AFHRL-TP-84-28

AIR FORCE HUMAN RESOURCES LABORATORY

AIR FORCE CIVILIAN POTENTIAL APPRAISAL SYSTEM: DEVELOPMENT

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November 1984
Final Technical Paper for Period July 1977 - April 1981

AIR FORCE SYSTEMS COMMAND
BROOKS AIR FORCE BASE, TEXAS 78235-5000

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Unclassified
SECURITY CLASSIFICATION OF THIS PAGE

AD-A148909

REPORT DOCUMENTATION PAGE

1a REPORT SECURITY CLASSIFICATION Unclassified	1b. RESTRICTIVE MARKINGS
2a SECURITY CLASSIFICATION AUTHORITY	3 DISTRIBUTION/AVAILABILITY OF REPORT Approved for public release; distribution unlimited.
2b DECLASSIFICATION/DOWNGRADING SCHEDULE	
4 PERFORMING ORGANIZATION REPORT NUMBER(S) AFHRL-TP-84-28	5. MONITORING ORGANIZATION REPORT NUMBER(S)
6a NAME OF PERFORMING ORGANIZATION Manpower and Personnel Division Air Force Human Resources Laboratory 6b OFFICE SYMBOL (*If applicable*) AFHRL/MO	7a. NAME OF MONITORING ORGANIZATION
6c ADDRESS (*City, State, and ZIP Code*) Brooks Air Force Base, Texas 78235-5000	7b. ADDRESS (*City, State, and ZIP Code*)
8a. NAME OF FUNDING/SPONSORING ORGANIZATION Air Force Human Resources Laboratory 8b. OFFICE SYMBOL (*If applicable*) HQ AFHRL	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER
8c ADDRESS (*City, State, and ZIP Code*) Brooks Air Force Base, Texas 78235-5000	10 SOURCE OF FUNDING NUMBERS PROGRAM ELEMENT NO. 62703F; PROJECT NO. 7734; TASK NO. 10; WORK UNIT ACCESSION NO 01

11 TITLE (*Include Security Classification*)
Air Force Civilian Potential Appraisal System: Development

12 PERSONAL AUTHOR(S)
Gould, R. Bruce; Black, Doris E.; Cummings, William H.

13a TYPE OF REPORT	13b TIME COVERED	14. DATE OF REPORT (*Year, Month, Day*)	15. PAGE COUNT
Final	FROM Jul 77 TO Apr 81	November 1984	192

16 SUPPLEMENTARY NOTATION

17 COSATI CODES			18 SUBJECT TERMS (*Continue on reverse if necessary and identify by block number*)
FIELD	GROUP	SUB-GROUP	behavioral dimensions; policy capturing; performance appraisal; predictor reduction; personnel legal issues; promotion potential
05	09		

19 ABSTRACT (*Continue on reverse if necessary and identify by block number*)

An appraisal system for use by the Air Force in ranking competitive position civilian promotion eligibles was developed to meet legal and operational requirements. Demographic data and supervisor and peer ratings were obtained from a 20,000 case target sample to establish a pool of possible ranking elements. Variable reduction procedures eliminated those elements which were redundant, showed greatest likelihood of creating adverse impact, or which appeared less defensible legally or psychometrically. The remaining variables were submitted to 12-member promotion data panels for each of 23 homogeneous job family clusters. Policy-capturing techniques resulted in regression-weighted promotion algorithms that use unique combinations of 19 behavioral dimensions, depending on the job family and supervisory or nonsupervisory classification of the job to be filled.

Correlations between job-family-specific, promotion panel rankings and algorithm-developed rankings ranged from .92 to .98, indicating remarkably consistent panel member policies and high agreement between raters. Separate panels convened for two job families resulted in cross-validation correlations of .94 to .98 between their

20 DISTRIBUTION/AVAILABILITY OF ABSTRACT ☒ UNCLASSIFIED/UNLIMITED ☐ SAME AS RPT ☐ DTIC USERS	21. ABSTRACT SECURITY CLASSIFICATION Unclassified
22a NAME OF RESPONSIBLE INDIVIDUAL Nancy A. Perrigo Chief, STINFO Office	22b. TELEPHONE (*Include Area Code*) (512) 536-3877 22c. OFFICE SYMBOL AFHRL/TSR

DD FORM 1473, 84 MAR 83 APR edition may be used until exhausted.
All other editions are obsolete.

SECURITY CLASSIFICATION OF THIS PAGE
Unclassified

Item 18 (Continued)

promotion ranking supervisory ratings

Item 19 (Continued)

(Cont.)

rankings indicating that the algorithms do not reflect just the judgment of panel members who happened to be selected but rather are indicative of the judgments of experienced members of an entire job family. A single supervisory rating form and 40 job-family-specific algorithms were recommended for operational implementation.

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This publication documents the detailed development of the Air Force Civilian Potential Appraisal System.

Summary

The Air Force Human Resources Laboratory began development of the Civilian Potential Appraisal System (CPAS) in July 1977 at the request of the Air Force Directorate of Civilian Personnel. The system was to provide a rating and promotion eligibility ranking process for all non-senior executive appropriated fund employees. The system was to be part of the final ranking process in the Air Force Promotions and Placements Referral System (PPRS). The primary objectives of the CPAS were to restore credibility to the civilian promotion appraisal process, to be operationally efficient, and to deter rating inflation.

The development process established a large pool of possible rating factors, produced prototype experimental data collection devices, organized the large number of civilian specialties into a manageable number of homogeneous job families, collected experimental rating data on a large sample of cases, and reduced the rating factor pool to a workable set. The set of ratings was then presented to job-family-specific panels of subject-matter experts who selected rating factors appropriate to their job family and sat as a promotion board, ranking employees according to promotability. The panel ranking processes were reproduced mathematically by judgment analysis techniques providing formulas or algorithms for operationally weighting rating factors for use in the CPAS.

Legal defensibility of the promotion appraisal system was a major goal of the project. Under the 1978 Uniform Guidelines for Employee Selection, any system which results in adverse impact on minority groups must have fulfilled several developmental requirements to establish job relatedness and the validity of the system; otherwise, the user would be liable under the guidelines. The probability that any major selection system will have adverse impact is sufficiently high that all such systems should be developed adhering to the guidelines. To satisfy the guidelines, all possible selection system components must be considered and the final set systematically selected to provide a system which maximizes objectivity and validity while minimizing the number of elements that contribute to adverse impact. Elements showing the least amount of bias should be selected, but not to the point of sacrificing validity. That is, selection system components must be valid, and when a choice must be made among candidate components which have equal validities, those with the least potential for adverse impact should be chosen. However, when the validities are not equal, components with the higher validities should be chosen. Where criterion validity is not available, construct and content validity should be used to develop the system, and criterion validation should become an ongoing process during system use. CPAS was designed to meet these requirements.

Three categories of information were considered for inclusion in CPAS: demographic, performance, and aptitudinal. To obtain these data, the Demographic Questionnaire-Worker booklet, Job/Worker Characteristics Ratings booklet, and Civilian Personnel Examination and Score Checking Test were developed.

The approximately 1,500 civilian job series were collapsed by two teams of industrial psychologists and expert position classifiers into 23 job families. The job series were clustered into homogeneous groups according to similarities in job tasks and skills, and the clustering process was cross-validated.

The data collection instruments were twice field tested, revised, and then disseminated to a representative sample of 20,000 civilian job incumbents and their supervisors. The CONUS-wide data collection effort resulted in 12,865 or 64.3% complete usable data sets.

A variable reduction process evaluated each candidate variable (items from the data collection instruments) on a number of criteria and reduced the set to a manageable number of 24 variables for further consideration. The criteria used to reduce the overall number of variables included the possibility of adverse impact and content redundancy and the lack of validity and legal defensibility.

Twenty-three panels of 12 subject-matter experts (i.e., one panel for each civilian job family) were assembled to provide a content- and construct-valid promotion system that would consist of a restricted set of weighted promotion factors. Each panel performed the two basic tasks of (a) selecting 6 to 10 promotion factors from the list of 24 candidate factors and (b) rank-ordering (sorting) a selected random sample of employees in terms of the employees' promotability as reflected by these factors. Out of 256 raters, only two inconsistent raters were identified; data from these raters were removed from further analyses. Judgment analysis techniques were used to derive a mathematical algorithm that essentially replicated the ranking judgments of panel members. The resulting promotion factors identified and their weights provided unique mathematical combinations (algorithms) for each of the 23 job families by supervisory or nonsupervisory category. The correlations between the panel ranks and the ranks assigned by the weighted algorithms were all above .91, with most above .95. Two additional panels were convened to cross-validate the final variable selection, ranking, and judgment analysis process. Cross-validation correlations ranged from .94 to .98. Such results provide strong support that CPAS is highly content and construct valid.

The Civilian Potential Appraisal System as developed by AFHRL was delivered to the Office of Civilian Personnel Operations in April 1981 and was operationally implemented in April 1982.

PREFACE

It is not possible to recognize individually the many thousands of civilian and military employees who have devoted so much effort to development of this system for rating and ranking civilian employees. However, the project officers at each base who coordinated the CONUS-wide collection effort and the civilian subject-matter specialists who participated in the promotion data panel exercises deserve special mention for their particular dedication to the effort. Their dedication is reflected in the unusually high rate of the survey returns and in the consistency of the final promotion algorithms.

Several members of the Office of Civilian Personnel Operations at Randolph Air Force Base directly influenced the development of CPAS. From the Human Resources Laboratory, Mr Dick Rogers and SSgt Lee Meyers must also be recognized for their computer expertise and tireless efforts.

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I. INTRODUCTION

Background

In December 1976, the Directorate of Civilian Personnel (AF/MPK) initiated a request for the Air Force Human Resources Laboratory (AFHRL) to develop new appraisal systems for the civilian work force. The request for personnel research (RPR), originally entitled Supervisory Appraisal of the Current Performance of Air Force Civilian Employees (RPR 76-40), was validated in July 1977, and the development process began immediately. The request was initiated because the existing job performance and promotion appraisal systems had highly inflated ratings. The ratings had become so inflated that it was no longer possible to make the necessary distinctions among employees that were required for promotion and other personnel actions. Further, the existing systems were not viewed as credible by the employees, supervisors, or management.

In the RPR, AF/MPK pointed out that when appraisal instruments are "developed to serve a variety of purposes (e.g., selection for training, details, reassignments, merit promotion), their use for the latter purpose - merit promotion - inevitably leads to their ineffectiveness to achieve any of these purposes." The use of appraisals in promotion actions places such pressure on raters to inflate them that eventually there is insufficient variance in the ratings to allow distinctions to be made between or among employees. Innovative modification of existing methodologies and instruments was required, but the modifications had to conform to constraints imposed by the U.S. Civil Service Commission (now the Office of Personnel Management) and user needs. The existing Civil Service Commission regulations precluded:

> (1) Withholding information from employees on appraisal ratings or any other information concerning their job performance; (2) Using a "single" total score for each employee for all promotion considerations (i.e., the score used in each consideration must be composed only of those elements in an appraisal form that are relevant to the position to be filled); and (3) Using elements inherently descriptive of the "personality" of an employee rather than as attributes relevant to job performance (RPR 76-40, p. 2).

Additional user-specified (AF/MPK) constraints were that the number of forms must be held to a minimum, required forms and accompanying instructions were to be as simple as possible, and appraisals were to be compatible for use in an automated data processing (ADP) environment. At the time the RPR was received, there were no desired implementation dates specified other than to replace existing deficient systems as soon as practical.

The Manpower and Personnel Division of AFHRL was to plan and conduct the research and development (R&D) program, iteratively develop and field-test prototype system components, and transition the systems to the user. The Directorate of Civilian Personnel and its operational arm, the Office of Civilian Personnel Operations (OCPO) were to provide policy guidance to ensure that the developing systems were operationally implementable; provide access to test subjects, organizations, and existing data bases; and give operational support in the form of travel funds and testing facilities. USAF/MPK would be fully responsible for systems implementation, including development of regulations and operational procedures.

The general development plan was presented to USAF/MPK and approved in January 1978. It included development of separate job performance evaluation and promotion appraisal systems. A research-based development approach would include basic (6.1) and exploratory development (6.2) work on rating processes, scale development, and identification and weighting of relevant experiences, aptitudes, and performances. The R&D results would then be used to develop the performance evaluation measures (job performance appraisal and promotion potential appraisal) that would be used operationally. All systems components would be field-tested and revised, based on objective data. Analyses would be designed to assess employee and management acceptability and credibility of the proposed systems. The systems components would be validated against external job performance measures, and an operational test and evaluation (OT&E) would be performed on both the job performance and promotion potential appraisal systems. Each OT&E would compare existing and proposed systems and include a cost-benefits analysis to aid management implementation decisions.

In November 1978, the passage of the Civil Service Reform Act (CSRA-78; Public Law 95-454) changed the R&D plans previously designed. The new law required development of three separate job performance appraisal systems, with specific implementation dates that must be met. To meet these new requirements, AFHRL revised their ongoing R&D to provide the three systems by the specified implementation dates as follows: (a) Senior Executive Appraisal System (SEAS) for senior executives: September 1979 (Guerrieri, 1981), (b) General Manager Appraisal System (GMAS) for GM-13 through GM-15s: October 1980 (Cowan, Thompson, & Guerrieri, 1983), and (c) the Job Performance Appraisal System (JPAS) for all non-manager, non-SES appropriated fund civilian employees: October 1981 (Guerrieri, Thompson, Cowan, & Gould, 1984). It is important to note that CSRA-78 did not require the development of a separate promotion system but did require that GMAS and JPAS be a "basis" for promotion. To incorporate the use of GMAS and JPAS as a basis for promotion, USAF/MPK made the decision that only employees rated "fully successful" or higher in their current jobs would be considered promotion eligible. Even though CSRA did not specifically require the development of a new promotion system, it was decided that a new promotion system was still needed. The new system would be used when the number of promotion eligibles exceeded the number of employees that could be readily interviewed for the vacant position. A system was required that would rate employees on their potential to perform in higher-level jobs, and these ratings could then be used to rank-order the promotion eligibles for management review.

Although CSRA-78 imposed new requirements and tight implementation suspenses, USAF/MPK requested that CPAS development continue and that the final product be delivered at the same time as JPAS. With these increased requirements and limited R&D resources, many proposed R&D projects were cancelled or scaled down, and development relied more on a system of field-testing and less on basic research. Nevertheless, even with the increased workload, CPAS was completed and delivered to OCPO in April 1981, and implemented in April 1982.

Overview

This paper describes the development of the requested promotion rating system, the Civilian Potential Appraisal System (CPAS). The body of the paper describes the research design, the process used to organize the hundreds of civilian job series into job families, development of prototype appraisal instruments, sample selection, the data collection process, the reduction of candidate rating factors to the final set, policy-capturing of promotion panel judgments, development and cross-validation of promotion algorithms, and implementation issues. Detailed discussions and results of the development and analysis processes are contained in the appendices. The appendices present the same general information as contained in the main body of this paper but go into considerably more detail.

Appendix A details the procedures used to cluster job series into job families, lists the job families, and identifies the major job series which make up each job family. Appendix B describes the basic research conducted, the development of prototype appraisal instruments, and the data collection process, along with copies of the major data collection instruments. Appendix C describes the convening of promotion data panels, procedures used in selecting variables and ranking promotion eligibles, the process which captured the panels' ranking policies, and the development of the operational CPAS algorithms. Appendix D provides a copy of the operational CPAS rating form, and Appendix E contains instructions to supervisors and the work sheets to be used during the rating process.

II. APPROACH AND RESULTS

The major objectives of the proposed research design were (a) to review the professional performance appraisal literature for identifying promising components and scales which could be used, and to consult with the leading performance measurement experts for their input to the developing system, (b) to conduct basic research to evaluate candidate measures, scaling systems, and novel approaches, (c) to develop a system for collapsing the large number of civilian job series into a manageable number of homogeneous job families for use in the promotion systems, (d) to develop a wide range of field-tested measurement systems, (e) to collect data from a large Continental United States (CONUS)-wide sample of Air Force civilians, (f) to convene job-family-specific panels of experts to sit as promotion panels whose judgments would determine the final promotion factors and weighting system, and (g) to develop and cross-validate promotion algorithms by which CPAS could replicate the experts' promotability judgments.

Review of Past Research

The implications of past efforts are detailed in Appendix B and cited publications. In summary, the initial review of the state-of-the-art in performance appraisal (Mullins & Winn, 1979) identified many research issues, cautions, and possible approaches. First, no ready-to-use, satisfactory appraisal system for Air Force use existed. In developing an appropriate system, discussions with expert industrial psychologists (Mullins, 1981; Mullins & Winn, 1979) confirmed that ratings used for promotion purposes should be as objective and job related as possible. Asking supervisors to rate directly employees' potential to perform higher level jobs with which the raters themselves were not familiar would not be technically sound or legally defensible. Further, there was little empirical evidence that supervisors are able to make satisfactory projections of future performance. On these grounds, it appeared that job-relevant aptitude scores and verifiable experience, training, and other demographic information would probably be the most promising objective predictors of future performance. A combination of peer, supervisor, and alternate supervisor ratings of current job performance might also be used in the prediction system. Whereas the user asked for a system that would rate employees' potential, it soon became apparent that only measures of past experience and current performance would be appropriate. The new promotion system thus had to identify and use current and past performances that would be predictive of performance at higher levels, rather than directly measuring future performance potential.

Military selection and promotion systems have been exempted from the jurisdiction of civil law by the Office of Management and Budget, but similar systems for Department of Defense civilians have no such exemptions. The mood of the nation for equal employment opportunity and the growing number of legal challenges of civilian promotion systems indicated a growing probability that any promotion system would eventually be challenged in court (United States Office of Personnel Management, 1979). Therefore, the CPAS developers made an initial assumption that the system they developed would be challenged in court. A top priority, then, was to develop a legally defensible and valid system.

The Uniform Guidelines for Employee Selection of 1978 became available in 1979, and early court cases began operationally defining the meanings of the provisions (Cascio & Bernardin, 1981). In effect, the Guidelines say that a selection or promotion system which creates adverse impact against a minority or protected group of employees or potential employees is legally defensible only if the systems' development process considered all practical variables that are likely to be related to job performance and selected those which are most valid (content, construct, or predictive validity) but are least likely to create adverse impact. Hence, the design concept for developing CPAS was to obtain the maximum information on each employee from a variety of different sources and identify the most efficient subset that would minimize adverse impact while providing a valid system. Since originally there were no required implementation dates and because so many promotion rating issues remained to be answered, the design concept was essentially a research-based

system where the empirical data rather than subjective judgments of the developers would determine the final form of the Civilian Potential Appraisal System. To meet this objective, a system of three diverse appraisal sources was developed -- testing, background information, and ratings.

Basic Research Conducted

The mass of research on job performance ratings has failed to demonstrate that any specific set or type of rating statement significantly enhances prediction accuracy. For example, behaviorally anchored rating scales (BARS) have been extensively researched in recent years. However, evidence for the psychometric superiority of these scales is mixed, and their predictive power is virtually untested (Dunnette & Borman, 1979). In support of the RPR, a series of AFHRL studies (Massey, Mullins, & Earles, 1978) also failed to detect any difference between worker-, task-, and trait-oriented rating scales in predicting Noncommissioned Officer (NCO) Academy performance. Another series of studies (Curton, Ratliff, & Mullins, 1979) likewise found no differences between sets of rating factors, even though subject-matter experts had preselected separate sets of factors that seemed most and least relevant to performance. Although alternative rating contents or techniques may ultimately provide superior ratings, these scales have not been developed.

At this point (early 1979), an ongoing series of studies investigating the use of peer ratings and novel scales which were not subject to classical halo and rating inflation was discontinued. The requirement to develop three separate job performance appraisal systems with tight suspenses (CSRA-78) forced a reduction of scientists' efforts on basic research. In addition, funding for this stream of basic (6.1) research was not renewed. It is not, however, likely that the resulting CPAS system would have differed significantly from its present form had the research continued because of the time required to conduct and transition basic research and the due date for CPAS. Research completed by 1979 did, however, provide the rating scales used in the final development of CPAS, as well as provide many components of the research design used in developing the operational CPAS.

Development of Job Family Clusters

There are approximately 1,500 civilian job series in the Air Force. It was necessary to cluster these job series into a small number of groups or job families before development of CPAS could proceed. If CPAS was to use relevant past experience, aptitude, and current job performance measures to predict future performance in higher-level jobs, candidate jobs had to be grouped into homogeneous clusters based on job requirements. Once jobs were so clustered, relevant requirements could be determined and promotion candidates rank-ordered according to the degree to which they met those requirements.

To obtain a manageable number of logical and homogeneous clusters of job types, six position classifiers and research psychologists were divided into two independent panels. They were instructed to arrange the 1,500 Air Force civilian job series into some 20 to 30 homogeneous clusters based on task

subject matter and job requirements. The clusters developed by the two panels were then compared and differences resolved. The comparisons indicated that there was near-perfect overlap between the clusters developed by the two panels. The only difference was in the number of trades-and-crafts job families, which one panel had separated based on environment and the other panel had combined on the grounds that their job tasks were similar. After resolution of these differences in a joint meeting, 23 job family groupings were specified. There were three professional, seven technical, five administrative, two clerical, and six trades-and-crafts job families. Appendix A lists the 23 job families and the major occupational series making up each job family. Also included is a more detailed description of the panel process and a summary report.

Data Collection Instruments

Overview. No measurement instruments currently available were considered adequate for use in the CPAS. Therefore, three experimental data collection instruments were developed: the Demographic Questionnaire-Worker, the Job/Worker Characteristics Ratings booklet, and the Civilian Personnel Examination and Score-Checking Test.

Literature surveys, review, and evaluation of currently existing Government and industry rating forms, job analysis data from similar military occupations, and subjective judgments by the research team provided a pool of potential items and scales from which the first two measurement instruments were developed. Test instruments previously developed for Air Force enlisted personnel provided the basic prototypes for the aptitude measures.

The Demographic Questionnaire-Worker was a 102-item, self-report survey designed to collect traditional demographic information on each employee, such as age, sex, and ethnic background; promotion, education, and job training history; current job data such as time in service, grade level, and on-the-job performance awards; and interest and motivation toward acceptance of additional responsibility, training and effort to become eligible for promotion.

The Job/Worker Characteristics Ratings Booklet contained 108 items, with 9-point, adjectival, anchored rating scales designed to obtain ratings on a wide range of operationally defined worker/job performance skills and knowledges. Also included in this booklet were ratings of overall job performance, predicted performance in the next higher job, and estimates of the scores the worker was likely to obtain on paper-and-pencil measures of verbal, quantitative, mechanical, electronics, and spatial aptitude.

The Civilian Personnel Examination (CPE) and the Score-Checking Test (SCT) were designed to measure objectively the workers' quantitative, verbal, spatial, mechanical, electronics, and administrative aptitudes. Although these two instruments were initially developed to be part of the operational CPAS, the aptitude tests were not retained as candidate components for the operational promotion system. However, they were used in the experimental

development process to provide a means for assessing rater accuracy and determining the reliability of specific skills and knowledge ratings given to employees.

