task Categories		
51	52	53	**SPACE-BASED ASSETS CONTROL:** Maintaining space systems equipment. Performing maintenance/job control or sensor technician functions.	54	55
56	57	58	**PROPULSION AND ENGINE SYSTEMS MAINTENANCE:** Removal, disassembly, inspection, repair, assembly, and installation of propulsion and engine systems and related equipment.	59	60

Step 3. Overall Ratings of Performance

The purpose of this part of the questionnaire is for you to evaluate your overall level of job performance using three global scales for: (a) technical proficiency, (b) interpersonal proficiency, and (c) time to reach full job proficiency following reassignment. **Remember** - the ratings you provide will be used solely for research purposes only. They will not be seen by other airmen or anyone else connected with your unit.

Technical proficiency refers to how skilled the person is at performing various tasks on the job, ignoring interpersonal factors (willingness to work, cooperation with others) or situational factors (lack of tools, weather conditions).

Interpersonal proficiency refers to how well the individual works with various levels of supervision and how cooperative the person is at tasks requiring team effort with co-workers, ignoring how skilled the person is at performing job tasks.

Time to reach proficiency after reassignment is the same as the fourth rating you made on the previous section of this questionnaire. However, the important difference is that the rating in this part is an overall or global rating of the time it took you to reach proficiency after being reassigned to your current position.

In making your global ratings, you will use the scales on the following page. The number preceding the ratings indicates where your rating is to be placed on the green answer sheet. For example, the first rating for Technical Proficiency would be placed in #61 of the second answer sheet. As before, you may mark on this questionnaire, but be certain to transfer your answer to the answer sheet.

Step 3: Overall Ratings of Performance

The purpose of this part of the questionnaire is for you to evaluate your overall level of job performance using three global scales for: (a) technical proficiency, (b) interpersonal proficiency, and (c) time to reach full job proficiency following reassignment. **Remember** - the ratings you provide will be used for research purposes only. They will not be seen by other airmen or anyone else connected with your unit.

61. Technical proficiency refers to how skilled the person is at performing various tasks on the job, ignoring interpersonal factors (willingness to work, cooperation with others) or situational factors (lack of tools, weather conditions).		62. Interpersonal proficiency refers to how well the individual works with various levels of supervision and how cooperative the person is tasks requiring team effort with co-workers, ignoring how skilled the person is at performing job tasks.	
A - Always exceeds acceptable level of proficiency	Completes all sections of required tasks without supervision and with few minor errors	A - Always exceeds acceptable level of proficiency	Always works well with all levels of supervision and co-workers; works effectively on tasks requiring teamwork or cooperation.
B - Usually exceeds acceptable level of proficiency		B - Usually exceeds acceptable level of proficiency	
C - Frequently exceeds acceptable level of proficiency	Completes all sections of tasks with minimal supervision and an acceptable number of errors	C - Frequently exceeds acceptable level of proficiency	Cooperates with most supervisors and co-workers; usually works effectively on tasks requiring teamwork or cooperation.
D - Sometimes exceeds acceptable level of proficiency		D - Sometimes exceeds acceptable level of proficiency	
E - Meets acceptable level of proficiency	Requires direct supervision or assistance on certain tasks in order to avoid numerous errors	E - Meets acceptable level of proficiency	Cooperates with only a select group of supervisors and co-workers; rarely works effectively on tasks requiring teamwork or cooperation.
F - Usually meets acceptable level of proficiency		F - Usually meets acceptable level of proficiency	
G - Occasionally meets acceptable level of proficiency	Completes all sections of required tasks with little or no supervision and few errors	G - Occasionally meets acceptable level of proficiency	Frequently works with all levels of supervision and co-workers; works effectively on tasks requiring teamwork or cooperation.
H - Rarely meets acceptable level of proficiency		H - Rarely meets acceptable level of proficiency	
I - Never meets acceptable level of proficiency	Is unable to complete tasks without direct supervision	I - Never meets acceptable level of proficiency	Is uncooperative and ineffective working on tasks requiring teamwork; unreceptive to guidance by supervisor or co-workers.

TIME TO PROFICIENCY

Select the letter that corresponds to the time it took for you to reach full proficiency on your current job after reassignment. If you do not feel you have yet reached full proficiency, circle "J", and mark "J" for #63 on the answer sheet. Then, indicate how long you think it will take you to reach full proficiency using the 9-point scale in #64.

63. Time to reach proficiency after reassignment: is the same as the fourth rating you made on the previous section of this questionnaire. However, the important difference is that the rating in this part is an overall or global rating of the time it took you to reach full proficiency after being reassigned to the current position.	64. Estimated time to proficiency If you circled "J" for #63, please indicate how long you think it will take you to reach full proficiency using the scale below.
A -- 1 month or less B -- 2 months C -- 3 months D -- 4 months E -- 5 months F -- 6 months G -- 7 months H -- 8 months I -- 9 months or more J -- not yet reached proficiency	A -- 1 month or less B -- 2 months C -- 3 months D -- 4 months E -- 5 months F -- 6 months G -- 7 months H -- 8 months I -- 9 months or more

When you finish these ratings, go on to step 4, the final section of the questionnaire.

Step 4: Work Unit Climate

In this section of the survey we are interested in the extent to which each of the statements below describes (or does not describe) your current job situation. Using the rating scale below, indicate the extent of your agreement with each statement as it describes your current job situation and enter your answer in the appropriate space on the green answer sheet. For example, if you disagree with the statement "I often must work with and depend upon others who are not well trained," you would mark "F" on the green answer sheet for item #65. Please be sure to indicate the extent that you agree or disagree with each statement as it describes your current job situation.

RATING SCALE

A. Strongly Agree
B. Agree
C. Slightly Agree
D. Neither Agree nor Disagree
E. Slightly Disagree
F. Disagree
G. Strongly Disagree

65. I often must work with and depend upon others who are not well trained.

66. The lack of qualified people in my unit typically makes it difficult for me to get my job done.

67. I frequently have trouble getting cooperation from others who are supposed to help me do my job.

68. Training aids are available on the job to support what newly trained airmen learned in retraining.

69. Supervisors make sure that newly retrained airmen have the opportunity to use their training immediately.

70. Too much "red tape" frequently keeps me from getting my job done on time.

RATING SCALE
A. Strongly Agree
B. Agree
C. Slightly Agree
D. Neither Agree nor Disagree
E. Slightly Disagree
F. Disagree
G. Strongly Disagree

71. My work doesn't get done because my schedule often gets changed without enough advance notice.

72. My job is frequently made more difficult by bad weather conditions (too hot, too cold, too wet, etc.).

73. Supervisors expect newly retrained airmen to make use of their training.

74. The proper forms I need to do my job are often not available.

75. Newly retrained airmen who use their retraining can expect to receive praise, such as being told they have performed well, from their supervisors.

76. There is excellent on-the-job training for retrained airmen.

77. Supervisors set goals for newly retrained airmen which encourage them to apply their training on the job.

78. The inconsistent policies, procedures, and instructions I often receive make it difficult for me to get my job done.

79. I frequently cannot get necessary material, tools, supplies, or equipment when I need them.

80. Supervisors meet regularly with newly retrained airmen to discuss ways to apply training on the job.

RATING SCALE
A. Strongly Agree B. Agree C. Slightly Agree D. Neither Agree nor Disagree E. Slightly Disagree F. Disagree G. Strongly Disagree

81. My work unit is highly innovative.

82. My work unit expects continuing technical excellence and competence.

83. Coworkers encourage each other to use new knowledge and skills on the job.

84. I often have to follow the instructions of others even though I am in a better position to know what should be done.

85. I often do not have the information I must have at work when it is needed.

86. My work unit expects high levels of performance.

87. I never have enough time to finish my duties without rushing.

88. I receive regular feedback on how well I have done on my job tasks.

89. Coworkers are willing to listen to new ideas, and suggest new approaches to solving problems.

90. Coworkers tell each other about new information that can be used to increase job performance.

91. Supervisors openly express their support of continuous learning on the job.

RATING SCALE
A. Strongly Agree B. Agree C. Slightly Agree D. Neither Agree nor Disagree E. Slightly Disagree F. Disagree G. Strongly Disagree

92. Supervisors give recognition and credit to those who apply new knowledge and skills to their work.

93. When I am learning a new task, I set specific goals for myself.

94. I will be evaluated as to whether I have learned areas that I have been retrained in.

95. My supervisor checks to see if I have been retrained properly.

96. My supervisor clarifies my job for me.

For the remaining items, choose the response alternative that best describes your attitudes about your retraining and reassignment to your current job.

97. Which statement below **BEST** describes who initiated the action to have you retrained and how you felt at the time?
    a. I initiated the action, because I wanted to retrain.
    b. The Air Force initiated the action, and I wanted to retrain.
    c. The Air Force initiated the action, and I did not want to retrain.

98. Rate the training you received in technical school in terms of how well it prepared you to perform in your current (retraining) specialty.
    a. Not applicable/I did not attend technical school
    b. Poor
    c. Fair
    d. Good
    e. Excellent

99. Rate the training you received on the job in terms of how well it prepared you to perform your current (retraining) specialty.
    a. Poor
    b. Fair
    c. Good
    d. Excellent

100. How often have you had problems performing your present job because of inadequate training?
    a. Never
    b. Seldom
    c. Sometimes
    d. Frequently
    e. Very frequently

101. How satisfied are you with your job overall?
    a. Very satisfied
    b. Satisfied
    c. Somewhat satisfied
    d. Somewhat dissatisfied
    e. Dissatisfied
    f. Very Dissatisfied

Step 5. Return Completed Materials

After you have completed the questionnaire, return the two green "GENERAL ANSWER SHEET TYPE B" forms in the preaddressed envelope **through base distribution** to the address below. The questionnaire is yours to keep, or discard if you wish.