Demographic Questionnaire-Worker. An employee self-report demographic questionnaire was believed to be the most efficient means of obtaining certain very basic data important for a promotion system. A long history of studies on demographic and other self-report type questionnaires has demonstrated their validity and usefulness in predicting future performance (Reilly & Chao, 1980). Reilly and Chao reported that self-report background measures provide as much or more validity, with as little or less adverse impact, than do many alternative selection devices. Therefore, these demographic data seemed to be a valuable source for appraisal information. Many of the items included in the questionnaire, such as race and sex, had no potential for actual use in CPAS but were included to aid analysis of the obtained data for potential adverse impact against minorities or to answer research questions in later analyses. The complete Demographic Questionnaire-Worker is shown in Appendix B-2.

Job/Worker Characteristics Ratings. The primary purpose of the Job/Worker Characteristics Rating booklet was to obtain job performance ratings and rater accuracy data. Because this booklet played the key role in development of the final CPAS, the design of the booklet is covered in considerable detail in Appendix B. A full copy of the booklet is included in Appendix B-3.

As previously mentioned, past research with rating factor content and scales has indicated that as long as the components are constructed with care, the specific format seems to make little difference. One possible exception is the number of scale points. When rating scale points are well defined, reliability usually increases as the number of points increase, but with diminishing returns after nine points (Gould, 1978). In view of these findings, neither the format nor the job-specific content of the rating scales was heavily emphasized. Instead, a working group of AFHRL behavioral scientists met in November 1978, to select a set of general performance ratings and a set of appraisal factors that would apply to all civilian job families in the Air Force. It was not intended that every factor would apply to every job family. These ratings and factors are similar to, and extracts of, those currently used in a number of research and operational systems (Massey, Mullins, & Earles, 1978; Roach, 1956). The ratings booklet contains a variety of items in 10 sections and was designed to be completed by raters who were acquainted with the employee's job performance. Each of the 10 sections tapped a different type of information; e.g., overall job performance, ratings on trait factors, ratings on general abilities, and ratee background information. Except for some ipsative scales, experimental scales, and the ratee background sections, ratings were made on 9-point, Likert-type normative scales, with anchors given at each point. Ipsative scales use the person being rated as the reference point and rank-order the rating items (in this case, appraisal factors) for that person from high to low to reflect their strengths and weaknesses. Normative scales solicit ratings of how a person compares to a reference group (usually a peer group), and the ratings are in terms of relative standing.

General performance ratings are presented in Section I of the Characteristics Ratings booklet. Each booklet section was designed for a specific purpose. Sections I and II provide normative job performance ratings. They provide for the ratee's evaluation of the worker's current job performance, potential for performance at the next grade level, and supervisory and managerial capability. Section III contains 12 traits that were chosen, from hundreds available, according to their judged applicability to most Air Force civilian jobs, comprehensiveness, and understandability. Ratings were limited to 12 since this was considered the greatest number of traits raters could distinguish between (Mullins, Weeks, & Wilbourn, 1978).

Numerous studies have demonstrated the generalizability of rater accuracy across different rating dimensions (Cummings, 1980). Estimates of rater accuracy are needed for the legal defense of ratings; therefore, Sections II and IV were designed to provide rater accuracy indices. Section II contained a single item requiring the rater to estimate the worker's score on the Word Knowledge portion of the CPE. Section IV consisted of ratings on eight general abilities reflecting seven of the 11 CPE subtests. These ability ratings provide rater accuracy indices when compared with the ratee's CPE and SCT scores.

The recurring inflation of normative performance ratings in operational settings suggested that new evaluation techniques needed to be investigated. One such technique is the ipsative ranking technique. With ipsative scales, the rater ranks the traits in a given list according to which traits are the worker's best. A similar ranking is obtained for the worker's job position (i.e., which traits are the most important for successful job performance). The two sets of rankings are then combined to yield a job-worker-match coefficient. This coefficient can be used in combination with other rating and background data as a possible index of promotion potential. Therefore, to reduce rater inflation, Sections V, VI, VIII, and IX were included to provide the ipsative scales needed to compute two different inflation-free, job-worker-match indices. During analysis, the information from these four sections was to be combined to compute a job-worker trait match and a job-worker ability match. The ipsative rankings could also be combined with the normative ratings to yield a variety of ipsative-normative measures. For example, the six traits most important for successful job performance could be identified by the rankings and only these six ratings used as predictors. Mullins and Weeks (1979) provide a technique for the "normative use of ipsative ratings."

To assess an individual's motivation and drive toward promotion, Section VII included rater estimates of these attributes. The ratings were not firmly grounded in previous research but were hypothesized to provide valuable predictive information. Items 1 through 4 provided for information on the worker's on-the-job drive and productivity level: speed of work, productivity, percent time spent working, and initiative. Each rating was made on a 5-point, Likert-type scale, with anchors given at each point. Items 5 through 21 provided for the rater's assessment of the worker's desire for a promotion. Each item required the rater to indicate (yes/no) whether the worker would be willing to incur a certain cost in order to be promoted to

the next grade level. Such costs included: entering a training/retraining program, moving to another organization, accepting a job outside the worker's current job series, assuming additional duties, and performing additional supervisory tasks.

The Section VII ratings served two important functions. First, both types of measures were later tested as potential predictors of a ratee's suitability for promotion. Second, the "desire for promotion" measures (items 5 through 21) provided an additional index of rater accuracy. In the Demographic Questionnaire, the workers indicated whether they desired a promotion on these same 17 items. By comparing the rater's responses on these 17 items with each worker's responses on the Demographic Questionnaire, it was possible to determine how well each rater knew the worker's desire for a promotion.

Section X contained 20 background items that related to the rater's familiarity with the individual. These items were designed to serve as possible control measures for prediction purposes and to be studied as correlates for the investigations of rater accuracy and possible adverse impact.

Civilian Personnel Examination and Scoring-Checking Test. Aptitude tests were considered an important candidate component for the proposed operational CPAS system. Such aptitude tests have been widely used and found to be valid predictors of training outcomes and job performance in a wide variety of situations (Green, 1978). Aptitude tests can cover a broad spectrum of abilities, are not as subject to inflation as are ratings (although they may be subject to bias), and are generally more objective measures of an individual's abilities than supervisors' subjective assessments and evaluations. In addition, the use of aptitude tests may provide an indication of skills not necessarily required on an individual's current job, hence not observable or ratable by supervisors, but which are essential in a higher-level job such as supervisory and/or managerial; for example, a Federal Wage System flightline maintenance employee probably uses few verbal and administrative skills in his job, his supervisor would be marginally qualified to rate such skills, and yet those skills would be essential if the employee was promoted to the next level (i.e., Wage Supervisor). For these reasons, aptitude tests were included in the original experimental design for developing CPAS. As will be explained later, aptitude tests were, however, not included in the operational system.

Two aptitude tests, the Civilian Personnel Examination (CPE) and the Score-Checking Test (SCT) were developed. The CPE was a modification of the Airman Qualification Examination, Form J (AQE-J) (Vitola, Massey, & Wilbourn, 1971), which was updated and adapted for civilian personnel. The examination consisted of 11 subtests, measuring verbal, quantitative, mechanical, and electronics ability. The subtests most heavily emphasized blue-collar and clerical skills, although many of the subtests (e.g., reading ability, arithmetic reasoning, word knowledge) could apply to a variety of job series. Appendix B (particularly Table B-2) details the CPE and its development. The Score-Checking Test (SCT), a carefulness test (Mullins & Force, 1962) which required the examinee to check two sets of numbers for transcribing errors,

was designed to evaluate the examinee's carefulness in spotting discrepancies. Carefulness is an essential entry-level ability for most clerical and administrative jobs but is not measured by most standard aptitude tests.

Instruments Pretest. Initial pretests of early versions of the Demographic Questionnaire-Worker and the Job/Worker Characteristics Ratings booklet were conducted with small samples of employees at Lackland AFB (N=15) and Randolph AFB (N=20). Pretesting provided the opportunity to evaluate the readability of the materials, the ease of following instructions, and any difficulties experienced in using the scales. Feedback received led to numerous wording revisions, changes in some rating scales, addition/deletion of some items, and reordering of sections.

Full-scale pretests of the CPAS data collection materials were conducted at McClellan AFB (February - March 1979) and Patrick AFB (May, 1979) using all three parts of the full system (testing, demographics, and ratings). Complete data sets were collected for 266 workers at McClellan AFB and for 102 workers at Patrick AFB. The means and standard deviations of the ratings indicated that there were no serious inflation or restriction in range problems. Workers completed the CPE, SCT, and Demographic Questionnaire-Worker in a single, half-day testing session. Approximately 1 month after the testing session, the rating booklets were mailed out to the prospective raters. In these pretests, three ratings were used for each employee: the supervisor, a co-worker, and an associate of the supervisor.

Follow-up interviews at these bases revealed that a few people found the rank-ordering procedure confusing; others found it difficult to rank-order the 12 traits (Sections V and VIII) accurately. A few raters complained that the booklet took too long to complete, though most raters agreed that it took approximately 1 hour. In general, most raters found the rating booklet straightforward and easy to work with.

The follow-up interviews also indicated that supervisors and employees tended to feel the evolving CPAS system would be superior to the current system. The majority of participants believed that a system of objective tests, comprehensive ratings, and multiple raters provided the basis for a better system. Several participants particularly favored having multiple raters so that someone in addition to their supervisor would be involved in evaluating their performance.

As a result of the field test, minor modifications were made in all three components of the CPAS in preparation for the CONUS-wide data collection effort. A list of formal training sources (Items 68 to 102) was added to the Demographic Questionnaire-Worker, and the order of most of the items in the questionnaire was changed to present a more logical sequence to the examinee. With these modifications, the CPAS materials were forwarded for review and approval by the Air Force Directorate of Civilian Personnel (USAF/MPK) prior to their use in the major CONUS-wide data collection process.

Management Review of the Proposed System. In October 1979, the prototype Civilian Potential Appraisal System to be used in the CONUS-wide field test and data collection effort was reviewed by the Air Force Directorate of Civilian Personnel (USAF/MPK). The experimental prototype system proposed by the developers consisted of the CPE, SCT, Demographic Questionnaire-Worker, and the Job/Worker Characteristics Ratings booklet, which was to be completed by three raters on each employee (supervisor, co-worker, and supervisor's alternate).

Seven data collection alternatives were actually presented to the user with benefits and costs in man-hours, as well as an assessment in terms of the research impact. The alternatives ranged from no peer or supervisor's alternate ratings and no aptitude tests to three sets of ratings and aptitude tests for all target employees. USAF/MPK selected a combination of 20,000 target workers with supervisor and co-worker ratings. Some 2,000 of the workers would be given the CPE and SCT.

The primary concerns expressed by USAF/MPK focused on the legal acceptability of the various components of the proposed system and the number of man-hours involved in collecting the data. As a result of their decision, the CPE, SCT, and ratings by the co-worker and the supervisor's alternate were eliminated from consideration in the operational system. USAF/MPK eliminated the tests because of the controversy surrounding the use of paper-and-pencil tests for selection/promotion purposes at that time (United States Office of Personnel Management, 1979) and because the Carter administration had just signed a consent decree to eliminate the PACE examination (an aptitude test similar to the CPE) for Civil Service entrants because of documented differences in performance between minority and majority applicants. With the Government's decision not to defend a demonstrably valid test, it was felt the Air Force should not undertake the use of a similar test in an appraisal system.

A second factor in the decision to eliminate the tests from CPAS was the number of man-hours involved in testing. Full testing would require approximately 4 hours (or more) per employee. This requirement was considered prohibitive even for the CONUS-wide data collection effort.

The co-worker ratings and supervisor's alternate ratings were eliminated from operational CPAS consideration because of the questionable use of these individuals as official raters for the employee. It was believed that operational use of ratings by individuals who are not official raters could create serious legal, administrative, and morale problems for the promotion system. Therefore, rating sources other than direct first-line supervisors were eliminated from inclusion in the final operational system.

Although the aptitude tests and nonsupervisory ratings were deleted from consideration in the operational system, it was decided that up to 10 percent of the CONUS sample would be given the CPE and SCT in addition to the other materials for research purposes. These data would permit an examination of rater accuracy, test validity, and evaluation of possible adverse impact. In addition, the co-worker ratings were also to be collected for all ratees for

research purposes only. This arrangement provided a comparison of co-worker versus supervisor rater accuracy, as well as an additional rating source for possible validity studies. The supervisor's alternate ratings, however, were eliminated entirely from the research design.

CONUS-Wide Data Collection

A CONUS-wide field test was originally scheduled to be accomplished from November 1979 to January 1980. However, problems encountered with the American Federation of Government Employee (AFGE) representatives within Air Force Logistics Command delayed completion of the project until June 1980.[1] The purpose of the CONUS-wide effort was to obtain sufficient data on all candidate CPAS components to permit reduction of the candidate variables to a manageable subset and to identify relevant variables and determine their relative weighting for rank-ordering promotion eligibles within each job family.

A stratified random sample of 20,000 target workers from the 74 most populous CONUS bases was selected. The sample was stratified by grade, job series, sex, and ethnic category with 600 to 1,100 cases representing each of the 23 job families. The sample over-represented the number of minority members so that cell sizes would be adequate for bias and adverse impact analyses.

Demographic Questionnaire-Worker booklets were sent to 20,000 target workers along with a self-addressed envelope to return the survey directly to AFHRL. Such a procedure would ensure respondents that privacy of the data requested from each individual would be maintained. Supervisors and co-workers of each of the target employees also received a Job/Worker Characteristics Ratings booklet to be completed and returned in a self-addressed envelope to AFHRL.

[1]Although national representatives of the AFGE had been informed on two occasions about CPAS development, AFGE representatives within AFLC continued to be strongly opposed to the development of a system based on ranking factors other than longevity. After three bargaining sessions failed to allay their concerns, USAF/MPK directed that the data collection effort proceed within AFLC as it had within the other commands.

The CPE was administered to a random sample of 2,000 of the 20,000 target workers to obtain aptitude measures for the rater accuracy studies. Seventy-one percent of the mail-out materials were returned, with 65% of the target workers (N=12,865) having completely matched and usable data sets. Possibly due to the AFGE concerns over the development of a new promotion system which considered any factors other than seniority to achieve promotion eligibility status, the return rates for the blue-collar civilian workers were significantly below those of other Federal service employees. However, the overall distribution of the blue-collar returns was still adequate for full analysis of the data. Substantial variance in the behavioral performance element ratings, constructive write-in comments, and completeness of the data attest to the overall support that workers and supervisors gave to the promotion system development effort. Statements indicating the use of the ratings for "research purposes only" and an explanation of the nature and purpose of the entire project and the dedicated efforts of local base project monitors were responsible for the enthusiastic support of most participants. A more detailed description of the sample selection process, sample characteristics, administration procedures, data collection and processing, and analysis of returns is included in Appendix B.

Variable Reduction

The 210 data elements in the Demographic Questionnaire-Worker (102 items) and Job/Worker Characteristics Ratings booklets (108 items) presented a formidable array of candidate variables for use in the operational CPAS. Although Promotion Policy Data Panels of experienced personnel were to be used to identify variables specifically related to performance in their job family, they could not be expected to handle such a large pool of items. Since these panel members could not be expected to evaluate the items on their psychometric characteristics and legal implications, a panel composed of industrial psychologists (under contract and from AFHRL) and personnel specialists (from OCPO) was tasked to reduce the pool of variables. These panel members were knowledgeable of the personnel system, applicable case law, and/or psychometrics.

Since a high proportion of selection systems have been determined to create adverse impact on minority groups (Cascio & Bernardin, 1981, United States Office of Personnel Management, 1979) particular attention was paid to the requirements of the Uniform Guidelines for Employee Selection during the variable reduction phase. The guidelines say, in effect, that a selection system which creates adverse impact is defensible if the development process tried to identify all sources of information that could be related to job performance and then selected for operational use those information items which minimized adverse impact; but only if the selected set of items provides a highly valid selection system. In other words, the goal is to try to select items which minimize adverse impact but do not sacrifice system validity in the process.

To reduce the 210 demographic and rating variables to a workable subset, a large data matrix was constructed for rating each of the elements on a series of selection criteria. Four basic types of criteria were used: (a) estimated

validity, (b) uniqueness, (c) bias, and (d) legal defensibility. Correlations of the variables with peer ratings of overall performance and projected performance at the next higher levels served as estimates of item validity. A computing process titled VARSEL (Gould & Christal, 1976), was used to develop indices of item uniqueness and redundancy from an item intercorrelation matrix. Comparisons of mean ratings by race and sex category were used to evaluate item bias. Thus, objective measures of each item's validity, uniqueness, and bias were available. Subjective ratings of legal defensibility were made by personnel specialists and psychologists, based on case law.

After the objective measures were available, a panel of eight research psychologists and two personnel specialists was convened to select a workable subset of variables from the data matrix using the criterion indices for guidance. All data items were rated on a continuum of their legal defensibility using the guidelines interpretable from case law on equity and fairness in selection procedures and those with low ratings were deleted. This procedure significantly reduced the pool of variables. This first procedure reduced the pool of variables to observable behaviors and deleted demographic variables most related to past opportunities and thus associated with past discriminations. A consensus of panel judgments then selected the final subset of variables consisting of 24 rating elements: three overall ratings (job performance, supervisory, managerial); 12 behavioral ratings such as responsiveness to directions, self-sufficiency, etc; three ability ratings (quantitative, reading, data interpretation); four motivation indicators (productivity, initiative, speed of completion, and amount of working time spent in productive efforts); and two composite variables which combined behavioral or motivational measures. The specific elements chosen were all contained in the Job/Worker Characteristics Ratings booklet: Section I items 1, 4, and 5; Section III items A through L; Sections IV items A, C, and H; and Section VII items 1 through 4 (Appendix B-3 contains detailed item descriptions). Once the final subset of 24 rating elements was selected, the next task was to identify the relative relationship of each element to job performance in each job family and to specify how those ratings were to be used in the operational CPAS.

Promotion Algorithm Development

This section describes the Promotion Policy Data Panel (PPDP) exercise. The purpose of the exercise was to capture the promotion policy of a group of experienced Federal service career-field representatives, such that their policy (when converted into a mathematical algorithm) could be used in conjunction with the Promotions and Placements Referral System (PPRS). The PPRS is a centralized computer system that contains the current background, experience, and rating data on all appropriated fund Air Force civilian employees and is used to identify and rank all eligibles for each job vacancy. The CPAS component (i.e., ratings and promotion algorithm) would be used as the last ranking factor only in cases where the number of promotion eligibles exceeds the possibility for direct referral. To use the CPAS in this way, it was believed that there must be a common set of rating factors for all eligibles, even if not all factors were used for all jobs. Given this

purpose, there were three specific objectives of the exercise. The first objective was to provide restricted lists of rating elements that would be maximally relevant to each of the 23 civilian job families. The second objective was to obtain a job-family-specific weight for each factor, so that the factors might be combined into a single promotion system, or "promotability score," for each job family. The third objective was to obtain interim evidence for the content validity of this ranking system, until a full-scale, criterion-related validity study could be completed after the CPAS became operational.

After selection of the workable subset of variables from the data collection instruments, some methodology had to be used to identify and weight the specific promotion factors (i.e., variables). Several techniques were considered for possible use. However, in the absence of an external criterion of promotability, the traditional multiple regression-based technique was not considered appropriate for the selection of the final factors and their weights. Another possibility considered was the use of a panel of management/personnel experts who could identify the final list of factors; however, this technique would have given no assurances about the content relevance or validity of the final factors. The use of an equal-weighting scheme, whereby all of the original factors would have been retained and unit weighted was also rejected since it would have little face validity or job-family-specific relevance. After an evaluation of the advantages and disadvantages of these techniques, it was decided that a promotion policy panel exercise would provide the best technique to solve and weight the final set of job-relevant promotion factors.

This section describes the activities and objectives of the Promotion Policy Data Panel (PPDP) exercise. The purpose of the exercise was to capture mathematically the experienced-based judgments of senior employees concerning the job-relevance and weighting of the rating elements. The selected research strategy used "policy-capturing," a statistical judgmental analysis technique developed at the Manpower and Personnel Division (Black, 1973; Christal, 1963). Basically, the technique consisted of convening a series of job-family-specific experimental promotion boards (the Promotion Policy Data Panels, or PPDPs) to perform two tasks: (a) select a list of 6 to 10 promotion factors for a particular job family; and (b) rank-order (sort) a selected random sample of employees in the job family according to the employees' promotability. Then the policy-capturing software is used to determine the relative value that panel members attached to the rating elements in making the promotability rank orders. The result was objective formulas or algorithms which replicate the ranking judgments of the panels.

Promotion Policy Data Panels. For panel composition, stratified random sampling techniques were used to select participants to balance representation by race (Black, Hispanic, other), sex, and supervisory/nonsupervisory status. Selectees (i.e., subject-matter specialists) proportionally represented job series, locality, and major commands while meeting minimum grade, experience, performance, and availability requirements.

Panels of 10 to 12 subject-matter specialists (SMSs) were convened for 1 week in each of the 23 job families to select the final set of factors to be used for rating and ranking promotion eligibles in their job family. In two job families, additional panels were selected and convened to permit double cross-validation of the panel variable selection process and the promotion policies or formulas resulting from the policy-capturing exercise. Appendix C details the panel member selection process. Table C-2 summarizes the characteristics of each panel.

Variable Selection Process. Each panel's first task was to review and discuss the 24 prospective rating elements. Next, they had to select a set of 6 to 10 elements which were observable on the job in their job family and were perceived as related to ability to perform at the next-higher-level nonsupervisory job. The process was repeated to select a second set of 6 to 10 elements for supervisory jobs. Panels were limited to 10 factors since the developers' past experience with policy-capturing indicates that members can not effectively consider more than 10 factors. All variables except one, Arithmetic Computation, were selected for use by at least one panel.

Experimental Promotion Board Activity. The second task of the panel was to convene as a civilian promotion board to rank-order promotion-eligible candidates based on the rating data provided. Ratings for each promotion-eligible candidate were contained on one data card and reflected the actual ratings collected in the CONUS-wide field test. The rating factors for any specific candidate being ranked were only those that had been previously selected by the panels for determining promotability in their particular job family.

Each panel member was given 9 to 15 decks consisting of 70 to 80 cards representing possible promotion-eligible employees. Panel members were also given copies of the Job/Worker Characteristics Ratings booklet, from which the rating elements had been taken, and a summary layout for each data deck. Decks were labeled according to the specific grade level and supervisory/nonsupervisory nature of the candidate job for which each promotion eligible was being considered. Identifying information such as name, race, sex, or specific experience was not included on the data cards, to provide anonymity of the field test participants. Each panel was then asked to rank-order the data cards (representing promotion eligibles) according to their promotability or potential to perform in the next-higher-level job.

Panel members ranking wage grade job families considered only nonsupervisory jobs, whereas the panel ranking the wage supervisory family considered both supervisory and nonsupervisory jobs. The single job type rankings for wage grade jobs account for the small number of decks considered by some panels.