Attn: Lt Col L.M. Scott
AL/HRMJ
7909 Lindbergh Drive
Brooks AFB TX 78235-5352

Thank you **very much** for your assistance in this study!

ARMSTRONG LABORATORY

TRANSFER OF SKILLS QUESTIONNAIRE FOR SUPERVISOR & CO-WORKER

AFPT 80-SKQ-234

25 JUL 94

HUMAN RESOURCES DIRECTORATE
MANPOWER AND PERSONNEL RESEARCH

AIR FORCE MATERIEL COMMAND
BROOKS AIR FORCE BASE, TEXAS

DEPARTMENT OF THE AIR FORCE
ARMSTRONG LABORATORY (AFMC)
BROOKS AIR FORCE BASE, TEXAS

25 Jul 94

MEMORANDUM FOR AIR FORCE TRANSFER OF SKILLS STUDY PARTICIPANTS

FROM: AL/HR
7909 Lindbergh Drive
Brooks AFB TX 78235-5352

SUBJECT: Questionnaire on Transfer of Skills in Enlisted Air Force Jobs

1. You have been selected to participate in a research project conducted by Armstrong Laboratory. The project goal is to determine whether transfer and reuse of job skills across Air Force enlisted specialties (AFSs) can be measured effectively and assist in decision-making for future changes in AFSs and selection of personnel for retraining.

2. Your contribution to this project is very important. Due to the downsizing of the Air Force, as well as changes in technology and deployment concepts, the structure of AFSs has changed in the past year. There will most likely be continued reduction in the number of AFSs with consolidation of jobs. Your completion of this questionnaire will help the Air Force make better decisions about the future of jobs and retraining assignments.

96

3. We expect most people will need 30 - 50 minutes to complete the questionnaire. To keep this task as short as possible, you will ONLY FILL IN THE PARTS OF STEP 2 THAT APPLY in your situation. Most of Step 2 will be blank on the answer sheet for most people when they finish.

4. Please complete the questionnaire within 10 working days and return your TWO answer sheets in the preaddressed envelope through your base mail distribution. No stamp is required. For any questions, please contact our project manager Doris Black (AL/HRMJ; DSN 240-3256).

5. We thank you for taking the time to complete this questionnaire.

William J. Strickland

WILLIAM J. STRICKLAND, Col, USAF
Director
Human Resources Directorate

UNITED STATES AIR FORCE
TRANSFER OF SKILLS QUESTIONNAIRE

PRIVACY ACT STATEMENT

AUTHORITY: 10 USC 8012, Secretary of the Air Force; powers and duties; delegation by; implemented by AFR 35-2, Occupational Analysis.

PURPOSE: Assist in defining transferability of skills and training requirements across Air Force Specialties (AFSs)

ROUTINE USES: Personnel research and management system applications.

DISCLOSURE: Completion of this questionnaire is voluntary. All completed questionnaires will be kept confidential and used for research purposes only.

INTRODUCTION

This study is critically important to the changes occurring in Air Force personnel assignments and re-assignments. This questionnaire is designed to collect information about general skills required in Air Force jobs and retraining times when changing specialties. This information will be used to enhance Air Force personnel reallocation policies in situations of workload imbalances and job restructuring. Although this questionnaire appears lengthy, you will find, from the instructions below, that we have simplified the response requirements to reduce the time needed to complete it. We consider this questionnaire to be very important for the future of Air Force jobs. Thus, we would ask that you give your utmost care in completing this questionnaire accurately.

This research examines the ease with which recently retrained airmen become effective in their new jobs. The recently retrained airman is the "Target Airman" for this study. To collect complete information on the skills development of the Target Airman in the new assignment, we are including both the supervisor and a peer co-worker as well as the recently retrained airman in the research project. Thus, all three persons will be responding to separate questionnaires.

INSTRUCTIONS

You will note that you have the questionnaire as well as two green "GENERAL ANSWER SHEET TYPE B" forms. All of your answers are to be made on these forms using a #2 pencil so that we can more rapidly process your answers into our research data base. You may, of course, complete your answer first on the questionnaire itself if you find this method easier. However, your answers must then be transferred to the green answer sheets. Specific instructions on how to record your answers will be included with each part of the questionnaire. Please be certain to read the instructions for each part of this questionnaire carefully.

Step 1. Background Information

Before beginning the questionnaire, please fill in the following information grids on the front, right hand side of BOTH answer sheets:

Social Security Number Grid: Your Social Security Number (optional; if provided it will be used to obtain additional background information or to contact you if any questions arise where you might provide assistance.)

Numeric Grid (first 4 columns starting from the left): 4-digit numeric code printed on the mailing label.

Numeric Grid (5th column from the left): Enter the number "2" if you are the supervisor of the Target Airman or "3" if you are the peer co-worker of the Target Airman.

Please be certain to darken the spaces in the grid with your #2 pencil. After you complete this information on the first green answer sheet, duplicate this information in the grids on the second answer sheet. After you complete this part, go on to Step 2.

Step 2. AFS Skills/Knowledges Categories

This part of the questionnaire contains a list of 45 general categories of job tasks performed in Air Force Specialties. You will be making five types of judgments for the task categories which apply to the AFS of the Target Airman. The first three judgments will be about a typical 5-skill level airman in this AFS. The last two judgments will be made about the Target Airman specifically. NOTE that the frame of reference for all five judgments is the Air Force Specialty of the Target Airman.

The numbers under each space of this part of the questionnaire refer to the numbers on the green answer sheet. Thus, for the first task category, CLERICAL, your five responses should be recorded on the first green answer sheet using the first five answer spaces (#s 1 - 5). These numbers are an important guide to recording your answers on the green answer sheet, because you probably will not be responding to each of the 45 task categories. Thus, you will be leaving blanks for certain answers on the green answer sheet. If you wish, you may first enter your answers directly on the questionnaire form, but you must then transfer them to the green answer sheet.

The five judgments for each task category follow:

1. Part of 5-level Job for a Typical Airman. The first judgment indicates whether any of the tasks in a typical 5-skill level job in the AFS of the Target Airman fall within each of the categories. If the task category is part of the job, answer "A" on the green answer sheet. For example, if a typical 5-level job in the AFS involves CLERICAL tasks as defined in the first category, you would mark an "A" on the green answer sheet for item #1. If this job does not involve CLERICAL tasks, you would simply leave this space blank, and go on to the next category - PERSONNEL. If a typical 5-level job in the AFS involves PERSONNEL, you would place an "A" on the green answer sheet for item #6. You should complete these part of job judgments for all 45 task categories first by entering an "A" or leaving a blank space. You will complete the other four judgments only for the task categories that you judge to be part of the job for a typical 5-level job in the AFS.

In completing this first set of judgments, you will notice that you will have to go to the second side of the green answer sheet after the PLANNING/PROBLEM SOLVING task category, and go to the second green answer sheet after the MALFUNCTION AND RECORDING

CONTROL SYSTEMS MAINTENANCE task category. After you have completed all 45 categories for the part of the job, go on to the second judgment.

2. Time Spent in 5-level Job. For each task category you checked as a part of the job in the AFS of the Target Airman, make a second judgment about how much time is spent on tasks that fit into this task category. In making this rating, you should use the rating scale that appears above the second column. This rating scale allows you to make a judgment of the relative time spent on each category by a person in a typical 5-level job in the AFS. Once you make your judgment, mark the letter of the scale value on the appropriate number of the green answer sheet. Remember that the appropriate number of the green answer sheet appears under the answer space. For example, if you had decided that PERSONNEL was part of the job, and felt that the typical airman at a 5-skill level spends an "above average" amount of time on these tasks, you would mark a "G" on the answer sheet for #7. **REMEMBER,** you should only make these judgments for the task categories you checked in the first column as being a part of the job. Make these ratings now. Then go on to the third judgment.

3. Months to Proficiency. For each task category you checked as part of the job in the AFS of the Target Airman, your third judgment will be to estimate how many months it would take a newly assigned typical airman to become proficient in performing tasks in these categories. By newly assigned we mean an airman who has just received a 3-skill level in the AFS. Use the **months to proficiency** rating scale in the third column to make your judgments. Once you make your judgment, mark the letter of the scale value on the appropriate number of the green answer sheet. For example, if you had decided that PERSONNEL was part of the job, and felt that the typical airman in this AFS takes 5 months to become proficient at the 5-skill level, you would mark a "E" on the answer sheet for #8.**REMEMBER,** you should only make these judgments for the task categories you checked in the first column as being a part of the job. Make these ratings now. Then go on to the fourth judgment.

4. Months to Proficiency: Target Airman. For this judgment and the next one, the rating focus or frame of reference shifts from the typical airman to the Target Airman in his/her current job. Our interest in these next two judgments is to determine how well this recently retrained or Target Airman has performed since reassignment. For each task category you checked as part of the job, estimate how many months it has taken the Target Airman to reach proficiency in performing tasks in these categories. Use the **months to proficiency** rating scale in the fourth column to make your judgments, and mark the letter of the scale value on the appropriate number of the green answer sheet. For example, if you had decided that PERSONNEL was part of the job, and you felt that the Target Airman reached proficiency in 4 months, you would mark the letter "D" on the answer sheet for #9. If your judgment is that the Target Airman has not yet reached proficiency on a task category, estimate how long you feel it will take the Target Airman to reach proficiency in months. Then, using the **months to proficiency** rating scale, mark the letter indicating your estimate on the green answer sheet. **REMEMBER,** you should only make these judgments for the task categories you checked in the first column as being a part of the job. Make these ratings now. Then go on to the fifth judgment.