Unknown to the panel participants, one duplicate deck of cards was included in each panel in order to identify inconsistent raters. Based on the analysis of the duplicate decks, ranking data from any inconsistent raters which might bias the results of the study could be omitted for further data analysis.

The ranking exercise required a maximum of 4 days for each job family.

Data Analyses

Analyses of the Promotion Policy Data Panels had several questions to answer. Was there adequate intra- and inter-rater reliability; that is, did the panel members have a consistent policy when ranking individuals on promotability and did their policy agree with those of other panel members? Was it possible to reproduce mathematically the panels' rankings such that additional promotion eligibles could be rank ordered the same as the panel would rank them, without active panel input? Would the panel policies have been different if another group of experts had been used? If the mathematical formula or algorithm derived was successful in weighting the rating factors and reproducing the board rankings, were separate algorithms required for every grade level for every type of job (supervisory or nonsupervisory) in every job family? Finally, could the algorithms be simplified without losing their predictive efficiency? Although all these questions must be addressed, it was particularly important that answers to the questions of consistency in ratings be verified; otherwise, the further development of CPAS for operational use would be useless.

Consistency Analyses. As previously indicated, two identical decks were included among the set of decks ranked by each panel member to check panel member consistency. (During the panel activities, none of the panel members indicated that they detected the duplicate decks.) The consistency of the rankings assigned to cases in the duplicate decks was checked for each panel member by computing Pearson product-moment correlation coefficients for the two sets of rankings. It was arbitrarily decided that .80 was the acceptable cutoff for intra-rater consistency. Only one panel member had a correlation of .68, which fell below the preset cutoff. This panel member's rankings were not included in future analyses. The intra-rater level of consistency was very high; 91 percent of the panel members had correlations that were .95 or greater. Table C-4 in Appendix C gives a full breakout of these correlations.

Evaluating consistency among panel members to see if a panel consensus existed or if there were aberrant panel members was more complex. Since the panels provided data both for a nonsupervisory and a supervisory policy for most job families, separate analyses were accomplished using non-supervisory and then supervisory data. The procedure consisted of first developing a separate policy equation for each panel member and then inputting each respective set of policy equations to a hierarchical grouping analysis to determine which panel members had similar policies. Regression analysis was used to develop the individual members' equations. Rank order assigned to the data cards (or cases) was the criterion measure. The predictive efficiency of a regression equation was evaluated in terms of the multiple correlation coefficient. Appendix C describes the regression weighting process.

A multiple correlation of .90 was preset as the acceptable minimum value. Only one panel member had an individual policy equation (non-supervisory) with predictive efficiency below the cutoff (R^2=.81). This member's data were

removed from further analysis. Eighty percent of the squared multiple correlations were .95 or greater. Appendix C (Tables C-5 and C-6) gives the full listing of values.

The last and most crucial consistency analysis was developing a group or panel consensus equation. The hierarchical grouping process used for this purpose is described in detail in Appendix C. Basically, hierarchial grouping starts with two panel members and develops a single regression equation to predict the rank orders each assigned and compares the predictive efficiency of the joint equation to the efficiencies of their respective individual equations. Then a third rater is added to the group and the change in predictive efficiency is evaluated and so on until the iterative process has added all the raters to a single group. Tests of statistical significance are used at each iteration to see if there was a significant loss in predictive efficiency at that stage which would indicate that a panel member's policy differed from the other members. It was found that none of the panel members' individual policy equations substantially disagreed with those of the other panel members and it was feasible to compute single panel equations. The lowest multiple correlation from the hierarchical grouping process was .93. Based on the results obtained from these analyses, it was concluded that panel consensus had been reached, the panel equations were highly predictive, and the computation of the final CPAS algorithms could begin.

Computation of the Promotion Policy Equations. Several analyses were performed in arriving at the final promotion policy equations. Basically, the hierarchical regression grouping process just described was used to evaluate similarities in policy equations across grade levels, and across grade levels within nonsupervisory and supervisory jobs. Results of these analyses indicated that there were no significant grade-level category differences within job-family policies, so a single equation could be used within a particular job family without a significant loss in predictive efficiency. Predicted scores from the combined grade-level equations showed very high agreement with those resulting from the separate grade-level equations. The correlations between the two sets of promotion scores based on the combined and separate equations were all .98 or higher. The magnitude of the correlations indicated that the panels' grade-level rankings could be reproduced with exceptional accuracy by the non-graded algorithm weights for each job family.

Significant differences, however, were found between supervisory and nonsupervisory panel policies within and between job families. This necessitated the use of separate supervisory and nonsupervisory policy equations (algorithms) for each job family having both job types. Therefore, a total of 40 CPAS algorithms were required for the 23 job families: supervisory and nonsupervisory algorithms for job families 1 through 17, only a supervisory algorithm for job family 18, and only nonsupervisory algorithms for job families 19 through 23. Specific analyses for the development of these algorithms are detailed in Appendix C.

Identification of Operational Weighting Systems. The next analysis task was algorithm simplification. Since it was noted that the weights for two factors (data interpretation and reading ability) had near-zero values in most algorithms, they were removed from the algorithms and the impact of their elimination evaluated. Results indicated that there was no significant effect on the predictive efficiency of the algorithms using only the remaining factors. This process reduced the total number of factors to be used in the operational CPAS to 19.

Some of the remaining factor weights were very small (near zero) in selected algorithms, a few were negative, and all contained values computed to the sixth decimal place. Past experience with weighting promotion factors suggested that the weights could be simplified by changing them to whole numbers without adversely affecting the prediction system (Black, 1973). Since both the computation and explanation of the weights used in the algorithms would be simplified by use of integer weights, a decision was made that all weights would be rounded to the nearest whole number and weights less than "1" would be set to zero. The new integer weights were used to generate algorithm scores; then the algorithm scores were correlated with averaged panel percentile ranks to assess the efficiency in using the new weights. As shown in Table 1, correlations ranged from .92 to .98, indicating that the use of the simplified weights would not decrease the overall predictive efficiency of the system. Therefore, it was decided that the simplified weights would be used in the operational CPAS. Additional analyses comparing the operational CPAS algorithm rankings with the panel rankings are presented in Appendix C.

The operational algorithms generate an employee's CPAS score by applying the appropriate job-family integer weighting systems (nonsupervisory or supervisory) to the employee's score on the respective CPAS promotion factors. For example, the CPAS score for an employee in a job family with five non-zero weighted factors would be:

$$\text{CPAS Score} = (F_{w1} \times F_{r1}) + (F_{w2} \times F_{r2}) + (F_{w3} \times F_{r3}) + (F_{w4} \times F_{r4}) + (F_{w5} \times F_{r5})$$

where F_w represents the integer weight for a factor, and F_r represents the factor rating given the employee in the CPAS rating

Table 1. Correlations Between Operational CPAS Algorithm Scores and Composite Panel Ranks

Job Family	Nonsupervisory		Supervisory	
	N	r	N	r
1	714	.940	256	.948
2	320	.951	167	.953
3	513	.943	189	.972
4	545	.944	324	.953
5	460	.940	206	.953
6	555	.943	198	.950
7	353	.936	141	.937
8	650	.949	278	.962
9	587	.965	214	.982
10	574	.959	315	.980
11	700	.951	229	.963
12	422	.953	225	.953
13	543	.936	283	.951
14	439	.946	315	.937
15	576	.960	209	.972
16	640	.968	162	.981
17	726	.919	114	.958
18	N/A*	N/A*	232	.933
19	669	.966	N/A*	
20	488	.959	N/A	
21	545	.957	N/A	
22	480	.974	N/A	
23	565	.971	N/A	

* N/A = Not Applicable.

The factor weights are whole integers and range from 1 to 10 for the nonsupervisory and 1 to 11 for the supervisory weighting systems. Appendix C (Tables C-17 and C-18) displays the possible point ranges for the nonsupervisory and supervisory CPAS weighting systems, along with the CPAS score ranges, means, and standard deviations for the job-family sample cases used in the development of the respective weighting systems. The Directorate of Civilian Personnel has declared that the actual promotion weights are "Privileged Information" and thus cannot be included in the body of the report. Similarly, the specific factors weighted for each job family are not identified.

Cross-Validation of CPAS Algorithms. To cross-validate the panel process (content validation) and the derivation of the operational algorithms (construct validation), two additional promotion policy data panels were convened for Job Family 11, Business Technical, and Job Family 20, General Mechanical. The panel process and algorithm development process for each was the same as described previously. The within-job-family replication panels were convened at different times and did not know of each other's existence. Results from the comparative data indicated the rank orders assigned to nonsupervisory and supervisory cases for Family 11 and nonsupervisory cases for Family 20 were virtually identical for the within-family algorithms developed for each panel. Correlations between the two panel rankings were .94 to .98 for Family 11 and Family 20 showing remarkable consistency (i.e., content and construct validity) for the Family 11 and Family 20 algorithms. Based on the analyses for these two job families, there is no reason to believe that such consistency would not be found for the remaining job-family algorithms.

III. DISCUSSION

Implementation Issues

Three basic implementation issues needed to be addressed. They dealt with development of the operational rating form, procedures for managing rating inflation, and training of management, supervisors, and employees.

Operational Rating Form

In their original request, USAF/MPK requested simplicity in the rating forms. It was also recognized that the rating forms were to be used in an automatic data processing (ADP) environment. Since different job families used different combinations of the 19 rating factors, the advisability of having separate rating forms for each job family was considered. Separate family forms would reduce to a minimum the number of rating factors that supervisors would have to use but would result in the need for 23 separate rating forms. By combining job families using similar factors, only seven rating forms would be required, thus significantly reducing the total number of forms to a more manageable number.

To provide empirical data related to this issue and before a final decision was made on the number of forms, AFHRL requested that OCPO conduct an analysis of employee movement to see if employees tended to remain within a certain job family. From their historical data base, OCPO constructed a matrix of employee movement within and between job families. Surprisingly, more individuals were promoted from outside their job family than within. Such movement between job families meant that individuals who were rated on one form would have to be rated on additional forms when they wanted to compete for promotion within other job families. Considering the results of the movement analysis, rating requirements for multiple rating forms would be substantial and probably unmanageable.

To achieve the desired simplicity, AFHRL recommended that a universal rating form be used whereby all employees would be rated on all 19 factors regardless of their applicability to promotion in the employee's current job family. Based on this recommendation, the Director of Civilian Personnel decided that a universal rating form would be used for the operational system. This decision had the added advantage that now every individual could be considered for promotion for every job vacancy for which that person was eligible, without delay. With the use of the Promotions and Placements Referral System (PPRS) within the centralized data system, eligible candidates could even be immediately considered for all CONUS job openings regardless of their base of assignment.

In their original form in the Job/Worker Characteristics Ratings booklet, the 19 selected factors were operationally defined such that all persons in all jobs should have observable job components relating to some facet of each factor. These factors also had generic factor names such as Leadership, Skill, Supervisory Ability and Management Ability.

It was recommended by AFHRL that these factor names be removed from the operational rating form for four reasons. First, raters might respond to the factor name without reading the operational definition and render ratings based on their own definit'ons of leadership, rather than having a frame of reference common to all raters. Second, some raters might resist rating some factors, based on the factor name alone. For example, a supervisor might hesitate to rate a non-supervisory employee on supervisory ability. However, the operational definition of supervisory ability describes behaviors which are related to supervisory activities but which do not necessarily have to be performed in a supervisory mode. Third, it was expected that raters would be more likely to avoid inducing halo effects into their ratings if they reacted to operational definitions rather than factor names. Finally, and most

importantly, the Uniform Guidelines (1978) and case law (Cascio & Bernardin, 1981) indicate that rating individuals on traits and characteristics was not acceptable. Instead, ratings should be in terms of behavioral dimensions.

Removing the generic factor names removes the temptation to rate the factors as traits or characteristics and fosters the use of the rating elements as behavioral dimensions.

The CPAS rating form (AF Form 1287) is reproduced in Appendix D. As recommended by AFHRL, 9-point normative rating scales were used. The specific format or layout of the form was adopted by a CPAS Implementation Working Group, which consisted of representatives of each major command Director of Personnel (DP) and OCPO.

Inflation Management

At the outset, USAF/MPK wanted a rating system that was resistant to inflation. Although it was not believed that an entirely inflation-free rating system could be developed, it was deemed possible to manage inflation such that there would be sufficient variance to permit accurate ranking of employees. Past research indicates that attempting to obtain variance by normalizing or curve-forcing actions or by very stringent rater-training programs does produce variance in ratings but that much of it is error variance rather than reflecting any true differences (Hedge, 1983). Therefore, the objective was to "manage" rather than "eliminate" rating inflation through a system that fostered information flow to managers and supervisors and created realism in ratings.

Four specific actions were recommended to promote inflation management of the rating system. These recommendations focused on the format of the rating scale, the advisability of rating all employees at one time in a unit, the need for separate job performance and promotion rating systems, and the utility of a feedback system.

It was believed that the most effective rating scale would be a 9-point behaviorally anchored scale where the rated individual would be compared to the average employee. The average employee should be defined as being highly effective and motivated in the performance of the assigned job. Ratings using the top or bottom two scale points should be substantiated by citing specific performance events relevant to that rating. This rating scale format was approved by USAF/MPK, and instructions for justifying extreme ratings and completion and interpretation of the rating summary work sheets were outlined in a brochure developed by OCPO with AFHRL input. A copy of the CPAS Supervisory Brochure is included in Appendix E.

The AFHRL developers believed that a major reason for inflation in the then-existing promotion rating system was that ratings were rendered on employees at differing times. This meant that supervisors and management could not compare employees within an organization at the same time. Without a visible comparison, there was no way to ensure that the proper distinctions were being made between employees and that the ratings of a particular supervisor or unit were not overinflated. By rating all individuals in a unit

simultaneously, raters should be able to make more objective comparisons among subordinates. Each supervisor's ratings should be summarized on work sheets and the summaries submitted with the ratings to an indorsing official. Indorsing officials can then check for rating errors such as leniency, halo, or response set. Further, the work sheet summaries will permit the indorsers to make comparisons across raters and ensure that ratings are consistent with each unit's productivity. Indorsers should be authorized to mandate that ratings be consistent with actual performance.

As recognized by USAF/MPK, when an appraisal instrument is used for a variety of purposes, it tends to make the instrument ineffective for any purpose. It appears that the greater the number of uses for a rating, the greater the pressure on the supervisor to inflate the rating. For this reason, AFHRL recommended that the CPAS ratings be separated from the job performance rating system entirely. The only relationship between the two systems should be (a) that individuals must have obtained at least satisfactory job performance ratings (i.e., under the General Manager Appraisal System (GMAS) or the Job Performance Appraisal System (JPAS)) to be promotion eligible, and (b) that the ability to render appropriate CPAS ratings should be a mandatory component of each supervisor's GMAS or JPAS rating. Separation of the two systems was approved and has been operationally implemented.

When rating feedback systems are used, the system usually provides mean summary values of ratings so that comparisons among raters and comparisons of subordinate units' rating policies can be made. Anecdotal information suggests that when such a system is used, organizations with lower mean ratings feel they may have been unfair to their employees and increase the average of their next ratings. Although it was recognized that a feedback system may actually increase rather than decrease inflation, such a system was still recommended for implementation of CPAS. With CPAS, however, the recommended system was to provide only variances in ratings given, not mean rating values. Accompanying guidance would point out that "the more variance, the better" would be the preferred policy. Since inflation reduces score dispersion, hence the amount of variance, the resulting lack of variance would be an indication of poor rating management and inability of the supervisor to differentiate performance between individuals. This variance yardstick could then be used to guide subsequent performance ratings of supervisors. The job performance rating systems now used by the Air Force (GMAS and JPAS), require that all supervisors have a critical supervisory ability job element. Therefore, all supervisors should be rated on their ability to rate. Variance feedback should make supervisors accountable for their rating styles. Although the suggested feedback system was not implemented, it is believed that reconsideration of the recommendation is warranted.

Training and Information Dissemination

Experience with SEAS, GMAS, and JPAS implementation indicated that those who most vigorously objected to the systems were those who had not undergone training. Since CPAS was a significant departure from the format of the existing promotion rating system, an aggressive training program was

recommended. Most important was the necessity to overcome the prevailing negative attitude toward promotion ratings and the concept that all but the very worst performers should receive top ratings. After initial training, periodic refresher training should be performed, possibly in conjunction with GMAS or JPAS refresher training. A continuing training program must be used to train new supervisors, particularly military members, since the military rating system has become highly inflated over the years.

The CPAS Implementation Working Group focused on what was needed to implement CPAS successfully. The working group recognized the need for adequate training and the local commander's support to make CPAS work. Four basic recommendations were made by the group. A mandatory training program (1 day for supervisors and 1/2 day for employees) should be implemented. The training should be professionally developed and should use an audiovisual format. Training should be conducted well before CPAS implementation and have formal train-the-trainer sessions.

To obtain the necessary support of the commanders, the working group felt a publicity campaign consisting of articles and briefings should be developed by the Public Affairs Unit at Kelly AFB. Then a team could take the briefings to the Air Staff and major commands.

Based on the union-induced delays during the CONUS-wide field test and announced AFGE opposition to any promotion system other than a seniority system, the group recommended early union notification and submission of negotiation guidance packages to the chiefs of civilian personnel offices (CCPOs) throughout the Air Force.

Finally, the group felt that a comprehensive informational package should be developed which explained CPAS, its origin, development process, and mechanics. The package should then be distributed to all employees who are affected by the system.

Research Plan and Product Changes

A variety of events changed the original proposed research plan and products to be delivered to the personnel community. Passage of CSRA-78 was the major event affecting CPAS development. Shifting of scientific resources to develop these snort-suspense job performance appraisal systems necessitated a realignment of manpower resources and change in research milestones.

In FY80, the exploratory development (6.2) program element used to fund the appraisal research and development (R&D) efforts was cut by Congress with prejudice because R&D funds were being used by all the services to implement CSRA. Since the cut with prejudice meant the Air Force could not reprogram funds, portions of the CPAS development program had to be omitted. Specifically, the operational test and evaluation (OT&E) of the finalized CPAS, cost-benefits analyses comparing CPAS to the current system, and planned publicity packages and the CPAS training system were removed from the AFHRL list of products to be delivered to USAF/MPK.

USAF/MPK eliminated the use of aptitude tests as a component of CPAS because their use may not be legally defensible. Loss of the CPE had the additional effect of eliminating the use of ipsative rankings in CPAS. The CPE scores and supervisory ratings on CPE-measured dimensions were going to be used to help benchmark and normalize the ipsative ratings. Ipsative ratings were expected to add an inflation-resistent component to CPAS.

A brief field test of the operational CPAS was planned to compensate for the loss of the OT&E. The test was held in conjunction with a final test of JPAS. Some 1,000 supervisors and employees were trained at five bases in July 1981 (Guerrieri, Thompson, Cowan, & Gould, 1984). JPAS ratings were rendered in October 1981, and CPAS ratings were collected, including followup interviews, in December 1981. However, since the field test was made voluntary, so few CPAS ratings were obtained that no definitive analyses could be made. The few CPAS respondents (less than 100) appeared to favor CPAS, but no conclusions could be drawn since attitude toward CPAS might have influenced the decision to complete or not complete the voluntary CPAS ratings.

Legal Considerations

As previously stated, consensus among industrial consultants, personnel specialists, and the AFHRL research staff was that any effective promotion system would undergo many legal challenges. To make the system legally defensible, the Air Force Central Labor Law Office at Randolph AFB assigned a legal advisor to the CPAS project. The specific contribution of the Law Office was a detailed review of the CPAS research and development plan in relation to the requirements of case law and the Uniform Guidelines for Employee Selection. Suggested changes were adhered to, particularly in the variable reduction process.

Although the Uniform Guidelines generally apply only if a selection system creates an adverse impact on minorities, the implications of the principles expressed are good selection system development practices. Under the guidelines, adverse impact can be justified when the system is a valid predictor of performance and specified development actions were taken.

As developed, CPAS meets the requirements of the guidelines. The suggested selection system development steps were followed, and the system development data give strong evidence that CPAS has both content and construct validity. Since the guidelines state that failure to collect and maintain data for assessment of possible adverse impact is to be considered as evidence of adverse impact, the user must now collect and maintain necessary records to advert this change. Further evidence must be collected to establish predictive validity since the guidelines consider content and construct validity to be acceptable only as interim validity for new systems until predictive validity can be established.

IV. RECOMMENDATIONS

Recommendations were made to USAF/MPK throughout the development of the CPAS; however, after operational implementation, several additional recommendations should be considered for the future.

It is recommended that an aggressive ongoing evaluation and analysis program be established. The analysis program should cover the entire promotion selection process, particularly the progression-level factors in the Promotion Placement and Referral System (PPRS). CPAS is only the last ranking factor in PPRS. Case law indicates that even if a system does not create adverse impact in its total effect, the system is still considered to have adverse impact if such can be demonstrated for any system subcomponent (Cascio & Bernardin, 1981).

Three basic areas of concern should be addressed by the evaluation program: (a) that the users are following proper procedures, (b) that CPAS is effective in helping managers identify the best promotion eligibles, and (c) that CPAS meets legal and regulatory requirements. An evaluation and analysis program should, as a minimum, perform the following functions:

1. Checking for adherence to CPAS procedures. This area should be an action item added to self-inspections, IG inspections, CCPO audits of personnel actions, and travel team evaluations. The objectives should be to ensure that there is a continuing program of initial and refresher training for supervisors, that current appraisals are being used, and that the proper CPAS algorithms are used in specific fill actions.

2. Monitoring the effectiveness of the CPAS program. Efforts should be directed on a periodic basis to review rating trends of the program and, if rising inflation is apparent, to propose corrective measures to improve the rating process. In addition, attention should be directed to the supervisors and employees participating in the system and their views toward the overall program. Surveys and questionnaires should be used to provide indications of acceptability to employees and supervisors.

3. Ensuring that CPAS meets legal and regulatory requirements. The basic steps needed to maximize the chance for successful defense against legal challenges would be to track adverse impact, document system changes, and further, establish CPAS predictive validity. Adverse impact is meaningful only in terms of actions taken rather than in terms of differences in minority versus majority CPAS scores. The numbers and classifications of eligible candidates who are rank-ordered by CPAS should be compared to the characteristics of groups actually referred for interview. This is the only appropriate evaluation of CPAS for adverse impact. Similarly, each progression level in PPRS should be evaluated on the same basis.

CPAS system changes such as adding new job series to job families or using CPAS for a new purpose, such as cadre selection for careers management programs, should be well documented. Finally, external job performance measures should be established and CPAS scores correlated with these measures to assess the predictive validity. The process will be complex and time-consuming because it will be a long time before sufficient promotions will occur in a job family to permit predictive analyses. In the interim, concurrent validities comparing CPAS scores with current performance measures, such as GMAS and JPAS, should be conducted.

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APPENDIX A: JOB FAMILY SPECIFICATIONS

General Charter

Since the development of the CPAS was dependent on an appropriate grouping of approximately 1,500 civilian job series into a manageable number of logical and homogeneous clusters of job types, a working group consisting of position classifiers and research psychologists was established and tasked to develop these homogeneous clusters. The following paragraphs describe the panel process by which the final job groupings were derived.