5. Current Task Performance: Target Airman. As in the previous rating, the Target Airman is the focus of this judgment concerning current job performance on the task categories. For each task category you checked as part of the job, estimate the current job performance of the Target Airman. Use the **job performance** rating scale in the fifth column to make your judgments, and mark the letter of the scale value on the appropriate number of the green answer sheet. For example, if you had decided that PERSONNEL was part of the job, and you felt that the current job performance of the Target Airman in this task category was "about average", you would mark the letter "E" on the answer sheet for #10. **REMEMBER,** you should only make these judgments for the task categories you checked in the first column as being a part of the job. Make these ratings now. Then go on to step 3 of this questionnaire.

If part of 5-level job, then place an "A" below	Time Spent 5-Level Job	Months to Proficiency
	A. Very small amount	A. 0-1
	B. Much below average	B. 2
	C. Below average	C. 3
	D. Slightly below ave.	D. 4
	E. About average	E. 5
	F. Slightly above ave.	F. 6
	G. Above average	G. 7
	H. Much above average	H. 8
	I. Very large amount	I. 9 or more
	Typical Airman	

AFS SKILLS/KNOWLEDGES CATEGORIES

Please make the five judgements described in the instructions on the form below.

Months to Proficiency	Job Performance
A. 0-1	A. Very much below ave.
B. 2	B. Much below average
C. 3	C. Below average
D. 4	D. Slightly below ave.
E. 5	E. About average
F. 6	F. Slightly above ave.
G. 7	G. Above average
H. 8	H. Much above average
I. 9 or more	I. Very much above ave.
Target Airman	

			Task Categories		
1	2	3	**CLERICAL:** Tasks such as filling, preparing forms, answering telephones, typing reports, and proofreading. Operating office equipment such as computers, typewriters, calculators, duplicating machines. Processing information related to military regulations, federal or state laws, contracts, and legal documents.	4	5
6	7	8	**PERSONNEL:** Processing data/information about individuals, such as employment applications, performance reviews, disciplinary reports, media releases, information, and social services.	9	10
11	12	13	**MAINTAINING INVENTORIES AND RECORDS:** Maintaining materials/ merchandise/supplies/equipment records. Ordering, receiving, maintaining, routing and accounting for inventory. Preparing, analyzing and maintaining records of financial dealings, property, assets.	14	15
16	17	18	**MATHEMATICAL:** Tasks such as adding, subtracting, multiplying, dividing. Computing statistics using formulas and equations. Locating statistics/data in graphs/ tables/charts.	19	20
21	22	23	**PHYSICAL/MANUAL LABOR:** Nontechnical manual and physical tasks such as sweeping, lifting, cleaning, sawing, lubricating, drilling, cutting, hoisting, chipping, and planing.	24	25

AFS SKILLS/KNOWLEDGES CATEGORIES

Please make the five judgements described in the instructions on the form below.

If part of 5-level job, then place an "A" below	Time Spent 5-Level Job	Months to Proficiency
	A. Very small amount	A. 0-1
	B. Much below average	B. 2
	C. Below average	C. 3
	D. Slightly below ave.	D. 4
	E. About average	E. 5
	F. Slightly above ave.	F. 6
	G. Above average	G. 7
	H. Much above average	H. 8
	I. Very large amount	I. 9 or more

Months to Proficiency	Job Performance
A. 0-1	A. Very much below ave.
B. 2	B. Much below average
C. 3	C. Below average
D. 4	D. Slightly below ave.
E. 5	E. About average
F. 6	F. Slightly above ave.
G. 7	G. Above average
H. 8	H. Much above average
I. 9 or more	I. Very much above ave.

Typical Airman			Task Categories	Target Airman	
26	27	28	**MANUFACTURING/FABRICATING:** Manufacturing things (e.g. pressing, mixing, forging, grinding) from materials such as sheet metal, metal tubing, glass, brick, plastic, rubber, paper, or lumber.	29	30
31	32	33	**CONSTRUCTION:** Building/ maintaining structures made of brick, stone, lumber, asphalt, or concrete, such as walls, floors, cabinets, houses, bridges, towers, roads, or runways.	34	35
36	37	38	**MEDICAL-PATIENT CARE:** Interacting with patients, e.g. bandaging, giving injections, applying medicines, drawing blood; Reading/interpreting medical charts, thermometer readings, test results.	39	40
41	42	43	**MEDICAL-TECHNICAL:** Performing technical procedures in a medical lab or operating room, e.g. operating X-ray machine, microscope, EKG machine, respirator, ultrasound machine.	44	45
46	47	48	**ORAL AND WRITTEN COMMUNICATION:** Reading, speaking, writing, expressing ideas, such as in letters, books, reports, phone calls, orders, directions/ instructions, and presentations.	49	50
51	52	53	**PLANNING/PROBLEM SOLVING:** Using information to anticipate/figure out/solve problems, and plan the steps and procedures required to reach a solution to the problem.	54	55

AFS SKILLS/KNOWLEDGES CATEGORIES

Please make the five judgements described in the instructions on the form below.

If part of 5-level job, then place an "A" below	Time Spent 5-Level Job A. Very small amount B. Much below average C. Below average D. Slightly below ave. E. About average F. Slightly above ave. G. Above average H. Much above average I. Very large amount	Months to Proficiency A. 0-1 B. 2 C. 3 D. 4 E. 5 F. 6 G. 7 H. 8 I. 9 or more	Task Categories	Months to Proficiency A. 0-1 B. 2 C. 3 D. 4 E. 5 F. 6 G. 7 H. 8 I. 9 or more	Job Performance A. Very much below ave. B. Much below average C. Below average D. Slightly below ave. E. About average F. Slightly above ave. G. Above average H. Much above average I. Very much above ave.
	Typical Airman			Target Airman	
56	57	58	**SCIENCE AND ENGINEERING:** Using technical information such as aerial photos, weather forecasts, maps, engineering plans, blueprints, circuit diagrams, or information about people, events, places to test theories/products/equipment.	59	60
61	62	63	**ARTISTIC-AUDIO/VISUAL:** Tasks such as designing/producing photographs, movies, recordings, drawings; playing musical instruments, singing, dancing, acting; operating videotape players, slide projectors etc.	64	65
66	67	68	**FOOD PREPARATION:** Preparing/cooking food, using/producing menus, recipes, nutrition guides, food requests and estimates.	69	70
71	72	73	**ANIMAL CARE:** Caring for animals, including grooming, training, treating, exercising, or tending animals.	74	75
76	77	78	**FABRIC/ROPE WORK:** Sewing, stitching, threading, weaving, combining, or separating materials such as fabric, thread, rope, material, fiber, and string.	79	80
81	82	83	**MANAGING OTHERS:** Supervising and evaluating others, e.g. setting goals, coordinating activities, assigning work, evaluating performance, conducting meetings, settling conflicts.	84	85

AFS SKILLS/KNOWLEDGES CATEGORIES

Please make the five judgements described in the instructions on the form below.

If part of 5-level job, then place an "A" below	Time Spent 5-Level Job	Months to Proficiency	Task Categories	Months to Proficiency	Job Performance
	A. Very small amount	A. 0-1		A. 0-1	A. Very much below ave.
	B. Much below average	B. 2		B. 2	B. Much below average
	C. Below average	C. 3		C. 3	C. Below average
	D. Slightly below ave.	D. 4		D. 4	D. Slightly below ave.
	E. About average	E. 5		E. 5	E. About average
	F. Slightly above ave.	F. 6		F. 6	F. Slightly above ave.
	G. Above average	G. 7		G. 7	G. Above average
	H. Much above average	H. 8		H. 8	H. Much above average
	I. Very large amount	I. 9 or more		I. 9 or more	I. Very much above ave.
	Typical Airman			Target Airman	

86	87	88	**TRAINING:** Explaining ideas/ procedures to others, demonstrating how a task is done, monitoring learner progress, providing feedback on mistakes, preparing lesson plans, course outlines, etc.	89	90
91	92	93	**SURVEILLANCE:** Detecting, and recognizing objects that are difficult to see, tracking and pursuing moving targets, using weapons, enforcing rules or laws.	94	95
96	97	98	**CRYPTOGRAPHIC EQUIPMENT MAINTENANCE:** Maintaining synchronizers and teletypewriter, cryptographic, automatic secure voice communications fixed record communications terminal equipment.	99	100
101	102	103	**FLIGHT CONTROL AND NAVIGATION SYSTEMS MAINTENANCE:** Maintaining navigation and flight instruments, and inertial navigation, fuel savings advisory, automatic flight control, damping, quantity indicating and position indicating systems.	104	105
106	107	108	**MUNITIONS HANDLING:** Installing, testing, inspecting, maintaining, configuring, reconditioning, storing, transporting, and disposing of munitions or ordnance devices.	109	110

AFS SKILLS/KNOWLEDGES CATEGORIES

Please make the five judgements described in the instructions on the form below.

If part of 5-level job, then place an "A" below	Time Spent 5-Level Job	Months to Proficiency
	A. Very small amount	A. 0-1
	B. Much below average	B. 2
	C. Below average	C. 3
	D. Slightly below ave.	D. 4
	E. About average	E. 5
	F. Slightly above ave.	F. 6
	G. Above average	G. 7
	H. Much above average	H. 8
	I. Very large amount	I. 9 or more

Months to Proficiency	Job Performance
A. 0-1	A. Very much below ave.
B. 2	B. Much below average
C. 3	C. Below average
D. 4	D. Slightly below ave.
E. 5	E. About average
F. 6	F. Slightly above ave.
G. 7	G. Above average
H. 8	H. Much above average
I. 9 or more	I. Very much above ave.