The following working group charter was agreed to by AFHRL and OCPO.

> The objective of this work group is to assign occupational groups and job families to categories that support research requirements. The work group will review categories previously developed by AFHRL and OCPO as well as the entire list of occupational groups and job families published by OPM or presently in use within the Air Force. Categories developed by the work group must represent sufficient personnel to support an appraisal algorithm and have homogeneous qualities relative to attributes required in the job (i.e., skills, knowledge, experience, and training). The work group will reduce the number of categories to the smallest possible total within the guidelines listed below. The work group will be divided into two panels, each arriving at its own conclusions on categories of occupational groups and job families. Each panel will assign a rating to factors for the occupational groups and job families considered for inclusion in a category. These ratings are later to be compared statistically to determine the agreement between the two panels and the adequacy of the criteria provided. The panels will keep a detailed record of all judgments made (e.g., rationale behind use of additional criteria during selection of an occupational group or job family for a category), so problem areas can be clearly identified and resolved, and so a complete history is available for analysis and future application or modification of procedures. The work group will submit the results of their efforts in writing to OCPO/MPKEA who will provide them to AFHRL. The Chairman of the group will be the OCPO/MPKMM representative.

Working Group Report Summary

The following paragraphs summarize the working group report and resulting job family specifications.

1. Working group composition. As a preliminary step in implementing the performance appraisal process, a work group was formed to divide the Air Force occupations into families. These families would be made up of series with tasks that are similar enough to be appaised by like methods. The work group composition is as follows:

Lynn Carpenter, OCPO/MPKMM, Position Classification Specialist, Chair
Capt William Cummings, AFHRL, Behavioral Scientist
Dwight Hall, OPO/MPKEE, Personnel Management Specialist
Ron Sheppard, OCPO/MPKT, Personnel Management Specialist
Bob Utterback, OCPO/MPKCL, Personnel Management Specialist
James Wilbourn, AFHRL, Personnel Research Psychologist

The three OCPO representatives had primary experience in the position classification specialty.

2. Ground rules. In general, the following ground rules were agreed upon:

a. Occupational series (both GS and WG) would be condensed into 20 to 30 groupings. Existing job families, as described by the Office of Personnel Management (OPM), will not be used as they are too numerous (21 GS, 53 blue-collar) and do not always look at task analysis in making occupational distinctions. For example, the GS-6XX family includes physicians, nurses, medical machine technicians, nursing assistants, medical clerks, and other positions which are found in a hospital/medical setting and does not group only those positions with similar duties. This grouping is made on an environmental basis rather than placing like tasks in the same job family.

b. For the first round of groupings, GS-301 would not be considered because of its heterogeneity.

c. The decision to put various grade levels of one occupational series into more than one grouping would be delayed until some of the basic determinations were made.

d. The first step would be to divide the job families (as defined in OPM classification standards) into one of five large groups: professional, administrative, technical, clerical, and blue collar. After this, future breaks of those groups (by occupational series) would be made.

e. Originally, the group felt that blue-collar occupations could be integrated with GS positions. However, it was decided that blue-collar occupations would be considered separately as they have predominantly trades and crafts tasks.

3. Consistency of specified occupational groupings. For cross-validation of the results, two subgroups were formed. Each subgroup was made up of two personnel specialists and a psychologist. The subgroups worked independently; plans were made that the two subgroups would reconvene and compare occupational groupings. The areas of disagreement would be resolved at that time. The Subgroup composition was as follows, group leader listed first:

Group A	Group B
Ms Carpenter	Mr Hall
Mr Sheppard	Capt Cummings
Mr Wilbourn	Mr Utterback

The two subgroups met separately on several occasions and divided occupational series into groups. There was no discussion between the subgroups on progress or problems encountered. Both subgroups used an Air Force Occupational Inventory dated 5 February 1979, the US Civil Service Commission Position Classification Standards, the USCSC Handbook of Blue Collar Occupational Families and Series, and the X-118 Qualification Standards as resource documents.

4. General comments on occupational grouping process. On 26 February, the two subgroups met to compare findings. The two groups' work was very similar; the only significant difference being in the separation of the blue-collar occupations. General comments on the groupings are as follows:

a. Only occupations that have positive education requirements (as prescribed by the X-118 Qualification Standards) were placed in "professional" groupings.

b. Where grades of the same occupational series, such as in GS-301, GS-501, etc., were placed in different groups, the distinctions were made between the GS-5 and GS-6 levels and between the GS-9 and GS-10 levels. The reasoning here was that most classification standards draw distinctions between clerical and technical work at the GS-5/6 stage; also, the GS-9 level usually represents either the advanced technical grade or the advanced trainee stage.

c. One group had divided the blue-collar occupations by environment, such as fabric working and aircraft working, whereas the other group had placed like tasks together. The second group's suggestions were adopted as they were more logical and corresponded to the rationale used in dividing the GS occupations. For example, all Wage Supervisory (WS) positions were in one group, rather than being integrated into their respective occupational series. This grouping was done because the tasks on which the WS employee would be evaluated were not technical, but centered on supervisory duties.

d. No definitions were specifically given to the terms "technical" and "administrative" as far as determining the occupations which were grouped together. For example, it was irrelevant whether manpower/personnel jobs or supply/transportation occupations were called "technical" or "administrative." What was relevant, however, was that these like occupations were grouped appropriately.

e. Certain general occupations, such as GS-301, GS-501, etc., would be placed in different groupings, as appropriate. These types of occupations encompass such a variety of occupations that it was more appropriate to group them with similar skills than strictly by occupational series. For example, the GS-301 series can range from a trainee clerical position classified as GS-301-1 to an Air Staff Manager, GS-301-18. Therefore, using grade level distinctions made in other occupational series as guides, grade level distinctions in these occupations were made at the GS-5/6 and GS-9/10 levels (see paragraph 4b).

f. In each of the four major GS categories (professional, administrative, technical, and clerical), there were a number of occupations that did not fall into any particular grouping and were too small in population to make into an individual subgroup for that specific occupational series. They became the Miscellaneous Professional, Administrative Support, Miscellaneous Technical and General Clerical job families.

5. Specific comments on final occupational groups. Specific comments on the groupings are presented below. The 23 job family categories and the occupational series included within each job family are contained in Tables A1 through A24.

a. Accounting and Finance Technical: Occupations support the Comptroller function and are nonmanagerial and nonprofessional.

b. Administrative Support: Occupations support primarily technical and administrative and some professional occupations. Except for very low grade levels, all occupations in this grouping must have substantive knowledge of the subject-matter area. The occupations share a requirement for researching of regulations and directives and processing work which has impact on monetary expenditures and impact on personnel. The exception is Editorial Assistant, GS-1087, which was placed in this group because of its requirement of strict adherence to guidelines.

c. Arts and Recreation Technical: This grouping is relatively self-explanatory. It consists of recreation-type occupations, as well as those in the information field which do not have positive education requirements. For the purpose of performance evaluation, these occupations (a) have particular technical standards which must be upheld and (b) require flexibility to respond to specific needs.

d. Biological and Medical Technical: Occupations do not have positive education requirements and support biological or medical professional occupations.

e. Biology Professional: Self-explanatory.

f. Business Technical: These occupations perform business- and industry-related functions in the Air Force. The supply/transportation occupations shown here were not grouped in the Supply/Transportation Group as the category is oriented toward management positions. At the GS-6/9 levels, the supply/transportation positions are technical.

g. Computer Technical: Self-explanatory.

h. Engineering, Physical Science, and Mathematical Professional: The similarity in tasks of dealing with physical phenomena and mathematics drew these occupations into the same grouping. All occupations have positive education requirements.

i. Engineering, Physical Science, and Mathematical Technical: Technical support of groups listed in paragraph h; do not have positive education requirements.

j. General Clerical: These occupations are similar as to what they do not require. For the most part, they do not require keyboard skills, substantive knowledge of subject-matter area, or extensive specialized or specific experience in the type of work to be performed. The Intelligence Clerk GS-134, Printing Clerk GS-351, Communications Clerk GS-394, and Medical Clerk GS-679 are in series which denote their environments rather than specialized tasks.

k. General Management/Administration: These occupations represent those series in which general management jobs are found. These may be found in any organization; management skills, rather than specialized knowledges, are their predominant requirements.

l. Keyboard Clerical: The Secretary GS-316 occupation was included as these positions usually require keyboard skills as well as secretarial skills. Additionally, the career pattern for secretaries is usually an outgrowth of the GS-312/316 series.

m. Medical Professional: Self-explanatory.

n. Miscellaneous Professional: These occupations fall into the other professional category. There are obvious subgroups here (GS-1701, 1710, 1720, 1725; GS-184, 185, 190, 193); however, these subgroups have populations that are too small for performance appraisal purposes and therefore were not divided further.

o. Miscellaneous Technical: The same rationale as above (paragraph n) applies for these technical positions, which do not fall clearly in any other grouping.

p. Personnel and Manpower: Self-explanatory.

q. Specialized Management/Administration: These occupations have management orientations but in specific subject matter areas. Although these specializations are not necessarily similar, the requirement for management within certain subject-matter requirements is present in all.

r. Supply/Transportation: Self-explanatory (see paragraph 5f).

s. Basic Shop Operations: These occupations do not require specialized skills.

t. Electric Repair and Service: Self-explanatory.

u. General Equipment Operation: Self-explanatory.

v. General Mechanical: Self-explanatory.

w. Systems Repair and Services: Self-explanatory.

x. Wage Supervisory: Self-explanatory (see paragraph 4c).

Table A-1. Occupational Group

Job Family	Title
1	ENGINEERING, PHYSICAL SCIENCE, AND MATHEMATICAL PROFESSIONAL
2	MEDICAL AND BIOLOGY PROFESSIONAL
3	MISCELLANEOUS PROFESSIONAL
4	COMPUTER TECHNICAL
5	PERSONNEL AND MANPOWER
6	SUPPLY AND TRANSPORTATION
7	BIOLOGICAL AND MEDICAL TECHNICAL
8	MISCELLANEOUS TECHNICAL
9	ENGINEERING, PHYSICAL SCIENCE, AND MATHEMATICAL TECHNICAL
10	ACCOUNTING AND FINANCE TECHNICAL
11	BUSINESS TECHNICAL
12	ARTS AND RECREATION TECHNICAL
13	GENERAL MANAGEMENT/ADMINISTRATION
14	SPECIALIZED MANAGEMENT/ADMINISTRATION
15	ADMINISTRATIVE SUPPORT
16	GENERAL CLERICAL
17	KEYBOARD CLERICAL
18	WAGE SUPERVISORY
19	ELECTRIC REPAIR AND SERVICE
20	GENERAL MECHANICAL
21	BASIC SHOP OPERATIONS
22	SYSTEMS REPAIR AND SERVICES
23	GENERAL EQUIPMENT OPERATIONS

Table A-2. Job Family 1

ENGINEERING, PHYSICAL SCIENCE, AND MATHEMATICAL PROFESSIONAL

Occupational Series	Title
405	Pharmacology
408	Ecology
410	Zoology
434	Plant Pathology
435	Plant Physiology
437	Textile Technology
801	General Engineering
803	Safety Engineer
804	Fire Prevention Engineer
806	Materials Engineer
807	Landscape Architect
808	Architect
810	Civil Engineer
819	Environmental Engineer
830	Mechanical Engineer
840	Nuclear Engineer
850	Electrical Engineer
855	Electronic Engineer
858	Biomedical Engineer
861	Aerospace Engineer
881	Petroleum Engineer
892	Ceramic Engineer
893	Chemical Engineer
894	Welding Engineer
895	Industrial Engineer
1301	General Physical Science
1306	Health Physics
1310	Physics
1313	Geophysics
1320	Chemistry
1321	Metallurgy
1330	Astronomy/Space Science
1340	Meteorology
1370	Cartographer
1372	Geodesist
1373	Land Surveyer
1384	Textile Technology
1386	Photographic Technology
1510	Actuary
1515	Operations Research
1520	Mathematics
1529	Mathematical Statistics
1530	Statistician
1540	Cryptography
1550	Computer Science

Table A-3. Job Family 2

MEDICAL AND BIOLOGY PROFESSIONAL

Occupational Series	Title
401	Biology
403	Microbiology
413	Physiology
414	Entomology
430	Botany
440	Genetics
454	Range Conservation
457	Soil Conservation
460	Forestry
471	Agronomy
486	Wildlife Biology
601	General Health Science
602	Medical Officer
603	Physician's Assistant
610	Nurse
630	Dietitian and Nutritionist
631	Occupational Therapy
633	Physical Therapist
635	Corrective Therapy
637	Manual Acts Therapy
638	Recreation/Creative Arts Therapist
639	Educational Therapy
644	Medical Technologist
660	Pharmacist
662	Optometrist
665	Speed Pathology/Audiology
668	Podiatrist
680	Dental Officer
690	Industrial Hygienist
701	Veterinarian

Table A-4. Job Family 3

MISCELLANEOUS PROFESSIONAL

Occupational Series	Title
020	Community Planner
060	Chaplain
101	Social Science
110	Economist
131	International Relations
140	Manpower Research
150	Geography
160	Civil Rights Analysis
170	Historian
180	Psychologist
184	Sociologist
185	Social Worker
190	Anthropologist
193	Archeology
493	Home Economist
510	Accountant
905	Attorney
1015	Museum Curator
1221	Patent Advisor
1222	Patent Attorney
1410	Librarian
1420	Archivist
1701	General Education/Training
1710	Education/Vocational/Training
1720	Education Research and Program
1725	Public Health Education

Table A-5. Job Family 4

COMPUTER TECHNICAL

Occupational Series	Title
332	Computer Operator
334	Computer Specialist
335	Computer Clerk/Assistant

Table A-6. Job Family 5

PERSONNEL AND MANPOWER

Occupational Series	Title
142	Manpower Development
201	Personnel Management
205	Military Personnel Management
212	Personnel Staffing
221	Position Classification
222	Occupational Analysis
223	Salary and Wage Administration
230	Employee Relations
233	Labor Relations
235	Employee Development
246	Contractor Industrial Relations
260	Equal Employment Opportunity

Table A-7. Job Family 6

SUPPLY AND TRANSPORTATION

Occupational Series	Title
1135	Transportation Industry Analyst
2001	General Supply Grades 10 and above
2003	Supply Program Management
2005	Supply Technician Grades 10 and above
2010	Inventory Management
2030	Distribution Facilities/Storage Management
2050	Supply Cataloging
2101	Transportation
2130	Traffic Management
2150	Transportation Operations

Table A-8. Job Family 7

BIOLOGICAL AND MEDICAL TECHNICAL

Occupational Series	Title
404	Biological Technician
462	Forestry Technician
620	Practical Nurse
621	Nursing Assistant
622	Medical Supply Aid/Technician
625	Autopsy Assistant
642	Nuclear Medicine Technician
645	Medical Technician
646	Pathology Technician
647	Diagnostic Radiologic Technologist
648	Therapeutic Radiologic Technologist
649	Medical Machine Technician
661	Pharmacy Technician
664	Restoration Technician
667	Orthotist/Prosthetist
669	Medical Record Librarian
675	Medical Record Technician
681	Dental Assistant
682	Dental Hygienist
683	Dental Lab Assistant/Technician
688	Sanitarian
698	Environmental Health Technician
699	Health Aid/Technician

Table A-9. Job Family 8

MISCELLANEOUS TECHNICIAN

Occupational Series	Title
021	Community Planning Technician
028	Environmental Protection Specialist
050	Funeral Directing
062	Clothing Design
081	Fire Protection
083	Police
085	Guard
102	Social Service Technician
119	Economics Assistant
132	Intelligence
181	Psychology Technician
186	Social Services Assistant
301	Administrative Series Grades 6-9
392	General Communication
393	Communications Specialist
671	Health System Specialist
962	Contract Representative
1021	Office Drafting
1361	Navigational Information
1411	Library Technician
1412	Technical Information Services
1421	Archives Technician
1721	Training Instructor
1810	Investigating
1811	Criminal Investigating
1815	Air Safety
1825	Aviation Safety
1910	Quality Assurance
1960	Quality Inspection
2032	Packaging
2144	Cargo Scheduler
2152	Air Traffic Controller
2181	Aircraft Operating

Table A-10. Job Family 9

ENGINEERING, PHYSICAL SCIENCE, AND MATHEMATICAL TECHNICAL

Occupational Series	Title
802	Engineering Technician
817	Surveying Technician
818	Engineering Draftsman
856	Electronic Technician
873	Ship Surveying
896	Industrial Engineering Technician
1311	Physical Science Technician
1341	Meteorology Technician
1371	Cartographic Technician
1374	Geodetic Technician
1521	Mathematical Technician
1531	Statistical Assistant

Table A-11. Job Family 10

ACCOUNTING AND FINANCE TECHNICAL

Occupational Series	Title
501	Accounting Grades 6-9
504	Budget and Accounting
525	Accounting Technician
530	Cash Processing
540	Voucher Examiner
544	Payroll
545	Military Pay
547	Benefit-Payment Collector
560	Budget Analyst
561	Budget Clerical and Assistance
590	Time and Leave
1160	Financial Analysis

Table A-12. Job Family 11

BUSINESS TECHNICAL

Occupational Series	Title
809	Construction Control
1101	General Business and Industry Grades 6-9
1102	Contract/Procurement
1104	Property Disposal
1105	Purchasing
1106	Procurement Clerk/Assistant
1107	Property Disposal Clerk/Technician
1130	Public Utilities Specialist
1150	Industrial Specialist
1152	Production Controller
1170	Realty
1670	Equipment Specialist
2001	General Supply Grades 6-9
2005	Supply Clerk/Technician Grades 6-9
2102	Transportation Clerk/Assistant
2131	Freight Rate Clerk
2132	Travel Clerk

Table A-13. Job Family 12

ARTS AND RECREATION TECHNICAL

Occupational Series	Title
030	Sports Specialist
188	Recreation Specialist
189	Recreation Aid/Technician
1001	General Arts and Information
1010	Exhibits Specialist
1016	Museum Specialist/Technician
1020	Illustrating
1035	Public Affairs (GS-1081s will exist until Apr 82)
1046	Language Specialist
1056	Art Specialist
1060	Photographer
1071	A-V Production Specialist
1082	Writer-Editor
1083	Technical Writer/Editor
1084	Visual Information

Table A-14. Job Family 13

GENERAL MANAGEMENT/ADMINISTRATION

Occupational Series	Title
301	Miscellaneous Administration and Program Grades 10-18
340	Program Manager
341	Administrative Officer
342	Support Services Administrator
343	Management Analyst
345	Program Analyst

Table A-15. Job Family 14

SPECIALIZED MANAGEMENT/ADMINISTRATION

Occupational Series	Title
018	Safety and Occupational Health Management
080	Security Administration
346	Logistics Management
391	Communications Management
501	Accounting Grades 10-18
505	Financial Management
670	Health System Administration
673	Hospital Housekeeping Management
1101	General Business and Industry Grades 10-18
1103	Industrial Property Management
1140	Facility Management
1144	Commissary Management
1173	Housing Management
1176	Building Management
1601	General Facilities and Equipment
1640	Facilities Management
1654	Printing Management
1658	Laundry/Dry Cleaning Plant Management
1666	General Housekeeping
1667	Steward

Table A-16. Job Family 15

ADMINISTRATIVE SUPPORT

Occupational Series	Title
019	Safety Technician
029	Environmental Protection Assistant
187	Social Services
203	Personnel Clerk/Assistant
204	Military Personnel Clerk/Technician
344	Management Clerk/Technician
950	Paralegal Specialist
963	Legal Instrument Examiner
986	Legal Clerk/Technician
990	Claims Examiner
992	Loss and Damage Claims Examiner
995	Dependents and Estate Claims Examiner
998	Claims Clerk
1087	Editorial Assistant
1101	General Business and Industry Grades 1-5
1702	Education/Training Technician
2135	Transportation Loss/Damage Claims Examiner

Table A-17. Job Family 16

GENERAL CLERICAL

Occupational Series	Title
134	Intelligence Clerk
302	Messenger
303	Miscellaneous Clerk/Assistant
304	Information Receptionist
305	Mail and File
309	Correspondence
350	Office Machine Operator
351	Printing Clerk
357	Coding
394	Communications Clerk
501	General Accounting Grades 1-5
679	Medical Clerk
2001	General Supply Grades 1-5
2005	Supply Clerk/Technician Grades 1-5
2091	Sales Store Clerk
2134	Shipment Clerk
2151	Dispatcher

Table A-18. Job Family 17

KEYBOARD CLERICAL

Occupational Series	Title
312	Clerk-Stenographer
313	Work Unit Supervisor
318	Secretary
319	Closed Microphone Reporter
322	Clerk-Typist
354	Bookkeeping Machine Operator
355	Calculating Machine Operator
356	Data Transcriber
359	EAM Operator
382	Telephone Operator
385	Teletypist
388	Crypotgraphic Equipment Operator
389	Radio Operating
390	Communications Relay Operator
1046	Language Clerk

Table A-19. Job Family 18

WAGE SUPERVISORY (WS)

Occupational Series	Title
All WS	

Table A-20. Job Family 19

ELECTRIC REPAIR AND SERVICE

Occupational Series	Title
2500	Wire Communications Equipment Installation and Maintenance
2600	Electronic Equipment Installation and Maintenance
2800	Electrical Installation and Maintenance

Table A-21. Job Family 20

GENERAL MECHANICAL

Occupational Series	Title
3100	Fabric and Leather Work
3400	Machine Tool Work
3600	Structural and Finishing Work
3700	Metal Processing
3800	Metal Work
3900	Motion Picture, Radio, Television, and Sound Equipment
4000	Lens and Crystal Work
4100	Painting and Paperhanging
4200	Plumbing and Pipefitting
4300	Pliable Materials Work
4600	Woodwork
4800	General Equipment Maintenance
6500	Ammunition, Explosive, and Toxic Material Work
8800	Aircraft Overhaul
9000	Film Processing

Table A-22. Job Family 21

BASIC SHOP OPERATIONS

Occupational Series	Title
3500	General Services and Support Work
4400	Printing
5000	Plant and Animal Work
5200	Miscellaneous Occupations
6900	Warehousing and Stockhandling
7000	Packing and Processing
7300	Laundry, Dry Cleaning, and Pressing
7400	Food Preparation and Serving
7600	Personal Services

Table A-23. Job Family 22

SYSTEMS REPAIR AND SERVICES

Occupational Series	Title
3300	Instrument Work
5300	Industrial Equipment Maintenance
5800	Transportation/Mobile Equipment Maintenance
6600	Armament Work
8200	Fluid Systems Maintenance
8600	Engine Overhaul

Table A-24. Job Family 23

GENERAL EQUIPMENT OPERATION

Occupational Series	Title
4700	General Maintenance and Operations
5400	Industrial Equipment Operation
5700	Transportation/Mobile Equipment Operation

APPENDIX B: DEVELOPMENT AND ADMINISTRATION OF THE CIVILIAN POTENTIAL APPRAISAL SYSTEM DATA COLLECTION INSTRUMENTS

I. OVERVIEW

This appendix describes the Air Force's stated promotion system requirements, legal considerations, and development and field testing of the data collection materials for development of the Civilian Potential Appraisal System (CPAS). The CPAS development process used a "funneling" type approach, whereby an extremely large number of promotion factors were considered in the initial pool of candidate factors. This initial set of factors was reduced at subsequent decision points, under a variety of different considerations. Data were obtained on the initial candidate factors by administering aptitude measures, self-report questionnaires, and peer and supervisory ratings. Development of the data collection instruments, the Civilian Personnel Examination (CPE), Score-Checking Test (SCT), Demographics Questionnaire-Worker, and Job/Worker Characteristics Ratings booklet, is described. After pretesting, the Demographics Questionnaire-Worker was administered to a CONUS-wide sample of 20,000 workers, and the Job/Worker Characteristics Ratings booklets were administered both to the target workers' supervisors and 20,000 co-workers. Responses to the data collection effort yielded 12,865, or 64.32%, complete and usable data sets. These data sets subsequently were used in analyses to identify the final set of job-family-specific promotion ranking factors and their relative weights as described in Appendix C. A subsample of 2,000 employees were administered the CPE and SCT for research purposes only.

II. DESIGN CONCEPT

Need for the Civilian Potential Appraisal System

By 1976, the Air Force Directorate of Civilian Personnel (USAF/MPK) had become acutely aware of inherent problems in the current civilian appraisal program. The existing appraisal system's inflated ratings had insufficient variance to make distinctions among employees and as a result, the systems were not viewed as being credible by the employees, supervisors, or management. In a December 1976 request for personnel research, USAF/MPK pointed out the need for separate appraisals - those to be used for promotion purposes versus those used for other personnel actions.

Although appraisal instruments employed in current and past operational programs were developed to serve a variety of purposes (e.g., selection for training, details, reassignments, merit promotions), their use for the latter purpose -- merit promotion -- inevitably led to their ineffectiveness in achieving any of those purposes. Of critical importance was the ultimate loss of credibility in the appraisal program in the eyes of the employees, supervisors, and higher management (RPR 76-40, pp. 1-2).

This concern led AFHRL to develop separate promotion appraisal and job performance appraisal systems for the assessment of Air Force civilian employees. One set of appraisals (i.e., CPAS) was developed strictly for promotion purposes, while a second set (i.e., SEAS, GMAS, JPAS) was developed

to assess performance in relation to specified job performance standards. The job performance ratings were to be used for other personnel actions such as within grade increases, feedback, dismissal, retraining, merit pay, and award of bonuses (Cowan, Thompson, & Guerrieri, 1983; Guerrieri, 1981; Guerrieri, Thompson, Cowan, & Gould, 1984).

Initial Design of the System

Three basic sets of requirements guided the development of CPAS -- those of the user (USAF/MPK), the U.S. Civil Service Commission, and legal guidelines. USAF/MPK wanted a system, separate from the job performance appraisal systems, that measured employees' potential to perform at levels higher than the requirements of their current jobs. The desired promotion system was to be inflation-resistant, as simple as possible, and compatible for use in an automatic data processing environment. The U.S. Civil Service Commission (now the Office of Personnel Management) regulations precluded "(1) Withholding information from employees on appraisal ratings or any other information concerning their job performance; (2) Using a 'single' total score for each employee for all promotion considerations (i.e., the score used in each consideration must be composed of those elements in an appraisal form that are relevant to the position to be filled); and (3) Using elements inherently descriptive of the 'personality' of an employee rather than as attributes relevant to job performance " (RPR 76-40, p.2).

Military selection and promotion systems have been exempted from the jurisdiction of civil law by the Office of Management and Budget, but similar systems for Department of Defense civilians have no such exemptions. The mood of the Nation for equal employement opportunity and the growing number of legal challenges to civilian promotion systems indicated a growing probability that any promotion system would eventually be challenged in court. Therefore, the CPAS developers made an initial assumption that the system they developed would be challenged in court. A top priority, then, was to develop a legally defensible system which met the requirements under the Uniform Guidelines for Employee Selection of 1978.

An initial review of relevant court cases (United States Office of Personnel Management, 1979) and discussions with expert industrial psychologists (Mullins, 1981; Mullins & Winn, 1979) concluded that ratings used for promotion purposes had to be as objective and job related as possible. Asking supervisors to rate directly employees' potential to perform higher level jobs, when they were not familiar with those jobs and their requirements, would probably not be legally defensible. Further, there was little empirical evidence that supervisors are able to make projections of future performance. It was believed that job-relevant aptitude scores and verifiable experience, training, and other demographic information would be the most objective predictors of future performance. In addition, it was thought that a combination of peer, supervisor, and alternate supervisor ratings of current job performance should also be used to complete the prediction system.

The Uniform Guidelines for Employee Selection of 1978 became available in 1979, and early court cases began to define operationally the meaning of the provisions (Cascio & Bernardin, 1981). In effect, the Guidelines say that a selection or promotion system that creates adverse impact against a minority or protected group of employees or potential employees is legally defensible if the system's development process considered all practical variables which are likely to be related to job performance and selected those which are most valid (content, construct, or predictive validity) but are least likely to create adverse impact. Hence, the design concept for developing CPAS was to obtain the maximum information on each employee from a variety of different sources and identify the smallest subset which minimized adverse impact while providing a valid system. To meet this objective, a system of three diverse appraisal sources was developed -- testing, background information, and ratings.

1. Aptitude Measures. To obtain relevant test data, two tests were developed for this specific use, the Civilian Personnel Examination (CPE) and the Score-Checking Test (SCT). The CPE test would provide both specific and general aptitude data applicable to a variety of jobs, while the SCT would measure the ability to pay attention to detail for record-keeping/reviewing types of clerical jobs. The CPE was a modification of the Airman Qualification Examination, Form J (AQE-J) (Vitola, Massey, & Wilbourn, 1971) that was updated and adapted for civilian personnel. The examination consisted of 11 subtests, designed to test the worker's knowledge/aptitude in a variety of areas (see Table B-1). The subtests most heavily emphasized blue-collar and clerical skills, although many of the subtests (e.g., reading ability, arithmetic reasoning, word knowledge) could apply to a variety of job series. The Score-Checking Test (SCT) was a carefulness test (Mullins & Force, 1962). This test required the examinee to check two sets of numbers for transcribing errors and was designed to evaluate that person's carefulness in spotting these discrepancies.

Table B-1. Civilian Personnel Examination (CPE) Subtests

Arithmetic Computation consists of simple arithmetic items involving addition, subtraction, multiplication, and division of whole numbers. Administered as a speed test, it is designed to measure the ability to manipulate numbers rapidly and accurately. (60 items, 8 minutes)

Arithmetic Reasoning evaluates the examinee's ability to think through mathematical problems presented in verbal form. It involves the discovery and application of the general mathematical principles required to arrive at a correct solution to each problem, as well as performance of the necessry calculations to attain the solution. (15 items, 25 minutes)

Data Interpretation is designed to measure the ability to draw conclusions or make interpretations from data presented in the form of graphs, charts, and tables. Two or three items are based on each presentation. (10 items, 13 minutes)

Table B-1 (Continued)

Electrical Information involves the ability to apply previously acquired knowledge in the areas of electricity and electronics toward the solution of problems in practical situations. (15 items, 9 minutes)

Mechanical Information consists of verbal items relating to the understanding and application of basic techniques required for troubleshooting and repairing various mechanical devices. It also requires the examinee to determine operating characteristics from pictures of mechanical devices. (15 items, 12 minutes)

Hidden Figures requires the examinee to determine which one of five simple line drawings is contained in a more complex arrangement of geometric figures. These items appear within the test in sets of four items per page with the five simple line drawings at the top of the page. (15 items, 20 minutes)

Pattern Comprehension involves visualizing the folding of flat patterns into three-dimensional objects and subsequently determining the location of specific points which are common to both the pattern and the solid figure. These items appear within the test in groups of three items for each pattern. (18 items, 12 minutes)

Shop Practices is a pictorial test which requires the examinee to identify pictured tools and determine their proper use in a specific situation or the selection of the proper tool for use in a given task. (15 items, 9 minutes)

Word Knowledge is a test of verbal ability involving the definition of words: this is a classical vocabulary test of non-technical terms. (30 items, 10 minutes)

Verbal Analogies is designed to measure the ability to perceive relationships. It requires the examinee to complete a relationship of four terms so that the correspondence between the last two terms will be the same as that between the first two (given) terms; i.e., dark is to light as night is to _____. (20 items, 10 minutes)

Reading Comprehension evaluates the examinee's ability to read and understand a written passage. It requires the examinee to read a series of written passages and then answer a series of questions on each passage. (18 items, 25 minutes)

The use of testing information provides three particular benefits in a personnel appraisal system. First, tests are widely used and accepted by personnel psychologists because of their high validities in predicting successful outcomes in a variety of situations (Green, 1978). Second, tests

provide a different sort of information than that normally available to the supervisor and other raters (i.e., more comprehensive information on a larger number of the employee's aptitudes and abilities, other than those being used in the current job). Third (and perhaps most important in the present context), tests are relatively inflation-free. Therefore, it was decided that testing data would provide a particularly useful input to the appraisal process.

2. Demographic/Background Information. The second source of relevant data to be used in CPAS was provided by the Demographic Questionnaire-Worker. The Demographic Questionnaire-Worker, which was designed to be completed by the employee, contained 102 items on education level, sex and ethnic group, time in civil service and grade, awards history, desire for a promotion, and related areas. The questionnaire also contained a listing of potentially relevant high school/college/trade school courses that could be used in promotion selections. A copy of the Demographic Questionnaire-Worker is contained in Appendix B-1.

This questionnaire was believed to be the most efficient method for obtaining basic data important for a valid promotion system. A long history of studies with demographic and other self-report-type questionnaires has demonstrated their validity and usefulness in selection or promotion systems (Reilly & Chao, 1980). Reilly and Chao demonstrated that self-report background measures provide as much, if not more, validity than do many alternative selection devices, with minimal adverse impact. Therefore, demographic data seemed to provide a valuable component for an appraisal system. Many of the variables included in the questionnaire, such as race and sex, had no potential for actual use in CPAS but were included to aid analysis of the obtained data.

3. Ratings. The third source of information to be obtained and used in CPAS was to be provided by the Job/Worker Characteristics Ratings booklet. Since this booklet played a key role in the development of the final operational CPAS, the design of the booklet will be discussed in more detail in the following paragraphs. This booklet is reprinted in Appendix B-2.

III. DESIGN OF THE JOB/WORKER CHARACTERISTICS RATINGS BOOKLET

A wide variety of items were developed and placed into 10 sections of the Job/Worker Characteristics Ratings booklet. This booklet was specifically designed to be completed by several different raters who were familiar with the employee's job performance. Each of the 10 sections listed in Table B-2 tapped a different type of information (e.g., overall job performance, ratings on trait factors, ratings on general abilities, and rater background information). The primary objective of the ratings portion of the CPAS data collection instruments was to provide three types of data necessary for the development of an objective, reliable, and valid appraisal process: normative data on the worker and that person's job performance, ipsative rating data on the worker, and rater accuracy data.

Table B-2. Job/Worker Characteristics Ratings

Section	Contents
I	Job Performance Data
II	Estimated Score on Vocabulary Test
III	Ratings of Trait Factors
IV	Ratings of General Abilities
V	Rankings of Trait Factors
VI	Rankings of General Abilities
VII	Additional Information
VIII	Rankings of Job Characteristics or Trait Factors
X	Background Data

Normative Data

Normative ratings are those that compare the job-incumbent's performance to some reference group (such as other employees in the same job in the same section), and the ratings reflect the placement of that individual in terms of relative standing with the reference group. In the development of CPAS, it was believed that normative ratings of each employee would be useful in determining promotion potential. The scale format to be used in obtaining these normative ratings was a question to be addressed. The mass of research on job performance ratings has failed to demonstrate that any specific set or type of rating statement significantly enhances prediction accuracy. For example, behaviorally anchored rating scales (BARS) have been extensively researched in recent years. However, evidence for the psychometric superiority of these scales is mixed, and their predictive power is virtually untested (Dunnette & Borman, 1979). Similarly, Massey, Mullins, and Earles (1978) failed to detect any difference between worker-oriented, task-oriented, and trait-oriented rating scales in predicting NCO Academy performance. Curton, Ratliff, and Mullins (1979) likewise found no differences between sets of rating factors, even though subject-matter experts had preselected separate sets of factors that seemed most and least relevant to performance. Although certain rating contents or techniques may ultimately provide superior ratings, these scales have not yet been developed.

Since no definitive results suggested a particular format or job-specific content for appraisal rating scales, a working group of AFHRL behavioral scientists selected a set of general performance ratings and a set of trait factors that would apply to all civilian job families in the Air Force. It was not intended that every factor would apply to every job family (for a description of the job families, see Appendix A) but rather, that the factors would cover the important components of each job family. These ratings and factors were similar to, and extracts of, those commonly used in research and operational systems (e.g., Massey, Mullins, & Earles, 1978; Roach, 1956). The general performance ratings are presented in Section I of the Job/Worker Characteristics Ratings booklet, and the trait factors are presented in Section III. As with the demographic questionnaire, some of the items included were intended to aid analysis of obtained data (such as Section X which obtained information on the raters).

The general performance ratings (Section I, Job Performance Data) provided for the rater's evaluation of the worker's current job performance (Item 1), potential for performance at the next grade level (Item 3), supervisory capability (Item 4), and managerial capability (Item 5). Ratings were made on a 9-point, Likert-type scale, with anchors given at each point. In addition to these items, the rater was asked to indicate whether the incumbent was a supervisor (Item 2) and to estimate the pay schedule (Item 6) and grade level (Item 7) the worker would ultimately reach in Federal service. The latter estimate, when combined with the worker's current grade level and pay schedule, gave the rater's estimate of the worker's potential (i.e., how much higher that person would rise in the system).

The trait factors (Section III) were chosen on the basis of three criteria: (a) generalizability (each trait should apply to some degree to most civilian jobs in the Air Force), (b) comprehensiveness (the most important traits for most jobs should be included), and (c) communication (the trait should be clearly definable within two typed lines). The number of traits was limited to 12 since these traits were going to be used in the ipsative ranking portion of the project (see "Ipsative Data" section, below) as well as for development of normative ratings. For the ipsative rating task, 12 traits were considered the maximum number most raters could rank-order. As in Section I, the 9-point, Likert-type scale was selected for the rater's response. Sections I and III provide normative data.

Rater Accuracy Data

The second item of major interest was rater accuracy data. Mullins and Force (1962), Mullins, Seidling, Wilbourn, and Earles (1979), and Cummings (1980) have demonstrated that rater accuracy can be determined and that accuracy is generalizable across different rating dimensions. The rating portion of the CPAS thus included an attempt to replicate and extend these findings and determine their applicability to operational settings.

Sections II and IV were designed to provide basic research information needed to calculate the rater accuracy indices. Section II consisted of a single item that required the rater to estimate the worker's score on the vocabulary (word knowledge) portion of the CPE. The rater was told that for a standard administration of the vocabulary test to Federal Service employees, scores generally ranged from 6 to 30 items correct, with an average score of 15 items correct. The rater was then required to estimate the worker's obtained score.

Section IV consisted of eight general abilities, identical in format to the 12 trait factors in Section III. These abilities reflected 7 of the 11 CPE subtests (arithmetic computation, word knowledge, data interpretation, electronics information, shop practices, mechanical information, and reading comprehension) and the Score-Checking Test. Four CPE subtests (arithmetic reasoning, hidden figures, pattern comprehension, and verbal analogies) were not reflected in the list of general abilities. The AFHRL research team judged these concepts too abstract to be described in simple terms. It should be noted that the word knowledge index was included as an exact-score

estimation in Section II and as a rating on a 9-point scale in Section IV. This technique was designed to indicate which measurement device, if either, provides the most useful information on rater accuracy.

These ratings of general abilities, when combined with each subject's CPE scores and SCT score, provided the rater accuracy indices. The indices, in turn, were designed to answer some important questions about rater accuracy in an operational setting: (a) Is rater accuracy indeed a generalizable ability? (b) Are these reasonably easy and accurate methods of determining the more accurate and less accurate raters? (c) Are there reliable correlates of rater accuracy? and (d) Can rater accuracy data be used in an operational appraisal and promotion system? Because of time constraints imposed to operationalize CPAS, the data were not analyzed and the answers to these issues are not contained in this paper.

Ipsative Data

The traditional inflation of performance ratings in operational settings certainly indicates that novel approaches to evaluation which might inhibit inflation should be thoroughly investigated. One such technique, with a strong logical appeal, is the ipsative ranking technique. Under the ipsative technique, the rater ranks the traits in a given list according to which are the worker's best traits. A similar ranking is obtained for the worker's job position (i.e., which traits are the most important for successful job performance). The two sets of rankings are then combined to yield a job-worker-match coefficient. This coefficient can be used in combination with other rating and background data as a possible index of promotion potential.

A previous study of the job-worker-trait-match coefficient (Mullins, Weeks, & Wilbourn, 1978) showed only limited value of the index as a predictor. However, this technique is new and deserves further consideration. This is particularly true in the context of performance ratings, where inflation has been a perennial problem.

Sections V, VI, VIII, and IX provided the scales needed to compute two different job-worker-match indices. Section V required the rater to rank the 12 trait factors (presented as normative ratings in Section III) according to how well they applied to the worker. Section VIII required a ranking of these same traits according to how important they were to successful performance of the worker's job. Section VI required the rater to rank the eight general abilities (presented as normative ratings in Section IV) in terms of the worker, while Section IX required a ranking of the abilities in terms of the job. The information from these four sections was to be combined to compute a job-worker-trait-match and a job-worker-ability match. The ipsative rankings could also be combined with the normative ratings to yield a variety of ipsative-normative measures. For example, the six traits most important for successful job performance could be identified by the rankings, and only these six normative ratings would be used as predictors. Similarly, Mullins and Weeks (1979) provided a technique for the "normative use of ipsative ratings." As will be discussed later, the ipsative scales were later removed from possible use in the operational CPAS for management reasons.

Additional Measures

Section VII provided two types of ratings which were not so firmly grounded in previous research as the measures already discussed but which could provide valuable predictive information. Items 1 through 4 provided for information on the worker's on-the-job drive and productivity level: speed of work, productivity, percent time spent working, and initiative. Each rating was made on a 5-point, Likert-type scale, with anchors given at each point. Items 5 through 21 provided for the rater's assessment of the worker's desire for a promotion. Each item required the rater to indicate (yes/no) whether the worker would be willing to incur a certain cost in order to be promoted to the next grade level. Such costs included: entering a training/retraining program, moving to another organization, accepting a job outside the worker's current job series, assuming additional duties, and performing additional supervisory tasks. These ratings served two important functions. First, both types of measures were potential predictors, either as individual items or as summated measures. Second, the "desire for promotion" measures (items 5 through 21) provided an additional index of rater accuracy. In the Demographic Questionnaire, the worker indicated his own desire for a promotion on these same 17 items. By comparing the rater's responses with the worker's responses, it could be possible to determine how well each rater knew the worker's desire for a promotion.

Section X contained 20 background items that related to the rater and to that person's familiarity with the individual being rated. These items were designed to serve as possible control measures for prediction purposes and to be studied as correlates for research purposes, particularly for the investigations of rater accuracy and possible adverse impact. These data were collected but, again because of subsequent time pressures to operationalize CPAS, the analyses were not completed.

IV. PRETESTS OF THE CIVILIAN POTENTIAL APPRAISAL SYSTEM DATA COLLECTION INSTRUMENTS

Initial pretests of early versions of the Demographic Questionnaire-Worker and the Job/Worker Characteristics Ratings booklet were conducted at Lackland AFB (N = 15) and Randolph AFB (N = 20). The pretests provided information on the readability of the materials, ease of following instructions, and difficulties in using the scales. Initial feedback on the booklets led to numerous wording changes, changes in some rating scales, addition/deletion of some items, and changing the order of some sections. However, the content of the sections remained substantially the same, and no sections were added or deleted.

Full-scale pretests of the CPAS data collection materials were conducted at McClellan AFB (February and March 1979) and Patrick AFB (May 1979). All three parts of the full system (testing, demographics, and ratings) were used in both pretests. Workers completed the CPE, SCT, and Demographic Questionnaire-Worker in a single, half-day testing session. Approximately 1 month after the testing session, the rating booklets were mailed out to the prospective raters. In these pretests, three raters were used for each

employee: the supervisor, a co-worker, and an associate of the supervisor. (The supervisor's associate was an employee of approximately the same grade level and in the same organization as the supervisor, who was familiar with the employee's job performance.) Completion of each rating booklet required approximately 1 hour.

Complete testing/demographic data and a complete set of peer, supervisor, and alternate supervisor ratings were collected for 266 workers at McClellan AFB and 102 workers at Patrick AFB. Means and standard deviations calculated on all measures indicated that there were no serious inflation or restriction in range problems, although the means of some items were fairly high. Correlation matrices indicated that practically all of the key rating variables (general performance measures, trait measures, and ability measures) were significantly ($p < .05$) intercorrelated, and in some instances the correlations were quite high. The drive/productivity measures correlated moderately with the performance, trait, and ability ratings, whereas the promotion desire measures showed considerably less relation with the other rating items.

Follow-up interviews at both bases resulted in relatively few comments about the workability of the materials; most comments concerned the CPAS in general. A few people found the rank-ordering procedure confusing; others found it difficult to rank-order the 12 traits (Sections V and VIII) accurately. A few raters complained that the booklet took too long to complete, though most raters agreed that it took approximately 1 hour. In general, most raters found the rating booklet straightforward and easy to work with.

One problem encountered in the rating procedure was obtaining ratings from the supervisor's associates. Many supervisors did not have co-workers of approximately the same level in their organization. Furthermore, many of the associates that were available were relatively unfamiliar with the employee to be rated. Therefore, the supervisor's alternate was substituted for the associate as an additional rating source. The supervisor's alternate is a subordinate of the supervisor who would normally assume supervisory duties in the supervisor's absence. The interviews at McClellan AFB and Patrick AFB indicated that the alternate was already designated or could easily be identified in most cases. Furthermore, the alternate would normally be familiar with the employee's work; in some instances, the alternate may be even more familiar with the employee than is the supervisor. Therefore, the supervisor's alternate was proposed for replacing the supervisor's associate in the CONUS-wide data collection effort.

The McClellan AFB and Patrick AFB follow-up interviews also indicated that supervisors and employees tended to feel the evolving CPAS system was preferred over the current system. Some 56 percent of the McClellan AFB participants felt an appraisal system of objective tests, comprehensive ratings, and multiple raters provided a better system, whereas 18 percent felt it would be worse. At Patrick AFB, 61 percent perceived it as a better system, and 30 percent said it was no better. Several participants

particularly favored having multiple raters where someone besides their supervisor could give ratings.