Typical Airman			Task Categories	Target Airman	
111	112	113	**TEST, MEASUREMENT, AND DIAGNOSTIC EQUIPMENT MAINTENANCE:** Maintaining and repairing equipment such as frequency generating and measuring, electronic precision measuring, waveform analyzing, electro-mechanical, optical precision measuring, and voltage, current, and impedance equipment.	114	115
116	117	118	**PNEUDRAULIC SYSTEMS INSPECTION AND MAINTENANCE:** Installing, removing, inspecting, maintaining and performing operational checks of hydraulic, pneudraulic systems and components.	119	120
121	122	123	**COMPUTER SYSTEMS MAINTENANCE:** Maintaining, installing and modifying keyboards, printers, central processing units, magnetic tape units, video display equipment, input/output assemblies etc.	124	125
126	127	128	**GROUND BASED COMMUNICATIONS SYSTEMS MAINTENANCE:** Maintaining receivers, transmitters, transceivers, antenna systems, ground radio and auxiliary equipment (Note: not telephone systems).	129	130
131	132	133	**NONDESTRUCTIVE AIRCRAFT STRUCTURE INSPECTION:** Performing liquid penetrant, radiographic, magnetic particle, ultrasonic, and eddy current inspections; Maintaining nondestructive inspection equipment.	134	135

AFS SKILLS/KNOWLEDGES CATEGORIES

Please make the five judgements described in the instructions on the form below.

If part of 5-level job, then place an "A" below	Time Spent 5-Level Job A. Very small amount B. Much below average C. Below average D. Slightly below ave. E. About average F. Slightly above ave. G. Above average H. Much above average I. Very large amount	Months to Proficiency A. 0-1 B. 2 C. 3 D. 4 E. 5 F. 6 G. 7 H. 8 I. 9 or more	Task Categories	Months to Proficiency A. 0-1 B. 2 C. 3 D. 4 E. 5 F. 6 G. 7 H. 8 I. 9 or more	Job Performance A. Very much below ave. B. Much below average C. Below average D. Slightly below ave. E. About average F. Slightly above ave. G. Above average H. Much above average I. Very much above ave.
	Typical Airman			Target Airman	

136	137	138	**AIRCRAFT INSTRUMENTATION MAINTENANCE:** Preparing, installing, calibrating, aligning, removing, replacing, inspecting, testing, troubleshooting and maintaining installed aircraft instrumentation equipment.	139	140
141	142	143	**METEOROLOGICAL EQUIPMENT MAINTENANCE:** Maintaining meteorological weather radar, nonelectronic meteorological instruments and solid state barometers, and wind, temperature, visibility, and cloud weather equipment.	144	145
146	147	148	**AIRCRAFT ARMAMENT DELIVERY AND CONTROL SYSTEMS MAINTENANCE:** Inspecting, maintaining, and performing operational or functional checks on aircraft installed suspension, launch, and release systems, gun systems, aircraft armament systems, and support equipment.	149	150
151	152	153	**TAKE-OFF AND LANDING CONTROL SYSTEMS MAINTENANCE:** Maintaining RAPCON, video mapper, landing control, and ASR, PAR, or OPS trailer systems.	154	155
156	157	158	**AIRCRAFT NAVIGATION AND WEAPON RADAR MAINTENANCE:** Installing, removing and maintaining navigation, radar, digital modular avionic, and weapons release computer systems.	159	160

If part of 5-level job, then place an "A" below	Time Spent 5-Level Job A. Very small amount B. Much below average C. Below average D. Slightly below ave. E. About average F. Slightly above ave. G. Above average H. Much above average I. Very large amount	Months to Proficiency A. 0-1 B. 2 C. 3 D. 4 E. 5 F. 6 G. 7 H. 8 I. 9 or more	**AFS SKILLS/KNOWLEDGES CATEGORIES** Please make the five judgements described in the instructions on the form below.	Months to Proficiency A. 0-1 B. 2 C. 3 D. 4 E. 5 F. 6 G. 7 H. 8 I. 9 or more	Job Performance A. Very much below ave. B. Much below average C. Below average D. Slightly below ave. E. About average F. Slightly above ave. G. Above average H. Much above average I. Very much above ave.
	Typical Airman		Task Categories	Target Airman	

161	162	163	**MALFUNCTION AND RECORDING CONTROL SYSTEMS MAINTENANCE:** Maintaining malfunction analysis detection and recording systems, general purpose or navigational computers, and digital modular avionic systems.	164	165

GO TO ANSWER SHEET #2

1	2	3	**TELEPHONE SYSTEMS MAINTENANCE:** Installing, repairing and maintaining key telephone systems, wiring or components, special circuits, and mobile or fixed switching center equipment.	4	5
6	7	8	**AIRCRAFT ELECTRICAL SYSTEMS MAINTENANCE:** Inspecting, maintaining and isolating malfunctions in aircraft electrical systems and circuit components.	9	10
11	12	13	**AEROSPACE GROUND EQUIPMENT CIRCUIT COMPONENT MAINTENANCE:** Maintaining heating and refrigeration systems and equipment coolers. Maintaining equipment enclosures, chassis, drives, and avionics aerospace ground equipment (AGE) such as AGE engines, motors and generators.	14	15
16	17	18	**AIR AND GROUND BASED NAVIGATIONAL AIDS MAINTENANCE:** Maintaining transponders and altimeters, and omnirange, beacon, instrument landing, long range navigation, and automatic direction finder systems.	19	20

AFS SKILLS/KNOWLEDGES CATEGORIES

Please make the five judgements described in the instructions on the form below.

If part of 5-level job, then place an "A" below	Time Spent 5-Level Job A. Very small amount B. Much below average C. Below average D. Slightly below ave. E. About average F. Slightly above ave. G. Above average H. Much above average I. Very large amount	Months to Proficiency A. 0-1 B. 2 C. 3 D. 4 E. 5 F. 6 G. 7 H. 8 I. 9 or more	Task Categories	Months to Proficiency A. 0-1 B. 2 C. 3 D. 4 E. 5 F. 6 G. 7 H. 8 I. 9 or more	Job Performance A. Very much below ave. B. Much below average C. Below average D. Slightly below ave. E. About average F. Slightly above ave. G. Above average H. Much above average I. Very much above ave.
	Typical Airman			Target Airman	

21	22	23	**SATELLITE, MISSILE, AND ANTENNA SYSTEMS INSPECTION:** Preparing, installing, and maintaining antenna, missile, and satellite instrumentation systems.	24	25
26	27	28	**AIRBORNE TELEMETRY MONITORING AND MAINTENANCE:** Maintaining, monitoring, and operating airborne computer and switching systems, synchronizers, and spread spectrum systems.	29	30
31	32	33	**SECURITY PERIMETER MAINTENANCE:** Maintaining solar optical and radio observing equipment, radar transit surveillance systems, and base and installation security systems.	34	35
36	37	38	**AVIONICS TEST EQUIPMENT MAINTENANCE:** Maintaining displays and indicators, computer inertial, and radio frequency test stations, avionic system mockups, aircraft mockups and manually tested equipment.	39	40
41	42	43	**QUALITY CONTROL:** Performing quality control, quality assurance, or contract monitor functions.	44	45
46	47	48	**DATA RETRIEVAL AND STORAGE SYSTEMS MAINTENANCE:** Maintaining BRITE II, simulator PIDP systems, drum units and plotters (e.g. XY plotters).	49	50

If part of 5-level job, then place an "A" below	Time Spent 5-Level Job A. Very small amount B. Much below average C. Below average D. Slightly below ave. E. About average F. Slightly above ave. G. Above average H. Much above average I. Very large amount	Months to Proficiency A. 0-1 B. 2 C. 3 D. 4 E. 5 F. 6 G. 7 H. 8 I. 9 or more
	Typical Airman	

AFS SKILLS/KNOWLEDGES CATEGORIES

Please make the five judgements described in the instructions on the form below.

Months to Proficiency A. 0-1 B. 2 C. 3 D. 4 E. 5 F. 6 G. 7 H. 8 I. 9 or more	Job Performance A. Very much below ave. B. Much below average C. Below average D. Slightly below ave. E. About average F. Slightly above ave. G. Above average H. Much above average I. Very much above ave.
Target Airman	

			Task Categories		
51	52	53	**SPACE-BASED ASSETS CONTROL:** Maintaining space systems equipment. Performing maintenance/job control or sensor technician functions.	54	55
56	57	58	**PROPULSION AND ENGINE SYSTEMS MAINTENANCE:** Removal, disassembly, inspection, repair, assembly, and installation of propulsion and engine systems and related equipment.	59	60

Step 3. Overall Ratings of Performance

The purpose of this part of the questionnaire is for you to evaluate the Target Airman's overall level of job performance using three global scales for: (a) technical proficiency, (b) interpersonal proficiency, and (c) time to reach full job proficiency following reassignment. **Remember** - the ratings you provide will be used solely for research purposes only. They will not be seen by other airmen or anyone else connected with your unit.

Technical proficiency refers to how skilled the person is at performing various tasks on the job, ignoring interpersonal factors (willingness to work, cooperation with others) or situational factors (lack of tools, weather conditions).

Interpersonal proficiency refers to how well the individual works with various levels of supervision and how cooperative the person is at tasks requiring team effort with co-workers, ignoring how skilled the person is at performing job tasks.

Time to reach proficiency after reassignment is the same as the fourth rating you made on the previous section of this questionnaire. However, the important difference is that the rating in this part is an overall or global rating of the time it took the target airman to reach proficiency after being reassigned to the current position.

In making your global ratings, you will use the scales on the following page. The number preceding the ratings indicates where your rating is to be placed on the green answer sheet. Thus, the first rating for Technical Proficiency would be placed in #61 of the second answer sheet. As before, you may mark on this questionnaire, but be certain to transfer your answer to the answer sheet.

Step 3: Overall Ratings of Performance

The purpose of this part of the questionnaire is for you to evaluate the Target Airman's overall level of job performance using three global scales for: (a) technical proficiency, (b) interpersonal proficiency, and (c) time to reach full job proficiency following reassignment. **Remember** - the ratings you provide will be used for research purposes only. They will not be seen by other airmen or anyone else connected with your unit.

61. Technical proficiency refers to how skilled the person is at performing various tasks on the job, ignoring interpersonal factors (willingness to work, cooperation with others) or situational factors (lack of tools, weather conditions).		62. Interpersonal proficiency refers to how well the individual works with various levels of supervision and how cooperative the person is tasks requiring team effort with co-workers, ignoring how skilled the person is at performing job tasks.	
A - Always exceeds acceptable level of proficiency	Completes all sections of required tasks without supervision and with few minor errors	A - Always exceeds acceptable level of proficiency	Always works well with all levels of supervision and co-workers; works effectively on tasks requiring teamwork or cooperation.
B - Usually exceeds acceptable level of proficiency		B - Usually exceeds acceptable level of proficiency	
C - Frequently exceeds acceptable level of proficiency	Completes all sections of tasks with minimal supervision and an acceptable number of errors	C - Frequently exceeds acceptable level of proficiency	Cooperates with most supervisors and co-workers; usually works effectively on tasks requiring teamwork or cooperation.
D - Sometimes exceeds acceptable level of proficiency		D - Sometimes exceeds acceptable level of proficiency	
E - Meets acceptable level of proficiency	Requires direct supervision or assistance on certain tasks in order to avoid numerous errors	E - Meets acceptable level of proficiency	Cooperates with only a select group of supervisors and co-workers; rarely works effectively on tasks requiring teamwork or cooperation.
F - Usually meets acceptable level of proficiency		F - Usually meets acceptable level of proficiency	
G - Occasionally meets acceptable level of proficiency	Completes all sections of required tasks with little or no supervision and few errors	G - Occasionally meets acceptable level of proficiency	Frequently works with all levels of supervision and co-workers; works effectively on tasks requiring teamwork or cooperation.
H - Rarely meets acceptable level of proficiency		H - Rarely meets acceptable level of proficiency	
I - Never meets acceptable level of proficiency	Is unable to complete tasks without direct supervision	I - Never meets acceptable level of proficiency	Is uncooperative and ineffective working on tasks requiring teamwork; unreceptive to guidance by supervisor or co-workers.

TIME TO PROFICIENCY

Select the letter that corresponds to the time it took for the Target Airman to reach full proficiency on the current job after reassignment. If the Target Airman has not yet reached full proficiency, circle "J", and mark "J" for #63 on the answer sheet. Then, indicate how long you think it will take this airman to reach full proficiency using the 9-point scale in #64.

63. Time to reach proficiency after reassignment: is the same as the fourth rating you made on the previous section of this questionnaire. However, the important difference is that the rating in this part is an overall or global rating of the time it took the Target Airman to reach full proficiency after being reassigned to the current position.	64. Estimated time to proficiency If you circled "J" for #63, please indicate how long you think it will take the Target Airman to reach full proficiency using the scale below.
A -- 1 month or less B -- 2 months C -- 3 months D -- 4 months E -- 5 months F -- 6 months G -- 7 months H -- 8 months I -- 9 months or more J -- not yet reached proficiency	A -- 1 month or less B -- 2 months C -- 3 months D -- 4 months E -- 5 months F -- 6 months G -- 7 months H -- 8 months I -- 9 months or more

When you finish these ratings, go on to step 4, the final section of the questionnaire.

Step 4: Work Unit Climate

In this section of the survey we are interested in the extent to which each of the statements below describes (or does not describe) your current job situation. Using the rating scale below, indicate the extent of your agreement with each statement as it describes your current job situation and enter your answer in the appropriate space on the green answer sheet. For example, if you disagree with the statement "I often must work with and depend upon others who are not well trained," you would mark "F" on the green answer sheet for item #65. Please be sure to indicate the extent that you agree or disagree with each statement as it describes your current job situation.

RATING SCALE
A. Strongly Agree
B. Agree
C. Slightly Agree
D. Neither Agree nor Disagree
E. Slightly Disagree
F. Disagree
G. Strongly Disagree

65. I often must work with and depend upon others who are not well trained.

66. Supervisors make sure that newly retrained airmen have the opportunity to use their training immediately.

67. The lack of qualified people in my unit typically makes it difficult for me to get my job done.

68. Coworkers are willing to listen to new ideas, and suggest new approaches to solving problems.

69. I frequently have trouble getting cooperation from others who are supposed to help me do my job.

70. Supervisors meet regularly with newly retrained airmen to discuss ways to apply training on the job.

RATING SCALE
A. Strongly Agree B. Agree C. Slightly Agree D. Neither Agree nor Disagree E. Slightly Disagree F. Disagree G. Strongly Disagree

71. Too much "red tape" frequently keeps me from getting my job done on time.

72. Training aids are available on the job to support what newly trained airmen learned in retraining.

73. My work unit is highly innovative.

74. I often do not have the information I must have at work when it is needed.

75. I often have to follow the instructions of others even though I am in a better position to know what should be done.

76. Supervisors expect newly retrained airmen to make use of their training.

77. My work doesn't get done because my schedule often gets changed without enough advance notice.

78. Supervisors give recognition and credit to those who apply new knowledge and skills to their work.

79. Newly retrained airmen who use their retraining can expect to receive praise, such as being told they have performed well, from their supervisors.

80. The inconsistent policies, procedures, and instructions I often receive make it difficult for me to get my job done.

RATING SCALE

A. Strongly Agree
B. Agree
C. Slightly Agree
D. Neither Agree nor Disagree
E. Slightly Disagree
F. Disagree
G. Strongly Disagree

81. There is excellent on-the-job training for retrained airmen.

82. I frequently cannot get necessary material, tools, supplies, or equipment when I need them.

83. Supervisors set goals for newly retrained airmen which encourage them to apply their training on the job.

84. The proper forms I need to do my job are often not available.

85. My work unit expects continuing technical excellence and competence.

86. My job is frequently made more difficult by bad weather conditions (too hot, too cold, too wet, etc.).

87. Coworkers encourage each other to use new knowledge and skills on the job.

88. My work unit expects high levels of performance.

89. Coworkers tell each other about new information that can be used to increase job performance.

90. I never have enough time to finish my duties without rushing.

91. Supervisors openly express their support of continuous learning on the job.

Step 5. Return Completed Materials

After you have completed the questionnaire, return the two green "GENERAL ANSWER SHEET TYPE B" forms in the preaddressed envelope **through base distribution** to the address below. The questionnaire is yours to keep, or discard if you wish.

Attn: Lt Col L.M. Scott
AL/HRMJ
7909 Lindbergh Drive
Brooks AFB TX 78235-5352

Thank you **very much** for your assistance in this study!

ARMSTRONG LABORATORY

TRANSFER OF SKILLS QUESTIONNAIRE

AFPT 80-SKQ-234

25 JUL 94

HUMAN RESOURCES DIRECTORATE
MANPOWER AND PERSONNEL RESEARCH

AIR FORCE MATERIEL COMMAND
BROOKS AIR FORCE BASE, TEXAS

DEPARTMENT OF THE AIR FORCE
ARMSTRONG LABORATORY (AFMC)
BROOKS AIR FORCE BASE, TEXAS

25 Jul 94

MEMORANDUM FOR AIR FORCE TRANSFER OF SKILLS STUDY PARTICIPANTS

FROM: AL/HR
7909 Lindbergh Drive
Brooks AFB TX 78235-5352

SUBJECT: Questionnaire on Transfer of Skills in Enlisted Air Force Jobs

1. You have been selected to participate in a research project conducted by Armstrong Laboratory. The project goal is to determine whether transfer and reuse of job skills across Air Force enlisted specialties (AFSs) can be measured effectively and assist in decision-making for future changes in AFSs and selection of personnel for retraining.

2. Your contribution to this project is very important. Due to the downsizing of the Air Force, as well as changes in technology and deployment concepts, the structure of AFSs has changed in the past year. There will most likely be continued reduction in the number of AFSs with consolidation of jobs. Your completion of this questionnaire will help the Air Force make better decisions about the future of jobs and retraining assignments.

3. We expect most people will need 20 - 35 minutes to complete the questionnaire. To keep this task as short as possible, you will ONLY FILL IN THE PARTS OF STEP 2 THAT APPLY in your situation. Most of Step 2 will be blank on the answer sheet for most people when they finish.

4. Please complete the questionnaire within 10 working days and return your answer sheet in the preaddressed envelope through your base mail distribution. No stamp is required. For any questions, please contact our project manager Doris Black (AL/HRMJ; DSN 240-3256).

5. We thank you for taking the time to complete this questionnaire.

WILLIAM J. STRICKLAND, Col, USAF
Director
Human Resources Directorate

UNITED STATES AIR FORCE
TRANSFER OF SKILLS QUESTIONNAIRE

PRIVACY ACT STATEMENT

AUTHORITY: 10 USC Sec 8012, Secretary of the Air Force; powers and duties; delegation by; implemented by AFR 35-2, Occupational Analysis.