Minor modifications were made in all three components of the CPAS, in preparation for the CONUS-wide test. The reading comprehension and verbal analogies subtests, which had not been in the original CPE, were added, and a single mechanical information subtest was created by combining the existing general mechanics and mechanical principles subtests. Minor modifications were made in the ratings booklet, although the sections remained substantially the same. The list of formal training sources (Items 68 through 102) was added to the Demographic Questionnaire-Worker, and the order of most of the items in the questionnaire was changed to present a more logical sequence to the examinee. With these modifications, the CPAS materials were prepared for review and approval by the Air Force Directorate of Civilian Personnel (USAF/MPK).

V. MANAGEMENT REVIEW

In October 1979, the entire proposed Civilian Potential Appraisal System was reviewed by the Air Force Director of Civilian Personnel and his staff (USAF/MPK). The proposed system consisted of the CPE (including all 11 subtests), SCT, Demographic Questionnaire-Worker, and the Job/Worker Characteristics Ratings booklet to be completed by three raters (supervisor, co-worker, and supervisor's alternate) on each employee. The ratings (particularly the supervisor's ratings) and the Demographic Questionnaire-Worker were designed to be the primary data sources in this system. The CPE and SCT were designed to provide additional information not readily available to the raters, limit the inflatability of the system, and allow computation of the rater accuracy measures. The co-worker ratings and supervisor's alternate ratings were designed to provide additional information and help limit inflation of the ratings.

The primary concerns expressed by USAF/MPK related to the legal acceptability of the various components of the proposed system and the number of man-hours involved in collecting the data. As a result, the CPE, SCT, and ratings by the co-worker and the supervisor's alternate were all eliminated from consideration in the operational system. The tests were eliminated because of the current controversy surrounding the use of paper-and-pencil tests for selection/promotion purposes (see United States Office of Personnel Management, 1979). Despite a wealth of validity information, the Carter administration had just signed a consent decree to eliminate the PACE examination for Civil Service entrants because of differences in performance between minority and majority applicants. (The PACE is an aptitude test similar to the CPE.) With the Government's decision not to defend even a demonstratively valid test, it was felt the Air Force should not undertake the use of a similar test. This was despite the fact that some of the most useful variance in ranking promotion eligibles in the trades, administrative job series, and some technical job series might come from such a test. Although the tests may prove to show little adverse impact and have high validity for certain job families, their use was a risk that management was unwilling to take. A second factor in the decision to eliminate the tests was the number

of man-hours involved in testing. Full testing would require approximately 4 hours (or more) per employee. This amount was prohibitive for even full-scale testing in the CONUS data collection effort. The co-worker ratings and supervisor's alternate ratings were eliminated from operational CPAS consideration because of the uncertainties associated with use of these individuals as official raters for the employee. Operational use of ratings by individuals who are not official raters could create serious legal, administrative, and morale problems for the promotion system. Therefore, these rating sources were eliminated from further consideration.

Although these elements were deleted from a possible operational system, they were retained to some extent for research purposes. It was determined that up to 10 percent of the CONUS sample could receive the CPE and SCT, in addition to the other materials. This would permit an examination of rater accuracy, test validity, and evaluation of possible adverse impact. In addition, the co-worker ratings were retained for research purposes only. This arrangement would provide a comparison of co-worker versus supervisor rater accuracy and provide an additional rating source for possible validity studies. The supervisor's alternate ratings, however, were eliminated entirely from the research design. Seven data collection alternatives were presented to the user (USAF/MPK) along with assessments of costs (in terms of manhours) and research impact. The options are summarized in Table B-3 and are arranged from most to least preferred by the AFHRL developers. The options ranged from the original research design that included CPE and SCT tests and demographic questionnaires administered to 20,000 target employees and 60,000 raters (one supervisor, one peer, and one supervisor's alternate rater for each target employee) to no field test data collection. The most extensive option would provide an extensive data base for future research and development (R&D), highly flexible options for the operational CPAS, and a legally defensible CPAS development process. The least preferred option -- no field test data collection -- would result in a totally subjective rather than research-based development process and would probably not have been legally defensible. USAF/MPK selected a combination of 20,000 target workers with 20,000 supervisor and 20,000 co-worker ratings, with a subset of approximately 2,000 of the workers given the CPE and SCT (option 3). The decision eliminated the use of tests as a CPAS component, eliminated the possible use of the inflation-resistant ipsative rating scales, and limited the scope of the research data base.

Table B-3. Data Collection Options for CPAS Field Test

Option	Target Workers	Supervisor Ratings	Peer Ratings	Supervisor's Alternate Ratings	CPE & SCT Administered	Total Manhours	Research Impact
1	20,000	20,000	20,000	20,000	20,000	210K	Original full research design; legally defensible; extensive data base for future research; flexible operational options
2	20,000	20,000	20,000	0	20,000	170K	Eliminates possible operational use of supervisor's alternate
[a]3	20,000	20,000	20,000	0	2,000	89K	Removes tests from possible use in CPAS; eliminates use of inflation-resistant rating scales; limits research data base
4	20,000	20,000	0	0	2,000	49K	Decreases accuracy research options
5	20,000	20,000	0	0	0	41K	No aptitude testing eliminates accuracy research options
6	0	20,000	0	0	0	31K	Field test only; no research data base
7	0	0	0	0	0	0	No field test, armchair-developed system not research based; probably not legally defensible

VI. CONUS-WIDE DATA COLLECTION EFFORT

Research Design

The objective of the CONUS-wide CPAS data collection effort was to obtain measures on 20,000 civilian employees representing all 23 Air Force job families, with complete supervisory ratings, co-worker ratings, and demographic materials. Between 600 and 1,100 employees were sampled from each job family, with the exact number depending on the size of the family. Some 2,000 (10%) of these employees were administered the CPE and SCT in formal testing sessions. Only the Job/Worker Characteristics Ratings (supervisor) and Demographic Questionnaire-Worker were to be used as inputs for the identification of candidate operational promotion factors, a system reduction exercise, and submission to the Promotion Policy Data Panels (see Appendix C) or for inclusion in the final CPAS. The CPE, SCT, and co-worker rating data would be analyzed separately to address R&D rather than operational issues.

Sample Selection

The sampling plan for the CONUS-wide test was a stratified random sampling plan, with specified grade level, sex group, and ethnic group restrictions. The Civilian Master Personnel File, APDS-C, including all Air Force civilian employees in the Continental United States, was obtained from the Office of Civilian Personnel Operations (OCPO) in August 1979. The initial display drawn from this file for sample selection purposes was a three-way distribution for each job family, giving the frequency of each ethnic group-sex group combination within each grade level. In order to facilitate sample selection, extremely small cells were eliminated by first collapsing all of the "smaller" ethnic group categories (American Indian, Oriental, Aleutian, Eskimo, Puerto Rican, and Guamanian/Hawaiian) into the Nonminority ("Other") category. This procedure resulted in three ethnic group categories: Black, Hispanic Surnamed, and Other. Next, the grade levels with smaller frequencies were collapsed so that each grade-level category would have a target frequency of at least 100. This procedure was generally successful, although some grade categories remained with fewer than 100 cases. It was believed that further collapsing would make the grade-level span of these categories too large, so they were left with the smaller frequencies. This problem occurred most often at the upper grade levels. The result of this process was frequency distributions for three ethnic categories, two sex categories, and from 4 to 12 grade categories per job family.

The number of cases to be sampled from each cell was based on these distributions, according to the following rules: (a) the number of cases drawn from each job family would vary from 600 to 1,100, depending on the population of the family, (b) the number of cases from each grade category would be proportional to that category, (c) the two minority ethnic group categories (Black and Hispanic Surnamed) would be oversampled in almost every instance, and (d) females would be oversampled in most cases, although males were also oversampled in some instances where job families were traditionally staffed by females. The ethnic categories and sex categories were oversampled in order to ensure adequate representation for those groups that were

relatively small so that sufficient cases would be available for the adverse impact analyses. The oversampling procedures were complex and (necessarily) varied from job family to job family. In some job families (e.g., Job Families 2 and 3; Appendix A lists the job families and their respective specialties), in which there were very few minority members, all the minority members were sampled. In many instances (e.g., Job Families 1 and 5), the minority members were either oversampled by a factor of two or sampled until 100 members were obtained, whichever value was higher (e.g., Job Families 4 and 8). In some families, this arbitrary value of 100 was raised to 150 or 200, depending on the size of the total sample and the proportion of minority members in the population. Females were often oversampled to ensure adequate representation; however, in some cases (e.g., Job Families 16 and 17), it was necessary to oversample males to ensure their representation. Thus, the oversampling procedures were designed to ensure an adequate representation of the smaller categories and were based on a mixture of objective rules and careful case-by-case judgments.

TABLE B-4. Numbers and Percentages of Employee in Population and Samples by Job Family

	GROUP						
	WF	WM	BF	BM	SSF	SSM	TOTAL
Job Family 1: Engineering, Physical Science, and Mathematics Professional							
Population	184 (1.7)	10450 (93.8)	15 (.1)	240 (2.2)	2 (0)	246 (2.2)	11137
Target Sample	85 (8.5)	718 (71.5)	13 (1.3)	88 (8.8)	2 (.2)	98 (9.8)	1004
Obtained Sample	64 (8.9)	525 (72.8)	8 (1.1)	58 (8.0)	1 (.1)	65 (9.0)	721
Job Family 2: Medical and Biology Professional							
Population	696 (62.3)	293 (26.2)	58 (5.2)	20 (1.8)	33 (3.0)	18 (1.6)	1118
Target Sample	332 (55.2)	140 (23.3)	58 (9.7)	20 (3.3)	33 (5.5)	18 (3.0)	601
Obtained Sample	189 (57.8)	85 (26.0)	28 (8.6)	9 (2.8)	7 (2.1)	9 (2.8)	327
Job Family 3: Miscellaneous Professional							
Population	446 (16.1)	2141 (77.2)	51 (1.8)	67 (2.4)	12 (.4)	55 (2.0)	2772
Target Sample	142 (20.1)	379 (53.7)	51 (7.2)	67 (9.5)	12 (1.7)	55 (7.8)	706
Obtained Sample	107 (20.4)	314 (59.8)	29 (5.5)	36 (5.5)	8 (1.5)	31 (5.9)	525
Job Family 4: Computer Technical							
Population	925 (21.8)	2781 (65.7)	165 (3.9)	151 (3.6)	45 (1.1)	166 (3.9)	4233
Target Sample	125 (15.6)	375 (46.8)	78 (9.7)	73 (9.1)	32 (4.0)	118 (14.7)	801
Obtained Sample	86 (15.7)	268 (48.8)	44 (8.0)	44 (8.0)	20 (3.6)	87 (15.8)	549
Job Family 5: Personnel							
Population	764 (32.9)	1188 (51.2)	118 (5.1)	116 (5.0)	46 (2.0)	88 (3.8)	2320
Target Sample	146 (24.3)	235 (39.0)	61 (10.1)	60 (10.0)	34 (5.7)	66 (11.0)	602
Obtained Sample	124 (26.5)	195 (41.7)	45 (9.6)	34 (7.3)	22 (4.7)	48 (10.3)	468

Values in paraentheses are percentages that correspond to each frequency.

TABLE B-4. (continued)

	GROUP						
	WF	WM	BF	BM	SSF	SSM	TOTAL
Job Family 6: Supply and Transportation							
Population	1637 (29.6)	3195 (57.8)	140 (2.5)	167 (3.0)	125 (2.3)	259 (4.7)	5523
Target Sample	194 (24.2)	394 (49.2)	46 (5.8)	54 (6.8)	36 (4.5)	76 (9.5)	800
Obtained Sample	145 (25.7)	272 (48.2)	25 (4.4)	30 (5.3)	27 (4.8)	65 (11.5)	564
Job Family 7: Biological and Medical Technical							
Population	735 (55.5)	228 (17.1)	237 (17.7)	38 (2.8)	49 (3.7)	49 (3.7)	1336
Target Sample	187 (31.1)	113 (18.8)	165 (27.4)	38 (6.3)	49 (8.1)	49 (8.1)	601
Obtained Sample	131 (36.4)	80 (22.2)	76 (21.1)	21 (5.8)	21 (5.8)	29 (8.1)	368
Job Family 8: Miscellaneous Technical							
Population	2997 (19.4)	10107 (65.5)	522 (3.4)	806 (5.2)	186 (1.2)	807 (5.2)	15425
Target Sample	180 (16.2)	521 (47.0)	84 (7.6)	118 (10.6)	44 (4.0)	161 (14.7)	1108
Obtained Sample	123 (18.5)	311 (46.8)	51 (7.7)	64 (9.6)	31 (4.7)	85 (12.8)	665
Job Family 9: Engineering, Physical Science, and Mathematical Technical							
Population	293 (5.7)	4202 (81.8)	22 (.0)	171 (3.3)	18 (0.0)	430 (8.4)	5136
Target Sample	166 (20.1)	350 (42.4)	20 (2.4)	133 (16.1)	14 (1.7)	142 (17.2)	825
Obtained Sample	109 (18.3)	262 (44.0)	15 (2.5)	80 (13.4)	8 (1.3)	121 (20.3)	595

TABLE B-4. (continued)

	GROUP						
	WF	WM	BF	BM	SSF	SSM	TOTAL
Job Family 10: Accounting and Finance Technical							
Population	3429 (65.9)	1019 (19.6)	316 (6.1)	96 (1.8)	228 (4.4)	118 (2.3)	5206
Target Sample	380 (46.6)	117 (14.4)	116 (14.2)	38 (4.7)	106 (13.0)	58 (7.1)	815
Obtained Sample	279 (47.4)	87 (14.8)	74 (12.6)	23 (3.9)	84 (14.3)	41 (7.0)	588
Job Family 11: Business Technical							
Population	4393 (28.0)	9130 (58.3)	473 (3.0)	454 (2.9)	316 (2.0)	900 (5.7)	15666
Target Sample	209 (18.7)	510 (45.5)	102 (9.1)	99 (8.8)	54 (4.8)	146 (13.0)	1120
Obtained Sample	136 (19.0)	315 (44.0)	64 (8.9)	60 (8.4)	46 (6.4)	95 (13.3)	716
Job Family 12: Arts and Recreation Technical							
Population	422 (20.7)	1391 (68.2)	33 (1.6)	88 (4.3)	22 (1.1)	82 (4.0)	2038
Target Sample	151 (25.2)	249 (41.6)	27 (4.5)	72 (12.4)	22 (3.7)	78 (13.0)	599
Obtained Sample	121 (27.8)	203 (46.6)	13 (3.0)	41 (9.4)	15 (3.4)	43 (9.9)	436
Job Family 13: General Management/Administration							
Population	837 (20.5)	3011 (73.7)	42 (1.0)	86 (2.1)	15 (0.4)	92 (2.2)	4083
Target Sample	253 (31.9)	348 (43.9)	31 (3.9)	61 (7.7)	14 (1.8)	85 (10.7)	792
Obtained Sample	185 (33.5)	256 (46.4)	15 (2.7)	34 (6.2)	9 (1.6)	53 (9.6)	552

TABLE B-4. (continued)

	GROUP						
	WF	WM	BF	BM	SSF	SSM	TOTAL
Job Family 14: Specialized Management/Administration							
Population	447 (12.7)	2848 (80.7)	28 (0.8)	97 (2.8)	8 (0.2)	103 (2.9)	3531
Target Sample	196 (28.1)	303 (43.5)	22 (3.2)	77 (11.0)	8 (1.2)	91 (13.1)	697
Obtained Sample	118 (26.8)	216 (49.0)	8 (1.8)	48 (10.9)	3 (0.7)	48 (10.9)	441
Job Family 15: Administrative Support							
Population	2991 (65.7)	792 (17.4)	339 (7.4)	79 (1.7)	257 (5.6)	93 (2.0)	4551
Target Sample	325 (40.6)	179 (22.4)	121 (15.1)	29 (3.6)	108 (13.5)	39 (4.9)	801
Obtained Sample	250 (42.4)	144 (24.4)	65 (11.0)	14 (2.4)	85 (14.4)	31 (5.3)	589
Job Family 16: General Clerical							
Population	7750 (64.3)	1721 (14.3)	1068 (8.9)	400 (3.3)	608 (5.0)	504 (4.2)	12051
Target Sample	410 (41.2)	139 (14.0)	179 (18.0)	70 (7.0)	108 (10.8)	90 (9.0)	996
Obtained Sample	268 (40.7)	99 (15.0)	122 (18.5)	38 (5.8)	465 (11.4)	193 (8.5)	1185
Job Family 17: Keyboard Clerical							
Population	16586 (84.7)	339 (1.7)	1266 (6.5)	75 (0.4)	1255 (6.4)	66 (0.3)	19587
Target Sample	335 (30.8)	305 (28.0)	176 (16.2)	51 (4.7)	180 (16.5)	41 (3.8)	1088
Obtained Sample	295 (40.0)	153 (20.7)	114 (15.4)	27 (3.7)	126 (17.1)	23 (3.1)	738

TABLE B-4. (continued)

	GROUP						
	WF	WM	BF	BM	SSF	SSM	TOTAL
Job Family 18: Wage Supervisory							
Population	46 (0.6)	6347 (82.0)	19 (0.2)	518 (6.7)	1 (0.0)	814 (10.5)	7745
Target Sample	46 (5.2)	564 (63.7)	19 (2.2)	111 (12.5)	1 (0.1)	144 (16.3)	885
Obtained Sample	17 (3.0)	389 (69.7)	9 (1.6)	62 (11.1)	1 (0.2)	80 (14.3)	558
Job Family 19: Electrical Repair and Service							
Population	394 (4.0)	7858 (80.5)	55 (0.6)	505 (5.2)	28 (0.3)	922 (9.4)	9762
Target Sample	182 (18.3)	494 (49.6)	12 (1.2)	105 (10.6)	6 (0.6)	196 (19.7)	995
Obtained Sample	129 (18.9)	359 (52.6)	7 (1.0)	61 (8.9)	3 (0.4)	123 (18.0)	682
Job Family 20: General Mechanical							
Population	608 (3.3)	13352 (72.8)	142 (0.8)	1480 (8.1)	79 (0.4)	2687 (14.6)	18348
Target Sample	342 (30.9)	376 (33.9)	25 (2.3)	165 (14.9)	25 (2.3)	175 (15.8)	1108
Obtained Sample	82 (16.2)	237 (46.8)	10 (2.0)	88 (17.4)	11 (2.2)	78 (15.4)	506
Job Family 21: Basic Shop Operations							
Population	1280 (9.6)	6581 (49.5)	674 (5.1)	2609 (19.6)	159 (1.2)	2001 (15.0)	13304
Target Sample	91 (9.1)	458 (45.9)	51 (5.1)	197 (19.8)	17 (1.7)	183 (18.4)	997
Obtained Sample	48 (8.5)	269 (47.9)	26 (4.6)	112 (19.9)	9 (1.6)	98 (17.4)	562

TABLE B-4. (continued)

	GROUP						
	WF	WM	BF	BM	SSF	SSM	TOTAL
Job Family 22: System Repair and Services							
Population	781 (5.8)	9589 (71.7)	120 (0.9)	930 (7.0)	97 (0.7)	1859 (13.9)	13376
Target Sample	200 (20.0)	351 (35.1)	30 (3.0)	169 (16.9)	20 (2.0)	230 (23.0)	1000
Obtained Sample	70 (14.4)	207 (42.5)	14 (2.9)	70 (14.4)	15 (3.1)	111 (22.8)	487
Job Family 23: General Equipment Operations							
Population	137 (1.7)	5346 (66.4)	28 (0.4)	1494 (18.6)	10 (0.1)	1032 (12.8)	8047
Target Sample	137 (13.7)	462 (46.2)	28 (2.8)	172 (17.2)	10 (1.0)	190 (19.0)	999
Obtained Sample	48 (8.3)	301 (52.1)	11 (1.9)	101 (17.5)	2 (0.4)	115 (19.9)	578

NOTE: Values in parentheses are percentages that correspond to each frequency.

Selection of the target worker sample was as follows:

1. The number of cases to be drawn from each grade-level, sex-category, and ethnic-category cell was specified. Job series, major command, location and time-in-service characteristics of the sample were not specified in the sample selection process and thus, were random. The total number of cases in the population and samples by subgroup category are given in Table B-4.

2. A total of 74 CONUS bases were sampled. All Air Force bases with less than 500 civilian employees were eliminated from consideration in sampling, in order to reduce the amount of low-yield administrative work. McClellan AFB, Patrick AFB, and Norton AFB were also eliminated from consideration, due to the extensive pretesting of either CPAS, the General Manager Appraisal System (GMAS), or the Job Performance Appraisal System (JPAS) at these bases.

3. In order to ensure availability of subjects in target categories, should target workers become unavailable, the target employees were paired or matched with an alternate employee at the same Air Force base according to their job family, grade level, ethnic group, and sex category. Target employees that could not be perfectly paired with an alternate were still matched on grade level and ethnic group if possible, or as a minimum, on grade level and sex. Employees that could not be paired on at least two characteristics were retained in the sample as "odd lots" without a match available.

4. The required numbers of pairs for each job family and each category were randomly drawn by computer. One member of each pair was randomly designated as the "target" worker, and the other member became the "alternate" worker. In those cases where only one worker was available for a given job family at a base, an unmatched alternate was selected. Some 98.3 percent of the target employees had a matching alternate.

5. Finally, the roster of selected target and matching alternate workers was printed. This list, organized by base and job family, provided the name, SSAN, organization, and office symbol for each target and alternate worker in the sample.

As noted, the management review determined that only 10 percent of the CONUS sample would receive the CPE and SCT. Therefore, 2,000 workers within the already-obtained sample were selected for the "full testing" process (e.g., to receive the CPE and SCT, as well as be rated by their supervisor and one peer). Only perfectly matched pairs of workers and alternates were used, and equal numbers of workers were drawn from each ethnic-sex category combination (333 workers from each of the six ethnic-sex cells). The pairs were randomly selected by computer within these constraints, preserving the proper proportion of subjects from each job family but without regard to Air Force base. The result of this procedure was a subsample of workers (within the full sample) that was selected for the full testing process by stratified random sampling, on the basis of ethnic-sex category combination and job family.

Administrative Procedures

Administration of the CPAS data collection tests, questionnaires, and rating forms at each base was handled by an employee of the Central Civilian Personnel Office (CCPO) who had been designated as the contact point. At the beginning of the CONUS administration (November 1979), each CCPO contact received a full set of materials: (a) Job/Worker Characteristics Ratings booklets, (b) Demographic Questionnaire-Worker, (c) Civilian Personnel Examinations, (d) Score Checking Tests, (e) personnel identification forms, (f) instructions to CCPO, including general administration information, booklets for administration of the questionnaire and tests, and union notification instructions, (g) rosters of selected target, matching, and second matching workers, (h) answer sheets, cover letters, envelopes, and printed return mailing labels, as needed for administration.

The data collection phase was handled by the CCPOs in a five-step process: (a) selection of workers, (b) identification and selection of raters, (c) administration of tests and demographic questionnaires, (d) administration of rating forms, and (e) collection, checking, and accounting of materials.