PURPOSE: Assist in defining transferability of skills and training requirements across Air Force Specialties (AFSs).

ROUTINE USES: Personnel research and management system applications.

DISCLOSURE: Completion of this questionnaire is voluntary. All completed questionnaires will be kept confidential and used for research purposes only.

INTRODUCTION

This study is critically important to the changes occurring in Air Force personnel assignments and re-assignments. This questionnaire is designed to collect information about general skills required in Air Force jobs. This information will be used in a study of transfer of skills among Air Force retrainees. The goal of this research is to enhance Air Force personnel reallocation policies in situations of workload imbalances and job restructuring. Although this survey appears lengthy, you will find, from the instructions below, that we have simplified the response requirements to reduce the time needed to complete it. We have done this because we consider this questionnaire to be very important for the future of Air Force jobs.

You may be one of only a few persons completing a questionnaire about your particular job. Therefore, we ask that you give your utmost care in completing this questionnaire accurately.

INSTRUCTIONS

You will note that you have the questionnaire as well as a green "GENERAL ANSWER SHEET TYPE B" form. All of your answers are to be made on this form using a #2 pencil so that we can more rapidly process your answers into our research data base. You may, of course, complete your answers first on the questionnaire itself if you find this easier. However, your answers must then be transferred to the green answer sheet. Specific instructions on how to record your answers will be included with each part of the questionnaire. Please be certain to read the instructions for each part of this questionnaire carefully.

Step 1. Background Information

Before beginning the questionnaire, fill in the following information grids on the front, righthand side of the General Answer Sheet Type B:

Numeric Grid (first 4 columns starting from the left): 4-digit numeric code printed on the mailing label.

Numeric Grid (5th column from the left): Enter the number "5". This is a group identification number for this study.

Numeric Grid (6th and 7th columns from the left): Enter how long, in months, you have been in your current assignment. Use the approximate number of months. If it has been less than 10 months, enter "0" in column 6, and the appropriate number of months in column 7.

Please be certain to darken the spaces in the grid with your #2 pencil.

Step 2. AFS Skills/Knowledges Categories

This part of the questionnaire contains a list of 45 general categories of job tasks performed in Air Force Specialties. You will be making three judgments for the task categories which apply to your current AFS. These judgments will be about a typical airman in this AFS, where this airman is defined as a typical 5-skill level person in your AFS.

The numbers below each space on the questionnaire refer to the numbers on the green answer sheet. Thus, for the first task category, CLERICAL, your three responses should be recorded on the green answer sheet using the first three answer spaces (1 to 3). The numbers below the answer spaces are an important guide to recording your answers on the green answer sheet because you probably will not be responding to all of the 45 task categories. Thus, you will be leaving blanks for some answers on the green answer sheet. If you wish, you may first enter your answers directly on the questionnaire form, but you must then transfer them to the green answer sheet.

The three judgments for each task category follow:

1. Part of 5-level Job for a Typical Airman. Indicate which of the tasks in a typical 5-skill level job in your AFS fall within each of the categories. If the task category is part of the job, answer "A" on the green answer sheet. For example, if a typical 5-level job in your AFS involves CLERICAL tasks as defined in the first category, you would mark "A" on the green answer sheet for item #1. If your job does not involve CLERICAL tasks, you would simply leave the space blank, and go on to the next category - PERSONNEL. If a typical 5-level job in your AFS involves PERSONNEL, you would place an "A" on the green answer sheet for item #4. You should complete these Part of Job judgments for all 45 task categories first by entering an "A" or leaving a blank space. You will only have to complete the other two judgments for the task categories that you judge to be part of the job for a typical 5-level job in your AFS. Make these ratings now. After you have completed all 45 categories for the Part of Job section, go to the second judgment.

2. **Time Spent in 5-level Job.** For every task category you checked as a part of your AFS, make a second judgment about how much time is spent on tasks that fit into each task category. In making this rating, you should use the rating scale that appears above the second column. This rating scale allows you to make a judgment of the relative time spent on each category by a typical 5-level person in your AFS. Once you make your judgment, enter the letter of the scale value on the appropriate number of the green answer sheet. Remember that the appropriate number of the green answer sheet appears under the answer space. For example, if you had decided that **PERSONNEL** was part of the job, and felt that the typical airman at a 5-skill level spends an "above average" amount of time on these tasks, you would mark a "G" on the answer sheet for #5. **REMEMBER**, you should only make these judgments for the task categories you checked in the first column as being part of your job. Make these ratings now. Then go to the third judgment.

3. **Months to Proficiency.** For each task category you checked as a part of your AFS, make a third judgment about how long it takes a newly assigned Airman to become proficient at the job. By newly assigned we mean an airman who has just received a 3-skill level in your AFS. Use the **months to proficiency** rating scale in the third column to make your judgments. Once you make your judgment, mark the letter of the scale value on the appropriate number of the green answer sheet. For example, if you had decided that **PERSONNEL** was part of the job, and felt that the typical airman in this AFS takes 5 months to become proficient at the 5-skill level, you would mark a "E" on the answer sheet for #6. **REMEMBER**, you should only make these judgments for the task categories you checked in the first column as being part of your job. Make these ratings now.

Step 3. Return Completed Materials

After you have completed the questionnaire, return the green "GENERAL ANSWER SHEET TYPE B" form in the preaddressed envelope **through base distribution** to the address below. The questionnaire is yours to keep, or discard if you wish.

Attn: Lt Col L.M. Scott
AL/HRMJ
7909 Lindbergh Drive
Brooks AFB TX 78235-5352

Thank you **very much** for your assistance in this study!

AFS SKILLS/KNOWLEDGES CATEGORIES

Please make the three judgements described in the instructions about each category.

If part of 5-level job, then mark an "A"	Time Spent 5-Level Job A. Very small amount B. Much below average C. Below average D. Slightly below ave. E. About average F. Slightly above ave. G. Above average H. Much above average I. Very large amount	Months to Proficiency A. 0-1 B. 2 C. 3 D. 4 E. 5 F. 6 G. 7 H. 8 I. 9 or more

Task Categories	Typical Airman		
CLERICAL: Tasks such as filling, preparing forms, answering telephones, typing reports, and proofreading. Operating office equipment such as computers, typewriters, calculators, duplicating machines. Processing information related to military regulations, federal or state laws, contracts, and legal documents.	1	2	3
PERSONNEL: Processing data/information about individuals, such as employment applications, performance reviews, disciplinary reports, media releases, information, and social services.	4	5	6
MAINTAINING INVENTORIES AND RECORDS: Maintaining materials/ merchandise/supplies/equipment records. Ordering, receiving, maintaining, routing and accounting for inventory. Preparing, analyzing and maintaining records of financial dealings, property, assets.	7	8	9
MATHEMATICAL: Tasks such as adding, subtracting, multiplying, dividing. Computing statistics using formulas and equations. Locating statistics/data in graphs/ tables/charts.	10	11	12
PHYSICAL/MANUAL LABOR: Nontechnical manual and physical tasks such as sweeping, lifting, cleaning, sawing, lubricating, drilling, cutting, hoisting, chipping, and planing.	13	14	15
MANUFACTURING/FABRICATING: Manufacturing things (e.g. pressing, mixing, forging, grinding) from materials such as sheet metal, metal tubing, glass, brick, plastic, rubber, paper, or lumber.	16	17	18

AFS SKILLS/KNOWLEDGES CATEGORIES

Please make the three judgements described in the instructions about each category.

If part of 5-level job, then mark an "A"	Time Spent 5-Level Job	Months to Proficiency
	A. Very small amount	A. 0-1
	B. Much below average	B. 2
	C. Below average	C. 3
	D. Slightly below ave.	D. 4
	E. About average	E. 5
	F. Slightly above ave.	F. 6
	G. Above average	G. 7
	H. Much above average	H. 8
	I. Very large amount	I. 9 or more

Task Categories	Typical Airman		
CONSTRUCTION: Building/ maintaining structures made of brick, stone, lumber, asphalt, or concrete, such as walls, floors, cabinets, houses, bridges, towers, roads, or runways.	19	20	21
MEDICAL-PATIENT CARE: Interacting with patients, e.g. bandaging, giving injections, applying medicines, drawing blood; Reading/interpreting medical charts, thermometer readings, test results.	22	23	24
MEDICAL-TECHNICAL: Performing technical procedures in a medical lab or operating room, e.g. operating X-ray machine, microscope, EKG machine, respirator, ultrasound machine.	25	26	27
ORAL AND WRITTEN COMMUNICATION: Reading, speaking, writing, expressing ideas, such as in letters, books, reports, phone calls, orders, directions/ instructions, and presentations.	28	29	30
PLANNING/PROBLEM SOLVING: Using information to anticipate/figure out/solve problems, and plan the steps and procedures required to reach a solution to the problem.	31	32	33
SCIENCE AND ENGINEERING: Using technical information such as aerial photos, weather forecasts, maps, engineering plans, blueprints, circuit diagrams, or information about people, events, places to test theories/products/equipment.	34	35	36
ARTISTIC-AUDIO/VISUAL: Tasks such as designing/producing photographs, movies, recordings, drawings; playing musical instruments, singing, dancing, acting; operating videotape players, slide projectors etc.	37	38	39

AFS SKILLS/KNOWLEDGES CATEGORIES

Please make the three judgements described in the instructions about each category.