1. Selection of Workers. The CCPO was instructed to select all target workers on the "Roster of Selected Target, Matching, and Second Matching Workers." The matching alternate was selected if the target worker could not be scheduled for a testing or background data session at any time or if it was impossible to obtain at least one of the two sets of required ratings on the target worker. If the matching alternate was also unavailable, the CCPO randomly selected another replacement from the same job family roster of alternates. Workers who were selected for the full testing procedure (CPE and SCT, in addition to the other materials) were indicated on the roster and were scheduled for an initial 4 1/2-hour testing/demographics session. All other workers (approximately 90% of the sample) received the Demographic Questionnaire-Workers by mail or were scheduled for a half-hour group administration session at a location selected by the CCPO.

2. Identification and Selection of Raters. When the worker had been identified, the CCPO mailed out an introductory letter, with the Personnel Identification Form attached, to the worker's supervisor. The introductory letter briefly described the nature of the study and assured the supervisor that all data collected from the worker and the raters would be strictly confidential and used for research purposes only. The supervisor was requested to release the employee for testing or demographics questionnaire administration at a specified time and informed that the supervisor and other raters would also be requested to complete some survey materials. The supervisor was then requested to identify his own alternate and as many of the employee's co-workers as possible, on the Personnel Identification Form. The co-workers were defined as workers "doing essentially the same kind of work as the designated employee. These co-workers should know the employee well enough to rate him/her...Co-workers may be either military or civilian."

The CCPO randomly selected a co-worker rater from the list of co-workers provided by the supervisor. This random selection was designed to avoid consistently using the worker's most-, least- or "typically-" familiar co-worker. Instead, a variety of different co-worker types was sampled.

3. Administration of Test and Demographic Questionnaires. Separate procedures were followed for the "full-testing" and the "demographics/ratings-only" workers. The demographics/ratings-only workers received their questionnaires either by mail or in the mass survey administration sessions which were scheduled depending on the requirements of the local CCPO. The survey session required approximately 35 minutes (15 minutes for administrative details and 20 minutes for completion of the questionnaire). Full-testing workers were tested in a single 4 1/2-hour testing session in which they completed the following items, in order: (a) SCT (20 items; 15 min), (b) the Demographic Questionnaire-Worker (102 items; approximately 20 min), and (c) CPE (223 items; approximately 2 1/2 hours). Approximately 85 minutes were provided for administrative details, breaks, and possible delays. Tests were administered by the CCPO contact or local Test Control Officer according to a standardized, administration booklet. The procedures mirrored those routinely used for administration of the AQE-J (Vitola et al., 1971), from which the CPE was adapted. Each subtest was preceded by a set of specifically tailored instructions and one or two illustrative examples. All subtests were timed according to the limits given in Table B-1.

4. Administration of Ratings Forms. The rating materials were mailed out to the supervisor and co-worker of each worker within 1 month after the testing/demographic information was completed. Each rating packet included a cover letter, a Job/Worker Characteristics Ratings booklet, a corresponding answer sheet, and a return envelope. The cover letter solicited the rater's participation in the study, which was described as a study of "how accurately people can rate other people in their organization." Raters were assured that the ratings would be kept strictly confidential and that they would have no effect on the rater or the rated individual. Raters were also instructed not to consult with any other individuals in their organization who may have been given rating materials. Raters then completed the identification data and proceeded through the 10 sections of the ratings booklet (Appendix B-2). All ratings were returned to the local CCPO in individual, sealed envelopes.

5. Collection, Checking, and Accounting of Materials. CCPOs were required to sort and check materials as they were received. Incorrect or partially completed answer sheets were returned to the rater for reaccomplishment. Additionally, each CCPO provided an "Incomplete Data Log," which described the workers with missing data and reasons for missing sheets (e.g., worker unwilling to participate under Privacy Act provisions, no co-worker available for the rated individual, supervisor on TDY).

Delay in Data Collection Efforts

Original plans called for the data collection efforts to be completed by February 1980, approximately 3 months after the study was started. However,

the Air Force Logistics Command Directorate of Civilian Personnel opted to delay the study until the concerns of the American Federation of Government Employees (AFGE) were resolved. On two occasions, national representatives of AFGE had been previously informed of the CPAS development effort including a detailed briefing at which the AFGE representative stated that they would oppose any promotion system that used any ranking factors other than longevity. Although three bargaining sessions were held, AFGE concerns remained unresolved by February 1980. Therefore, Headquarters USAF directed that the data collection efforts in support of the CPAS proceed within AFLC as with the other Air Force bases regardless of the opposition. As a result, the closeout date for the data collection effort had to be reset to June 1980. AFGE subsequently filed an Unfair Labor Practices (ULP) complaint.

Database Generation

All demographic and rating answer sheets received at AFHRL by the revised closeout were checked and entered into the CONUS-CPAS master file. Numerous answer sheets were received after the closeout date, particularly from the AFLC bases. However, the need to process the records for input to the Promotion Policy Data Panel analyses required that data received after June 1980 be left out of the database. CPE and SCT answer sheets were not included in the file since they were not to be used in the CPAS development. These answer sheets were retained and placed with the co-workers' ratings in a separate, "research-only" database file. Each subject's record consisted of five parts: (a) master record identification, (b) worker's Demographic Questionnaire-Worker, (c) supervisor's Job/Worker Characteristics Ratings, and (e) pre-survey source data.

Field Test Participation Rate

This section presents information on the data return rate from the CONUS-wide field test. Analyses of the CONUS data are presented in Appendix C.

Table B-2 presents the numbers and percentages of employees that were available for sampling in each job family population, the target sample, and the obtained sample. The figures for each family are broken down by ethnic-sex category. Values for the obtained sample reflect only those cases for which complete data sets were received. A complete data set consisted of both the Demographic Questionnaire-Worker and the supervisor's Job/Worker Characteristic Ratings (or co-worker's ratings that could be substituted for the supervisor's ratings).

Complete data sets were received for 12,865 workers, for a total return rate of 64.32 percent. The return rate per job family varied from a low of 45.7 percent (Job Family 20) to a high of 77.7 percent (Job Family 5), with a median rate of 67.8 percent. The smallest number of usable cases obtained was 327 in Job Family 2, while the largest number was 738 in Job Family 17. In general, the return rate was higher for the General Schedule families, with a range of 54.4 percent to 77.7 percent, than for the Wage Grade families, with a range of 45.7 percent to 68.5 percent. Demographic Questionnaires-Worker were received from 15,406 workers (77.03 percent), while 12,978 supervisor's ratings were received (64.89 percent), along with 11,597 (58.00 percent)

co-worker ratings. This is a solid return rate, and it provided ample data for all families for the variable reduction phase and the Promotion Policy Data Panels exercise, from which the final set of rating factors and their relative weights were developed.

Data Analysis

After completion of the database, two major tasks remained in the final development of the CPAS: reduction of the numerous variables to a manageable subset and the identification and weighting of the final operational set of variables. Reduction of the numerous variables to a manageable subset is discussed in the body of this technical paper, while the weighting of the operational variables is presented in considerable detail in Appendix C.

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AIR FORCE HUMAN RESOURCES LABORATORY

DEMOGRAPHIC QUESTIONNAIRE – WORKER

USAF SCN 79 – 21
(Expires 31 Dec 79)

AIR FORCE SYSTEMS COMMAND
BROOKS AIR FORCE BASE, TEXAS 78235

PRIVACY ACT STATEMENT

AUTHORITY: Statute 10 U.S.C. 8012; Secretary of Air Force, Powers, Duties, Delegation by Compensation, E09397, 22 Nov 43, Numbering System for Federal Accounts Relating to Individual Persons.

PRINCIPAL PURPOSE: This information will be used solely for Air Force Research and Development purposes. Use of the Social Security Account Number is necessary to make positive identification of the individual's records.

ROUTINE USES: Information provided by respondents will be treated as CONFIDENTIAL and will be used for official research purposes only. Responses to this survey will be known only to the researchers in the form of group statistics. **Your responses will not be revealed to anyone for any reason.** This includes your supervisor, your co-workers, any subordinates, your CPO personnel specialists, and any union officials. None of these individuals will know how you answered this survey. Although respondents are identified by name and SSAN, the research information obtained will be used only to improve evaluation and promotion techniques within the Air Force Civil Service Personnel System.

DISCLOSURE IS VOLUNTARY: There will be no adverse personnel actions taken if you choose not to participate. However, failure to provide information would hinder the Air Force's ability to improve the effectiveness of the civilian personnel system. The personnel system continues to improve only with your assistance to make additional refinements in policies and procedures. Your cooperation in this effort is appreciated.

The following questions deal with your background and interest in promotional opportunity. Please answer them as truthfully and completely as you can.

23. Your sex

A. Male
B. Female

24. Your age

A. Less than 25 years
B. 25 – 30
C. 31 – 35
D. 36 – 40
E. 41 – 45
F 46 – 50
G. 51 – 55
H. Over 55 years

25. Your racial or ethnic category

A. American Indian or Alaskan native
B. Asian or Pacific Islander
C. Black, not of Hispanic origin
D. Hispanic
E. White, not of Hispanic origin

26. What is the highest education level you have reached?

A. Eighth grade or lower
B. Attended high school; did not graduate
C. Completed high school with graduation
D. Attended two years or less college
E. Associate degree or more than two years of college
F. Bachelor's degree
G. Bachelor's degree with some graduate work; no graduate degree
H. Master's degree or PhD

27 Your present civil service status

A. Temporary
B. Career conditional
C. Career
D. Other

28. Your pay schedule

A. GS
B. WG
C. WL
D. WS
E. Other

29. Your grade

A.	1	I.	9
B.	2	J.	10
C.	3	K.	11
D.	4	L.	12
E.	5	M.	13
F.	6	N.	14
G.	7	O.	15
H.	8	P.	16

30. What was your pay schedule when you first entered Civil Service?

A. GS
B. WG
C. WL
D. WS
E. Other

31. What was your grade level when you first entered Civil Service?

A.	1	I.	9
B.	2	J.	10
C.	3	K.	11
D.	4	L.	12
E.	5	M.	13
F.	6	N.	14
G.	7	O.	15
H.	8	P.	16

32. How long have you worked for the Civil Service?

A. Less than 1 year
B. 1 – 2 years
C. 3 – 5 years
D. 6 – 10 years
E. 11 – 15 years
F. 16 – 20 years
G. Over 20 years

GO ON TO THE NEXT PAGE.

33. How much total time have you had in your present grade level?

A. Less than 1 year
B. 1 – 2 years
C. 3 – 4 years
D. 5 – 6 years
E. 7 – 8 years
F. 9 – 10 years
G. Over 10 years

34. How long have you worked in your present job series?

A. Less than 1 year
B. 1 – 2 years
C. 3 – 4 years
D. 5 – 6 years
E. 7 – 8 years
F. 9 – 10 years
G. Over 10 years

35. Is your supervisor:

A. Civilian
B. Military

36. Are you currently an official supervisor?

A. Yes
B. No

37. Have you received any formal government-administered training for the position you currently hold?

A. Yes
B. No

38. Have you received an Outstanding Performance Rating (OPR) within the last year?

A. Yes
B. No

39. Have you received a Quality Step Increase (QSI) within the last year?

A. Yes
B. No

40. Have you received a Sustained Superior Performance award within the last year?

A. Yes
B. No

41. Are you currently eligible for promotion?

A. Yes
B. No

42. How many times have you interviewed for promotion within the last year?

A. 0
B. 1
C. 2
D. 3
E. 4 or more

43. Have you been promoted in the last year?

A. Yes
B. No

44. Can you be promoted to a higher-level position in your current job series?

A. Yes
B. No

45. If you can be promoted to a higher position in your job series, is it:

A. Non-supervisory
B. Supervisory
C. Could be either supervisory or non-supervisory
D. I cannot be promoted in my current job series

46. Do you plan to continue Civil Service employment until retirement?

A. Yes
B. No
C. I do not know

GO ON TO THE NEXT PAGE.

47 On the average, how many hours per week do you spend on community service activities (little league coaching, church activities, scouts, PTA, Red Cross, etc.)?

A. None
B 1 3 hours per week
C. 4 -- 6 hours per week
D. 7 – 9 hours per week
E. 10 or more hours per week

48. On the average, how many hours per week do you spend in extracurricular activities that involve physical exertion (sports, exercising, yardwork, home maintenance, etc.)?

A 5 or fewer hours per week
B. 6 – 10 hours per week
C. 11 – 15 hours per week
D. 16 – 20 hours per week
E. More than 20 hours per week

49. On the average, how many hours per week do you spend in extracurricular intellectual activities (reading, music, theater, education, hobbies, etc.)?

A. 5 or fewer hours per week
B. 6 – 10 hours per week
C. 11 – 15 hours per week
D. 16 – 20 hours per week
E. More than 20 hours per week

50. In the past year, how much effort have you spent toward getting a promotion?

A. No effort—I am not interested in a promotion
B. No effort—but would like a promotion
C. A little effort
D. A moderate effort
E. A lot of effort

GO ON TO THE NEXT PAGE.

USE THE FOLLOWING FOR QUESTIONS 51 – 67: Most promotions involve taking on additional duties, responsibilities, training, and effort for successful job performance. Which of the following responsibilities or activities would you accept for promotion to the next grade level?

51. Increase the amount of your work?

A. Yes
B. No

52. Increase the quality of your work?

A. Yes
B. No

53. Improve your working relationships with supervisor, co-workers, or subordinates?

A. Yes
B. No

54. Assume extra additional duties?

A. Yes
B. No

55. Take more initiative on important projects?

A. Yes
B. No

56. Perform additional supervisory tasks?

A. Yes
B. No

57. Assume high pressure tasks or duties, such as public briefings, working on tight deadlines, negotiations, or dealing with other agencies on major projects?

A. Yes
B. No

58. Work overtime?

A. Yes
B. No

59. Enter a training/retraining program on government time and expense?

A. Yes
B. No

60. Enter a training/retraining program on own time but at government expense?

A. Yes
B. No

61. Enter a training/retraining program on own time and expense?

A. Yes
B. No

62. Move to another branch/section within the present organization?

A. Yes
B. No

63. Move to another organization on base?

A. Yes
B. No

64. Move to another base within the same local area?

A. Yes
B. No

65. Move to another base outside of the local area?

A. Yes
B. No

66. Accept a job outside of your current job series?

A. Yes
B. No

67. Devote more time to administrative/ managerial duties?

A. Yes
B. No

GO ON TO THE NEXT PAGE.

USE THE FOLLOWING FOR QUESTIONS 68–102: Have you ever had formal training in any of the following courses, in high school, college, or trade school?

68. Algebra

A. Yes
B. No

69. Geometry

A. Yes
B. No

70. Trigonometry

A. Yes
B. No

71. Analytical Geometry

A. Yes
B. No

72. Calculus

A. Yes
B. No

73. Probability or Statistics

A. Yes
B. No

74. Business Mathematics

A. Yes
B. No

75. Mechanical Engineering

A. Yes
B. No

76. Chemical Engineering

A. Yes
B. No

77. Electrical Engineering

A. Yes
B. No

78. Computer Science

A. Yes
B. No

79. Physics

A. Yes
B. No

80. Chemistry

A. Yes
B. No

81. Biology

A. Yes
B. No

82. Anatomy or Physiology

A. Yes
B. No

83. Geology

A. Yes
B. No

84. Geography

A. Yes
B. No

85. Basic Electronics

A. Yes
B. No

GO ON TO THE NEXT PAGE.

86. Bookkeeping/Accounting

A. Yes
B. No

87. Commercial Graphic Art

A. Yes
B. No

88. Drafting/Mechanical Drawing

A. Yes
B. No

89. Radio Repair

A. Yes
B. No

90. Auto Repair

A. Yes
B. No

91. Mechanical/Technical Theory

A. Yes
B. No

92. Speech/Drama

A. Yes
B. No

93. English Grammar/Composition

A. Yes
B. No

94. American Literature

A. Yes
B. No

95. English Literature

A. Yes
B. No

96. World Literature

A. Yes
B. No

97. Creative Writing

A. Yes
B. No

98. Technical Writing

A. Yes
B. No

99. Journalism

A. Yes
B. No

100. Introductory Foreign Language

A. Yes
B. No

101. Intermediate Foreign Language

A. Yes
B. No

102. Advanced Foreign Language

A. Yes
B. No

APPENDIX B-2

JOB/WORKER CHARACTERISTICS RATINGS BOOKLET

AIR FORCE HUMAN RESOURCES LABORATORY

JOB/WORKER CHARACTERISTICS RATINGS

USAF SCN 79-20
(Expires 31 Dec 79)

AIR FORCE SYSTEMS COMMAND
BROOKS AIR FORCE BASE, TEXAS 78235

PRIVACY ACT STATEMENT

AUTHORITY: Statute 10 U.S.C. 8012; Secretary of Air Force, Powers, Duties, Delegation by Compensation, E09397, 22 Nov 43, Numbering System for Federal Accounts Relating to Individual Persons.

PRINCIPAL PURPOSE: This information will be used solely for Air Force Research and Development purposes. Use of the Social Security Account Number is necessary to make positive identification of the individual's records.

ROUTINE USES: Information provided by respondents will be treated as CONFIDENTIAL and will be used for official research purposes only. Responses to this survey will be known only to the researchers in the form of group statistics. **Your responses will not be revealed to anyone for any reason.** This includes your supervisor, your co-workers, any subordinates, your CPO personnel specialists, and any union officials. None of these individuals will know how you answered this survey. Although respondents are identified by name and SSAN, the research information obtained will be used only to improve evaluation and promotion techniques within the Air Force Civil Service Personnel System.

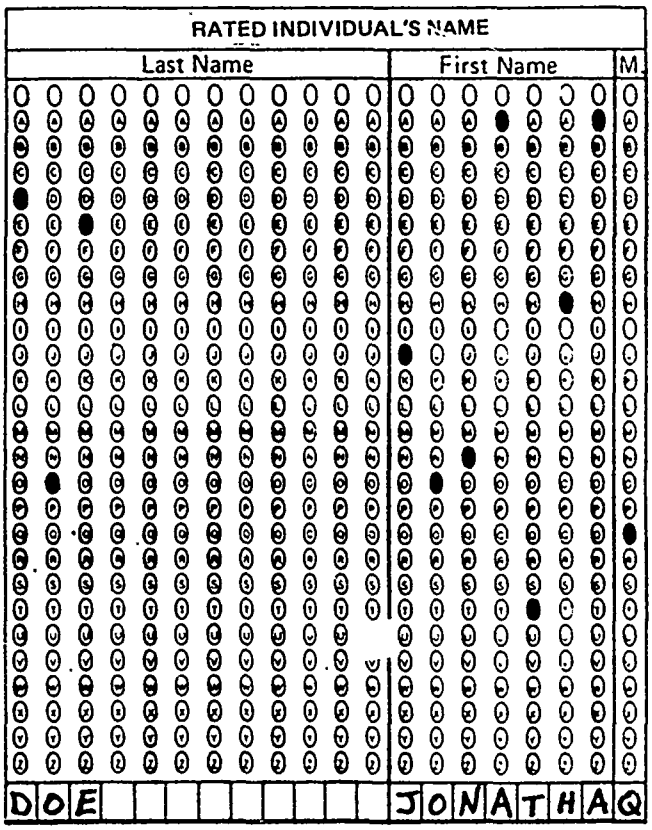
DISCLOSURE IS VOLUNTARY: There will be no adverse personnel actions taken if you choose not to participate. However, failure to provide information would hinder the Air Force's ability to improve the effectiveness of the civilian personnel system. The personnel system continues to improve only with your assistance to make additional refinements in policies and procedures. Your cooperation in this effort is appreciated.

DIRECTIONS

All your marks should be made on the answer sheet provided with this survey. Use a soft lead pencil (Number 1 or Number 2). Be extremely careful not to make any stray marks on the answer sheet because it will be machine scanned, and such marks will cause errors. If you decide to change an answer, make sure you erase thoroughly. Your marks should fill the answer oval and be darkened completely. Do not fold or bend the answer sheet in any way.

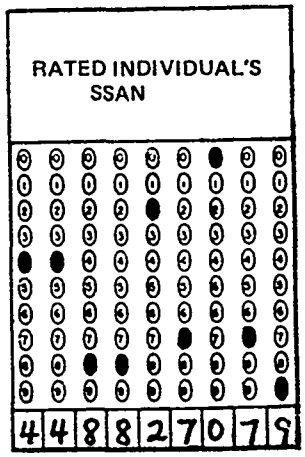
First, using the example below, print the name of the rated individual at the bottom of the special section on the front of the answer sheet called "RATED INDIVIDUAL'S NAME." Put his/her last name (up to 12 letters), then his/her first name (up to 7 letters), and finally his/her middle initial in the last slot (if there is no middle initial, leave this space blank). In the column above each letter, blacken the appropriate oval for the letter you have printed in the box. Where you have left a box blank, leave the column blank.

Example. Suppose the rated individual's name is Jonathan Q. Doe.



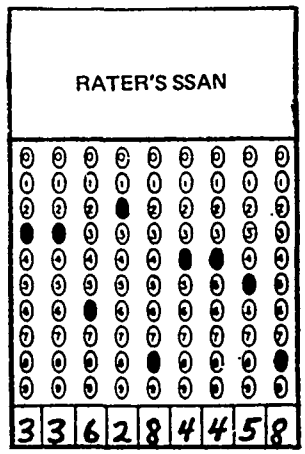
Second, using the example on the next page write the **rated individual's** Social Security Account Number (SSAN) at the bottom of the special section on the front of the answer sheet called "RATED INDIVIDUAL'S SSAN." (The rated individual's SSAN is given in paragraph 2 of the cover letter sent with this booklet.) **Don't use dashes.** Darken in the proper oval in the column above each number in the SSAN.

Example. Suppose the rated individual's SSAN is 448-82-7079.



Third, using the example below, write **your own** Social Security Account Number (SSAN) at the bottom of the special section on the front of the answer sheet called "RATER'S SSAN." **Don't use dashes.** Darken in the proper oval in the column above each number in the SSAN.

Example. Suppose your own SSAN is 336-28-4458.



Fourth, turn to Section I and code your responses to the items in the appropriate answer rows as in this example:

Example. Suppose you choose selection C to item 1, then mark the answer row 1 this way.

This booklet is divided into 10 sections. Your answer sheet is also divided into 10 sections. Each section asks for a different type of information. Make sure that the section number on the answer sheet matches the section number in this booklet.

Make sure that the question number on the answer sheet matches the question number in this booklet.

This survey will take you about 1 hour to complete. This is work-associated and may be completed during normal duty hours.

How to Rate

As noted in the cover letter, this is a study of **rater accuracy**. It is designed to determine how accurately you can rate other people, based on what you know about them. Therefore, you should try to rate the individual as accurately as you can.

Be objective with your ratings.

Base your judgments on what the rated individual has done and is doing now. Except for a few specified items, you should **not** try to decide how (s)he will do in the future.

As noted, the ratings will be kept completely confidential. The results will **not** affect you or the rated individual in any way.

SECTION I: Job Performance Data

Locate the block of answer spaces on your answer sheet identified as SECTION I.