If part of 5-level job, then mark an "A"	Time Spent 5-Level Job	Months to Proficiency
	A. Very small amount	A. 0-1
	B. Much below average	B. 2
	C. Below average	C. 3
	D. Slightly below ave.	D. 4
	E. About average	E. 5
	F. Slightly above ave.	F. 6
	G. Above average	G. 7
	H. Much above average	H. 8
	I. Very large amount	I. 9 or more

Task Categories	Typical Airman		
FOOD PREPARATION: Preparing/cooking food, using/producing menus, recipes, nutrition guides, food requests and estimates.	40	41	42
ANIMAL CARE: Caring for animals, including grooming, training, treating, exercising, or tending animals.	43	44	45
FABRIC/ROPE WORK: Sewing, stitching, threading, weaving, combining, or separating materials such as fabric, thread, rope, material, fiber, and string.	46	47	48
MANAGING OTHERS: Supervising and evaluating others, e.g. setting goals, coordinating activities, assigning work, evaluating performance, conducting meetings, settling conflicts.	49	50	51
TRAINING: Explaining ideas/ procedures to others, demonstrating how a task is done, monitoring learner progress, providing feedback on mistakes, preparing lesson plans, course outlines, etc.	52	53	54
SURVEILLANCE: Detecting, and recognizing objects that are difficult to see, tracking and pursuing moving targets, using weapons, enforcing rules or laws.	55	56	57
CRYPTOGRAPHIC EQUIPMENT MAINTENANCE: Maintaining synchronizers and teletypewriter, cryptographic, automatic secure voice communications fixed record communications terminal equipment.	58	59	60

AFS SKILLS/KNOWLEDGES CATEGORIES

Please make the three judgements described in the instructions about each category.

Task Categories	If part of 5-level job, then mark an "A"	Time Spent 5-Level Job A. Very small amount B. Much below average C. Below average D. Slightly below ave. E. About average F. Slightly above ave. G. Above average H. Much above average I. Very large amount	Months to Proficiency A. 0-1 B. 2 C. 3 D. 4 E. 5 F. 6 G. 7 H. 8 I. 9 or more
		Typical Airman	
FLIGHT CONTROL AND NAVIGATION SYSTEMS MAINTENANCE: Maintaining navigation and flight instruments, and inertial navigation, fuel savings advisory, automatic flight control, damping, quantity indicating and position indicating systems.	61	62	63
MUNITIONS HANDLING: Installing, testing, inspecting, maintaining, configuring, reconditioning, storing, transporting, and disposing of munitions or ordnance devices.	64	65	66
TEST, MEASUREMENT, AND DIAGNOSTIC EQUIPMENT MAINTENANCE: Maintaining and repairing equipment such as frequency generating and measuring, electronic precision measuring, waveform analyzing, electro-mechanical, optical precision measuring, and voltage, current, and impedance equipment.	67	68	69
PNEUDRAULIC SYSTEMS INSPECTION AND MAINTENANCE: Installing, removing, inspecting, maintaining and performing operational checks of hydraulic, pneudraulic systems and components.	70	71	72
COMPUTER SYSTEMS MAINTENANCE: Maintaining, installing and modifying keyboards, printers, central processing units, magnetic tape units, video display equipment, input/output assemblies etc.	73	74	75

AFS SKILLS/KNOWLEDGES CATEGORIES

Please make the three judgements described in the instructions about each category.

If part of 5-level job, then mark an "A"	Time Spent 5-Level Job	Months to Proficiency
	A. Very small amount	A. 0-1
	B. Much below average	B. 2
	C. Below average	C. 3
	D. Slightly below ave.	D. 4
	E. About average	E. 5
	F. Slightly above ave.	F. 6
	G. Above average	G. 7
	H. Much above average	H. 8
	I. Very large amount	I. 9 or more
Task Categories	Typical Airman	

GROUND BASED COMMUNICATIONS SYSTEMS MAINTENANCE: Maintaining receivers, transmitters, transceivers, antenna systems, ground radio and auxiliary equipment (Note: not telephone systems).	76	77	78
NONDESTRUCTIVE AIRCRAFT STRUCTURE INSPECTION: Performing liquid penetrant, radiographic, magnetic particle, ultrasonic, and eddy current inspections; Maintaining nondestructive inspection equipment.	79	80	81
AIRCRAFT INSTRUMENTATION MAINTENANCE: Preparing, installing, calibrating, aligning, removing, replacing, inspecting, testing, troubleshooting and maintaining installed aircraft instrumentation equipment.	82	83	84
METEOROLOGICAL EQUIPMENT MAINTENANCE: Maintaining meteorological weather radar, nonelectronic meteorological instruments and solid state barometers, and wind, temperature, visibility, and cloud weather equipment.	85	86	87
AIRCRAFT ARMAMENT DELIVERY AND CONTROL SYSTEMS MAINTENANCE: Inspecting, maintaining, and performing operational or functional checks on aircraft installed suspension, launch, and release systems, gun systems, aircraft armament systems, and support equipment.	88	89	90
TAKE-OFF AND LANDING CONTROL SYSTEMS MAINTENANCE: Maintaining RAPCON, video mapper, landing control, and ASR, PAR, or OPS trailer systems.	91	92	93

AFS SKILLS/KNOWLEDGES CATEGORIES

Please make the three judgements described in the instructions about each category.

If part of 5-level job, then mark an "A"	Time Spent 5-Level Job A. Very small amount B. Much below average C. Below average D. Slightly below ave. E. About average F. Slightly above ave. G. Above average H. Much above average I. Very large amount	Months to Proficiency A. 0-1 B. 2 C. 3 D. 4 E. 5 F. 6 G. 7 H. 8 I. 9 or more
Task Categories	Typical Airman	

AIRCRAFT NAVIGATION AND WEAPON RADAR MAINTENANCE: Installing, removing and maintaining navigation, radar, digital modular avionic, and weapons release computer systems.	94	95	96
MALFUNCTION AND RECORDING CONTROL SYSTEMS MAINTENANCE: Maintaining malfunction analysis detection and recording systems, general purpose or navigational computers, and digital modular avionic systems.	97	98	99
TELEPHONE SYSTEMS MAINTENANCE: Installing, repairing and maintaining key telephone systems, wiring or components, special circuits, and mobile or fixed switching center equipment.	100	101	102
AIRCRAFT ELECTRICAL SYSTEMS MAINTENANCE: Inspecting, maintaining and isolating malfunctions in aircraft electrical systems and circuit components.	103	104	105
AEROSPACE GROUND EQUIPMENT CIRCUIT COMPONENT MAINTENANCE: Maintaining heating and refrigeration systems and equipment coolers. Maintaining equipment enclosures, chassis, drives, and avionics aerospace ground equipment (AGE) such as AGE engines, motors and generators.	106	107	108
AIR AND GROUND BASED NAVIGATIONAL AIDS MAINTENANCE: Maintaining transponders and altimeters, and omnirange, beacon, instrument landing, long range navigation, and automatic direction finder systems.	109	110	111

AFS SKILLS/KNOWLEDGES CATEGORIES

Please make the three judgements described in the instructions about each category.

If part of 5-level job, then mark an "A"	Time Spent 5-Level Job	Months to Proficiency
	A. Very small amount	A. 0-1
	B. Much below average	B. 2
	C. Below average	C. 3
	D. Slightly below ave.	D. 4
	E. About average	E. 5
	F. Slightly above ave.	F. 6
	G. Above average	G. 7
	H. Much above average	H. 8
	I. Very large amount	I. 9 or more

Task Categories	Typical Airman		
SATELLITE, MISSILE, AND ANTENNA SYSTEMS INSPECTION: Preparing, installing, and maintaining antenna, missile, and satellite instrumentation systems.	112	113	114
AIRBORNE TELEMETRY MONITORING AND MAINTENANCE: Maintaining, monitoring, and operating airborne computer and switching systems, synchronizers, and spread spectrum systems.	115	116	117
SECURITY PERIMETER MAINTENANCE: Maintaining solar optical and radio observing equipment, radar transit surveillance systems, and base and installation security systems.	118	119	120
AVIONICS TEST EQUIPMENT MAINTENANCE: Maintaining displays and indicators, computer inertial, and radio frequency test stations, avionic system mockups, aircraft mockups and manually tested equipment.	121	122	123
QUALITY CONTROL: Performing quality control, quality assurance, or contract monitor functions.	124	125	126
DATA RETRIEVAL AND STORAGE SYSTEMS MAINTENANCE: Maintaining BRITE II, simulator PIDP systems, drum units and plotters (e.g. XY plotters).	127	128	129

AFS SKILLS/KNOWLEDGES CATEGORIES

Please make the three judgements described in the instructions about each category.

If part of 5-level job, then mark an "A"	Time Spent 5-Level Job	Months to Proficiency
	A. Very small amount	A. 0-1
	B. Much below average	B. 2
	C. Below average	C. 3
	D. Slightly below ave.	D. 4
	E. About average	E. 5
	F. Slightly above ave.	F. 6
	G. Above average	G. 7
	H. Much above average	H. 8
	I. Very large amount	I. 9 or more

Task Categories	Typical Airman		
SPACE-BASED ASSETS CONTROL: Maintaining space systems equipment. Performing maintenance/job control or sensor technician functions.	130	131	132
PROPULSION AND ENGINE SYSTEMS MAINTENANCE: Removal, disassembly, inspection, repair, assembly, and installation of propulsion and engine systems and related equipment.	133	134	135

APPENDIX B

REVISED TAXONOMY CATEGORY DEFINITIONS BASED ON 29 COMPONENT SOLUTION

CLERICAL Tasks such as filing, preparing forms, answering telephones, typing reports, and proofreading. Operating office equipment such as computers, typewriters, calculators, duplicating machines. Processing information related to military regulations, federal or state laws, contracts, and legal documents.

PERSONNEL Processing data/information about individuals, such as employment applications, performance reviews, disciplinary reports, media releases, production records, personnel forecasts, training records, counseling information, and social services.

MAINTAINING INVENTORIES AND RECORDS Maintaining materials/merchandise/ supplies/equipment records. Ordering, receiving, maintaining, routing and accounting for inventory. Preparing, analyzing and maintaining records of financial dealings, property, assets.

MATHEMATICAL Performing numerical operations such as adding, subtracting, multiplying, dividing. Computing statistics using formulas and equations. Locating statistics/data in graphs/ tables/charts. Using calculators or adding machines to solve math problems.

PHYSICAL/MANUAL LABOR Nontechnical manual and physical tasks such as sweeping, lifting, carrying, cleaning, sawing, lubricating, drilling, cutting, hoisting, chipping, and planing. Using basic tools such as a hammer, paint scraper, shovel, or wheelbarrow.

MANUFACTURING/FABRICATING Making things from materials such as sheet metal, metal tubing, glass, brick, plastic, rubber, paper, or lumber. For example, pressing, mixing, forging, grinding, stitching, forming, melting, or chemically treating materials to manufacture things.

CONSTRUCTION Using construction information such as materials lists, building designs, etc. Building/maintaining structures made of brick, stone, lumber, asphalt, or concrete, such as walls, floors, cabinets, houses, bridges, towers, roads, or runways. Laying/covering with roofing materials, floor coverings, wall paper.

MEDICAL - PATIENT CARE Verbally or physically interacting with patients, e.g., bandaging, giving injections, applying medicines, drawing blood, performing physical therapy. Reading/interpreting

medical charts, thermometer readings, test results.

MEDICAL - TECHNICAL Performing technical procedures in a medical lab or operating room, e.g., operating X-ray machine, microscope, EKG machine, respirator, ultrasound machine.

ORAL AND WRITTEN COMMUNICATION Reading/speaking/writing, understanding words, and expressing ideas, including receiving/processing/initiating letters, books, reports, phone calls, orders, directions/instructions, lectures, contracts; attending/conducting meetings, making presentations.

PLANNING/PROBLEM SOLVING Using available information to anticipate/figure out/solve problems, and plan the steps and procedures required to reach a solution to the problem (e.g., identifying a traffic problem and formulating a plan for rerouting traffic).

SCIENCE AND ENGINEERING Collecting/organizing/summarizing technical information, or information about people, events, places. Using systematic/scientific methods to test theories/products/equipment. Writing reports of results/findings. Using technical information such as aerial photos, weather forecasts, maps, engineering plans, blueprints, circuit diagrams, and other designs/plans for equipment, manufacturing processes, etc.

ARTISTIC - AUDIO/VISUAL Audio and visual art design/production, e.g., photography, movies, recordings, drawings, illustrations, layouts, musical compositions, interior decorations. Performing, e.g., playing musical instruments, singing, dancing, and acting. Operating equipment such as turntables, videotape players, slide projectors, film developing equipment, etc.

FOOD PREPARATION Preparing/cooking food, using/producing menus, recipes, nutrition guides, food requests and estimates.

ANIMAL CARE Caring for animals, including grooming, training, treating, exercising, or tending animals.

FABRIC/ROPE WORK Sewing, stitching, threading, weaving, combining, or separating materials such as fabric, thread, rope, material, fiber, and string.

MANAGING OTHERS Managing/administering/supervising/evaluating others, e.g., determining goals and coordinating others' activities, assigning work to others and supervising their work, evaluating others' performance, making staffing decisions, conducting group meetings, settling conflicts and enforcing rules.

TRAINING Explaining ideas/procedures to others, demonstrating how a task is done, monitoring learner progress, providing feedback on mistakes, preparing lesson plans, course outlines, etc.

SURVEILLANCE Using codes/symbols (e.g., traffic control "lingo," flag, and hand signals), detecting, visualizing and recognizing objects that are difficult to see (e.g., ships and aircraft at a distance, criminal suspect in a crowd), tracking and pursuing moving targets or objects, using firearms or other handheld weapons, enforcing rules or laws.

ELECTRONIC AND MAINTENANCE FACTORS

CRYPTOGRAPHIC EQUIPMENT MAINTENANCE Maintaining synchronizers and teletypwriter, cryptographic, automatic secure voice communications fixed record communications terminal equipment.

FLIGHT CONTROL AND NAVIGATION SYSTEMS MAINTENANCE Maintaining engine and integrated navigation and flight instruments, and inertial navigation, fuel savings advisory. automatic flight control, stability augmentation (damping), quantity indicating and position indicating systems.

MUNITIONS HANDLING Installing, checking, testing, inspecting, maintaining, assembling, configuring, and reconditioning munitions or ordnance devices. Performing munitions control functions, serviceability inspections, and disposal procedures. transporting, storing, handling, and shipping munitions and weapons.

TEST, MEASUREMENT, AND DIAGNOSTIC EQUIPMENT MAINTENANCE Maintaining and repairing equipment such as frequency generating and measuring, electronic precision measuring, waveform analyzing, electro-mechanical,electrical measurements consoles, electrical standards sets, radiac, optical precision measuring, weapons systems precision measuring, and voltage, current, and impedance equipment.

PNEUDRAULIC SYSTEMS INSPECTION AND MAINTENANCE Installing, removing, inspecting, maintaining and performing operational checks of hydraulic, pneumatic, and pneudraulic systems and components.

COMPUTER SYSTEMS MAINTENANCE Maintaining, installing and modifying keyboards, printers, central processing units, magnetic tape units, video display equipment, memory assemblies, input/output assemblies (e.g., buffers, controllers, interfaces), magnetic disk systems and drum units.

Appendix B (continued)

GROUND BASED COMMUNICATIONS SYSTEMS MAINTENANCE Maintaining receivers, transmitters, tranceivers, antenna systems, ground radio and auxiliary equipment, and communications-electronic equipment. Note: this category excludes telephone systems.

NONDESTRUCTIVE AIRCRAFT STRUCTURE INSPECTION Performing liquid penetrant, radiographic, magnetic particle, ultrasonic, and eddy current inspections. Maintaining and inspecting nondestructive inspection equipment.

AIRCRAFT INSTRUMENTATION MAINTENANCE Preparing, installing, calibrating, aligning, removing, replacing, inspecting, testing, troubleshooting and maintaining installed aircraft instrumentation equipment.

METEOROLOGICAL EQUIPMENT MAINTENANCE Maintaining meteorological weather radar, nonelectronic meteorological instruments and solid state barometers, AN/FPS systems, and wind, temperature, visibility, and cloud weather equipment.

AIRCRAFT ARMAMENT DELIVERY AND CONTROL SYSTEMS MAINTENANCE Inspecting, maintaining, and performing operational or functional checks on aircraft installed suspension, launch, and release systems, gun systems, aircraft armament systems, and support and munitions handling equipment.

TAKE-OFF AND LANDING CONTROL SYSTEMS MAINTENANCE Maintaining RAPCON, video mapper, landing control, and ASR, PAR, or OPS trailer systems.

AIRCRAFT NAVIGATION AND WEAPON RADAR MAINTENANCE Installing, removing and maintaining navigation, radar, radar power distribution, digital modular avionic, and weapons release computer systems.

MALFUNCTION AND RECORDING AND CONTROL SYSTEMS MAINTENANCE Maintaining malfunction analysis detection and recording systems, general purpose or navigational computers, and digital modular avionic systems.

TELEPHONE SYSTEMS MAINTENANCE Installing, repairing and maintaining key telephone systems, telephone systems wiring or components, special circuits, and mobile or fixed switching center equipment.

AIRCRAFT ELECTRICAL SYSTEMS MAINTENANCE Inspecting, maintaining and isolating malfunctions in aircraft electrical systems and circuit components.

AEROSPACE GROUND EQUIPMENT CIRCUIT COMPONENT MAINTENANCE Maintaining heating and refrigeration systems and equipment coolers. Maintaining equipment enclosures, chassis, drives, and avionics aerospace ground equipment (AGE) such as AGE engines, motors and generators.

AIR AND GROUND BASED NAVIGATIONAL AIDS MAINTENANCE Maintaining transponders and radio/radar altimeters, and VHF omnirange, beacon, variable omnirange, instrument landing, long range navigation, and automatic direction finder systems.

SATELLITE, MISSILE, AND ANTENNA SYSTEMS INSPECTION Preparing, installing, and maintaining antenna, missile, and satellite instrumentation systems.

AIRBORNE TELEMETRY MONITORING AND MAINTENANCE Maintaining, monitoring, and operating airborne computer and switching systems, synchronizers, and spread spectrum systems.

SECURITY PERIMETER MAINTENANCE Maintaining solar optical and radio observing equipment, radar transit surveillance systems, and base and installation security systems.

AVIONICS TEST EQUIPMENT MAINTENANCE Maintaining displays and indicators, computer inertial, and radio frequency test stations. Maintaining test equipment, avionic system mockups, aircraft mockups and manually tested equipment.

QUALITY CONTROL Performing quality control, quality assurance, or contract monitor functions.

DATA RETRIEVAL AND STORAGE SYSTEMS MAINTENANCE Maintaining BRITE II, simulator, PIDP systems, drum units and plotters (e.g., XY plotters).

SPACE-BASED ASSETS CONTROL Maintaining space systems equipment. Performing maintenance/job control or sensor technician functions.

PROPULSION AND ENGINE SYSTEMS MAINTENANCE Removal, disassembly, inspection, repair, assembly, and installation of propulsion and engine systems and related equipment.