Blacken the letter on the answer sheet that best answers each of the following questions:

1. How would you rate this individual's **overall** job performance in his/her present job?

   A) Very poor
   B) Far below average
   C) Below average
   D) Slightly below average
   E) Average
   F) Slightly above average
   G) Above average
   H) Far above average
   I) Outstanding

2. Is this individual's present position a supervisory position (in other words, is (s)he a rating official)?

   A) Yes, it is a supervisory position
   B) No, it is **not** a supervisory position

3. What do you estimate that this individual's **overall** job performance would be if (s)he were to be promoted to the next grade level?

   A) Very poor
   B) Far below average
   C) Below average
   D) Slightly below average
   E) Average
   F) Slightly above average
   G) Above average
   H) Far above average
   I) Outstanding

4. How would you rate this individual's capability to serve in a supervisory position (in other words, as a rating official)?

   A) Very poor
   B) Far below average
   C) Below average
   D) Slightly below average
   E) Average
   F) Slightly above average
   G) Above average
   H) Far above average
   I) Outstanding

5. How would you rate this individual's capability to serve in a managerial position (in other words, making, interpreting, and executing policy)?

A) Very poor
B) Far below average
C) Below average
D) Slightly below average
E) Average
F) Slightly above average
G) Above average
H) Far above average
I) Outstanding

6. In your estimation, what pay schedule will this individual be working under when (s)he retires, if (s)he stays with Federal service until retirement?

A) GS
B) WG
C) WL
D) WS

7. In your estimation, what is the **highest** grade level this individual will reach before retiring, if (s)he stays with Federal service until retirement? (assume that (s)he will be working under the pay schedule you marked in question 6)

A) 1
B) 2
C) 3
D) 4
E) 5
F) 6
G) 7
H) 8
I) 9
J) 10
K) 11
L) 12
M) 13
N) 14
O) 15
P) 16 or above

SECTION II: Estimated Score on Vocabulary Test

From your knowledge of the rated individual, you probably have some knowledge of his/her vocabulary skills. This would include his/her knowledge of different words, correct word usage, and vocabulary size.

In this section, you are asked to estimate the rated individual's vocabulary skills.

Previously, the rated individual took a series of tests that included a vocabulary test. The vocabulary test was 30 questions long. For a standard administration of the test to Civil Service employees, the range of scores generally runs from 6 items correct to 30 items correct, with an average score of 15 items correct.

Blacken the circle in Section II of the answer sheet that indicates the score you think the rated individual got on the vocabulary test. You may assume that (s)he took the standard administration of the test:

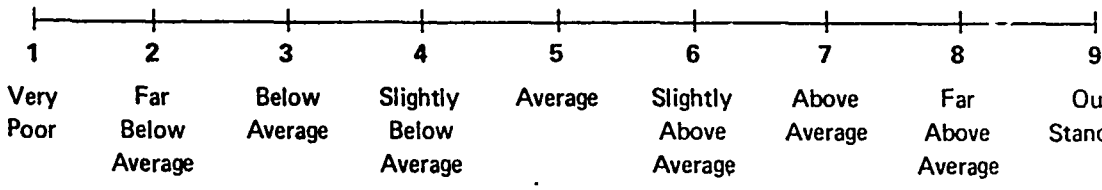
Range: Bottom score = 6 items correct
Top score = 30 items correct

Average score = 15 items correct

SECTION III: Ratings of Trait Factors

Locate the block of answer spaces on your answer sheet identified as SECTION III.

In this section, you will rate the individual on 12 traits, according to the following 9-point scale:



The list of 12 traits you will use for rating is shown below.

You should blacken the corresponding numbers (1–9) in items A through L on Section III of the answer sheet, depending on how you rate the individual on each trait.

For example, if you feel that (s)he rates "Above Average" on "Energy," you would blacken circle "7" for item "A." If you feel that (s)he rates "Far Below Average" on "Skill," you would blacken circle "2" for item "B."

Rate the individual on every trait, even if you know little or nothing about his/her strength or weakness on that trait.

Please read the list of traits and their definitions carefully. Then fill in the appropriate ratings on the answer sheet.

TRAIT FACTORS

A. **Energy:** Shows vigor on the job; seems to prefer a fast pace; willing to exert effort in accomplishing tasks.

B. **Skill:** Performs job-associated tasks well, whether they require physical, mechanical, technical, professional, or managerial skills; considered expert by co-workers.

C. **Completion:** Follows through well; accomplishes all tasks required to complete a job in a timely manner on his/her own; hates to leave a task unfinished.

D. **Self-sufficiency:** Works independently with little need for supervision or help from co-workers.

E. **Leadership:** Inspires others to action; accomplishes goals by organizing others and influencing their behavior.

F. **Responsiveness:** Follows instructions; understands and carries out oral and written instructions to the best of his/her ability.

G. **Understanding of Others:** Understands the behaviors of fellow workers, superiors, and subordinates; can "stand in the other person's shoes."

H. **Originality:** Devises new solutions to problems; creates new methods and procedures for accomplishing objectives.

I. **Pride in Work:** Enjoys doing good work and producing a first-rate product; likes to be the best at whatever (s)he does.

J. **Learning Ability:** Picks up new ideas and procedures very quickly; easy to train; can change to meet the demands of the situation.

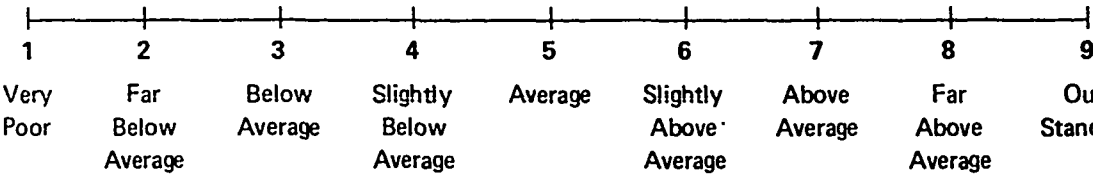
K. **Speaking Ability:** Explains, instructs, and converses with others in a clear and effective manner.

L. **Writing Ability:** Prepares memos, letters, reports, instructions, and other written materials that are effective and clearly understood.

SECTION IV: Ratings of General Abilities

Locate the block of answer spaces on your answer sheet identified as SECTION IV.

In this section, you will rate the individual on a set of abilities. These abilities are similar to the traits used in the previous section. However, they describe some different characteristics. Use the 9-point scale below.



The list of eight abilities you will use for rating is shown below.

Rate the individual on every ability, even if you know little or nothing about his/her strength or weakness on that ability.

Please read the list of abilities and their definitions carefully. Then fill in the appropriate ratings on the answer sheet.

GENERAL ABILITIES

A. **Arithmetic Computation:** Good at adding, subtracting, multiplying, and dividing numbers; manipulates numbers rapidly and accurately.

B. **Word Knowledge:** Uses many different words in conversation and writing; large vocabulary; uses words correctly.

C. **Data Interpretation:** Good at drawing conclusions and making interpretations from data presented in the forms of graphs, charts, and tables.

D. **Electrical Information:** Good at solving electrical problems by applying knowledge of electricity and electronics.

E. **Shop Procedures:** Has a wide knowledge of tools; good at selecting the proper tool for use in a specific situation or for a specific task.

F. **Mechanical Skill:** Good at troubleshooting and repairing various mechanical devices; can understand the operating characteristics of mechanical devices by examining and studying their parts.

G. **Carefulness:** Takes the necessary time and effort to produce work which has few errors; hates to make mistakes; would rather work slowly than take a chance on making errors.

H. **Reading Ability:** Correctly understands written instructions; knows the meaning of what he/she reads.

SECTION V: Rankings of Trait Factors

Locate the block of answer spaces on your answer sheet identified as SECTION V.

In this section, you will **rank** the traits you used in Section III, according to how well they apply to the rated individual.

For instance, if you are ranking the traits for an individual, Jonathan Doe, and you decide that his most outstanding trait is "Originality," you would give that trait a rank of 1. It doesn't matter if every other person in the organization has more originality than Jonathan. If that is Jonathan's best trait, give it a rank of 1.

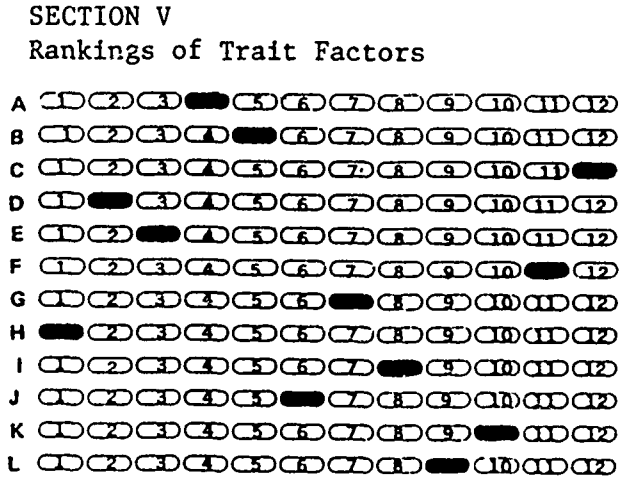
Use each number only once. Give the individual's most outstanding trait a 1. Give his/her next most outstanding trait a 2. Continue this way until you have only one trait left—his/her least outstanding trait—which you give a rank of 12.

Rank all 12 traits even if you know little or nothing about the individual's strengths or weaknesses on some traits.

The completed section of a sample answer sheet below shows the ranking of Jonathan Doe. You can see that the rater ranked "Originality" as number 1 for Jonathan. Actually, there are a number of people in the organization with more originality than Jonathan. But, originality is still Jonathan's best trait, so it must be given a 1.

Note that each trait was given a different ranking. **Make sure that you blacken only one number for each trait. Also, make sure that you blacken a number for every trait, even if you are unsure of some of your rankings.**

Sample Answer Sheet



The list of traits is shown on the next page. Please review the traits and their definitions. Then fill in the appropriate numbers on your answer sheet.

TRAIT FACTORS

A. **Energy:** Shows vigor on the job; seems to prefer a fast pace; willing to exert effort in accomplishing tasks.

B. **Skill:** Performs job-associated tasks well, whether they require physical, mechanical, technical, professional, or managerial skills; considered expert by co-workers.

C. **Completion:** Follows through well; accomplishes all tasks required to complete a job in a timely manner on his/her own; hates to leave a task unfinished.

D. **Self-sufficiency:** Works independently with little need for supervision or help from co-workers.

E. **Leadership:** Inspires others to action; accomplishes goals by organizing others and influencing their behavior.

F. **Responsiveness:** Follows instructions; understands and carries out oral and written instructions to the best of his/her ability.

G. **Understanding of Others:** Understands the behaviors of fellow workers, superiors, and subordinates; can "stand in the other person's shoes."

H. **Originality:** Devises new solutions to problems; creates new methods and procedures for accomplishing objectives.

I. **Pride in Work:** Enjoys doing good work and producing a first-rate product; likes to be the best at whatever (s)he does.

J. **Learning Ability:** Picks up new ideas and procedures very quickly; easy to train; can change to meet the demands of the situation.

K. **Speaking Ability:** Explains, instructs, and converses with others in a clear and effective manner.

L. **Writing Ability:** Prepares memos, letters, reports, instructions, and other written materials that are effective and clearly understood.

SECTION VI: Rankings of General Abilities

Locate the block of answer spaces on your answer sheet identified as SECTION VI.

In this section, you will rank the general abilities you used in Section IV, according to how well they apply to the rated individual.

As in the previous section, you are comparing the degree to which each ability applies to the **rated person only.** You must use each number **only once.**

Rank all eight **abilities, even if you know little or nothing about the individual's strengths or weaknesses on** some abilities.

Make sure that you blacken only one number for each ability. Also, make sure that you blacken a number for every ability, even if you are unsure of your rankings.

The list of abilities is shown below. Please review the abilities and their definitions. Then fill in the appropriate numbers on your answer sheet.

GENERAL ABILITIES

A. **Arithmetic Computation:** Good at adding, subtracting, multiplying, and dividing numbers; manipulates numbers rapidly and accurately.

B. **Word Knowledge:** Uses many different words in conversation and writing; large vocabulary; uses words correctly.

C. **Data Interpretation:** Good at drawing conclusions and making interpretations from data presented in the forms of graphs, charts, and tables.

D. **Electrical Information:** Good at solving electrical problems by applying knowledge of electricity and electronics.

E. **Shop Procedures:** Has a wide knowledge of tools; good at selecting the proper tool for use in a specific situation or for a specific task.

F. **Mechanical Skill:** Good at troubleshooting and repairing various mechanical devices; can understand the operating characteristics of mechanical devices by examining and studying their parts.

G. **Carefulness:** Takes the necessary time and effort to produce work which has few errors; hates to make mistakes; would rather work slowly than take a chance on making errors.

H. **Reading Ability:** Correctly understands written instructions; knows the meaning of what he/she reads.

SECTION VII: Additional Information

Locate the block of answer spaces on your answer sheet identified as SECTION VII.

Compared to other individuals doing about the same type of work, does the rated individual:

1. Complete his/her work (projects, duties, and tasks) faster?

   A) Much faster
   B) Somewhat faster
   C) About average
   D) Somewhat slower
   E) Much slower

2. Work more productively during his/her work time?

   A) Much more productively
   B) Somewhat more productively
   C) About average
   D) Somewhat less productively
   E) Much less productively

3. Spend a greater percentage of time on the job working, as opposed to socializing, sitting idle, involved in personal affairs, taking breaks, and so forth?

   A) Much more time working
   B) Somewhat more time working
   C) About average
   D) Somewhat less time working
   E) Much less time working

4. Show more initiative in starting, carrying out, and completing projects?

   A) Much more initiative
   B) Somewhat more initiative
   C) About average
   D) Somewhat less initiative
   E) Much less initiative

Most promotions involve taking on additional duties, responsibilities, training, effort, etc., for successful job performance. Which of the following responsibilities or activities do you believe the rated individual would accept for promotion to the next grade level?

5. Enter a training/retraining program on government time and expense?

   A) Yes
   B) No

6. Enter a training/retraining program on his/her own time but at government expense?

   A) Yes
   B) No

7. Enter a training/retraining program on his/her own time and own expense?

   A) Yes
   B) No

8. Move to another branch/section within the present organization?

   A) Yes
   B) No

9. Move to another organization on base?

   A) Yes
   B) No

10. Move to another base within the same local area?

    A) Yes
    B) No

11. Move to another base outside the local area?

    A) Yes
    B) No

12. Accept a job outside his/her current job series?

    A) Yes
    B) No

13. Devote more time to administrative/managerial duties?

    A) Yes
    B) No

14. Do more work (increase production)?

    A) Yes
    B) No

15. Increase the quality of his/her work?

    A) Yes
    B) No

16. Improve his/her working relationships with supervisor, co-workers, or subordinates?

    A) Yes
    B) No

17. Assume extra additional duties?

A) Yes
B) No

18. Take more initiative on important projects?

A) Yes
B) No

19. Perform additional supervisory tasks?

A) Yes
B) No

20. Assume high pressure tasks or duties, such as public briefings, working on tight deadlines, negotiations, or dealing with other agencies on major projects?

A) Yes
B) No

21. Work overtime?

A) Yes
B) No

SECTION VIII: Rankings of Job Characteristics on Trait Factors

Locate the block of answer spaces on your answer sheet identified as SECTION VIII.

In this section, you will be ranking the rated individual's job, instead of the individual, himself.

The same 12 traits and definitions you used in Section III are listed below. This time you will rank them to show how important they are to **successful performance of the individual's job.**

For example, if you think "Leadership" is the most important trait required for doing well in this job, you would give that trait a rank of 1. The next most important trait would get a rank of 2. Continue this way until you have only one trait left—the one **least** important for the job—which you give a rank of 12.

In this section, you are **not** ranking the individual. Instead, you are ranking the **job requirements.** Do **not** consider how well or how poorly the individual fulfills these requirements. Instead, rank each trait on how important it is to successful performance of the job.

Make sure that you blacken only one number for each trait. Also, make sure that you blacken a number for every trait, even if you are unsure of your rankings.

TRAIT FACTORS

A. **Energy:** Shows vigor on the job; seems to prefer a fast pace; willing to exert effort in accomplishing tasks.

B. **Skill:** Performs job-associated tasks well, whether they require physical, mechanical, technical, professional, or managerial skills; considered expert by co-workers.

C. **Completion:** Follows through well; accomplishes all tasks required to complete a job in a timely manner on his/her own; hates to leave a task unfinished.

D. **Self-sufficiency:** Works independently with little need for supervision or help from co-workers.

E. **Leadership:** Inspires others to action; accomplishes goals by organizing others and influencing their behavior.

F. **Responsiveness:** Follows instructions; understands and carries out oral and written instructions to the best of his/her ability.

G. **Understanding of Others:** Understands the behaviors of fellow workers, superiors, and subordinates; can "stand in the other person's shoes."

H. **Originality:** Devises new solutions to problems; creates new methods and procedures for accomplishing objectives.

I. **Pride in Work:** Enjoys doing good work and producing a first-rate product; likes to be the best at whatever (s)he does.

J. **Learning Ability:** Picks up new ideas and procedures very quickly; easy to train; can change to meet the demands of the situation.

K. **Speaking Ability:** Explains, instructs, and converses with others in a clear and effective manner.

L. **Writing Ability:** Prepares memos, letters, reports, instructions, and other written materials that are effective and clearly understood.

SECTION IX: Rankings of Job Characteristics on General Abilities

Locate the block of answer spaces on your answer sheet identified as SECTION IX.

Below is a list of the same eight general abilities and definitions you used in Section IV.

This time you will rank them to show how important they are to **successful performance of the individual's job,** just as you did with the trait factors in the previous section.

As in the previous section, you are **not** ranking the individual. Instead, you are ranking the job **requirements.** Do **not** consider how well or how poorly the individual fulfills these requirements. Instead, rank each ability on how important it is to successful performance of the job.

Make sure that you blacken only one number for each ability. Also, make sure that you blacken a number for every ability, even if you are unsure of your rankings.

GENERAL ABILITIES

A. **Arithmetic Computation:** Good at adding, subtracting, multiplying, and dividing numbers; manipulates numbers rapidly and accurately.

B. **Word Knowledge:** Uses many different words in conversation and writing; large vocabulary; uses words correctly.

C. **Data Interpretation:** Good at drawing conclusions and making interpretations from data presented in the forms of graphs, charts, and tables.

D. **Electrical Information:** Good at solving electrical problems by applying knowledge of electricity and electronics.

E. **Shop Procedures:** Has a wide knowledge of tools; good at selecting the proper tool for use in a specific situation or for a specific task.

F. **Mechanical Skill:** Good at troubleshooting and repairing various mechanical devices; can understand the operating characteristics of mechanical devices by examining and studying their parts.

G. **Carefulness:** Takes the necessary time and effort to produce work which has few errors; hates to make mistakes; would rather work slowly than take a chance on making errors.

H. **Reading Ability.** Correctly understands written instructions; knows the meaning of what he/she reads.

SECTION X: Background Data

Locate the block of answer spaces on your answer sheet identified as SECTION X.

The previous sections dealt with the rated individual and his/her job.

The following items concern **you** and **your job.** This information will provide a better understanding of how people do ratings.

Please answer the following questions about yourself.

1. What is your relationship to the rated individual?

   A) Co-worker of the rated individual
   B) Supervisor (Rating Official) of the rated individual
   C) Associate of the Supervisor of the rated individual

2. What is your military/civilian status?

   A) Military
   B) Civilian

3. What is your pay schedule?

   A) GS
   B) WG
   C) WL
   D) WS
   E) Military

4. What is your **current** civilian grade level?

   A) Not applicable (Military)
   B) 1, 2, or 3
   C) 4, 5, or 6
   D) 7, 8, or 9
   E) 10, 11, or 12
   F) 13, 14, or 15
   G) 16 or above

5. What is your **current** military grade level?

   A) Not applicable (Civilian)
   B) Airman Basic, Airman, Airman First Class, or Senior Airman
   C) Sergeant, Staff Sergeant, or Technical Sergeant
   D) Master Sergeant, Senior Master Sergeant, or Chief Master Sergeant
   E) Second Lieutenant, First Lieutenant, or Captain
   F) Major, Lieutenant Colonel, or Colonel
   G) Brigadier General or above

6. What is the **highest** education level you have reached?

   A) Eighth grade or lower
   B) Attended high school; did not graduate
   C) Completed high school with graduation
   D) Attended two years or less college
   E) Associate degree or more than two years of college
   F) Bachelor's degree
   G) Bachelor's degree with some graduate work; no graduate degree
   H) Master's degree or PhD

7. How many years of total active Federal service do you have?

   A) Fewer than 5 years
   B) 5–9 years
   C) 10–14 years
   D) 15–19 years
   E) 20 or more years

8. How many years have you spent in your current job series (civilian) or career field (military)?

   A) Fewer than 5 years
   B) 5–9 years
   C) 10–14 years
   D) 15–19 years
   E) 20 or more years

9. How many years have you spent in your current job?

   A) Less than 1 year
   B) 1–3 years
   C) 4–6 years
   D) 7–9 years
   E) 10 or more years

10. How many years have you spent in a supervisory position of any sort?

    A) Not applicable; I have never been a supervisor
    B) Fewer than 5 years
    C) 5–9 years
    D) 10–14 years
    E) 15–19 years
    F) 20 or more years

11. How many **civilian** workers do you directly supervise (as a rating official)?

    A) None
    B) 1–2
    C) 3–4
    D) 5–6
    E) 7–8
    F) 9 or more

12. How many **total** workers (both military and civilian) do you directly supervise (as a rating official)?

A) None
B) 1–2
C) 3–4
D) 5–6
E) 7–8
F) 9 or more

13. How accurately do you feel you can rate other people, in general?

A) Extremely accurately
B) Very accurately
C) Somewhat accurately
D) Not very accurately
E) Not at all accurately

14. How familiar are you with the rated individual and his job performance?

A) Minimally (I know the individual but I am not familiar with his/her job performance)
B) Not very familiar
C) Moderately familiar
D) Very familiar
E) Extremely familiar

15. How long have you known the rated individual?

A) Less than 6 months
B) 6 months – 11 months
C) 12 months – 23 months
D) 2–5 years
E) More than 5 years

16. How long have you supervised (as a rating official) the rated individual?

A) Not applicable (for co-workers of the rated individual and associates of supervisors)
B) Less than 6 months
C) 6 months – 11 months
D) 12 months – 23 months
E) 2–5 years
F) More than 5 years

17. On the average, how often do you come in contact with the rated individual?

A) More than once a day
B) Once a day
C) More than once a week but less than once a day
D) Once a week
E) Less than once a week

18. Do you know the rated individual more by direct observation or by his/her reputation?

A) Entirely by direct observation
B) Mostly by direct observation
C) Equally by direct observation and reputation
D) Mostly by reputation
E) Entirely by reputation

19. How accurate do you think your judgments of the rated individual were?

A) Extremely accurate
B) Very accurate
C) Moderately accurate
D) Very inaccurate
E) Extremely inaccurate

20. The Department of the Air Force Civilian Personnel Office is considering the use of a promotion system that resembles the one you used in this project. The proposed system would include the Civilian Personnel Examination, experience/background information, and ratings by people who know you. How do you think this system compares with the current system for making promotions?

A) The proposed system is much better than the current system
B) The proposed system is somewhat better than the current system
C) The two systems are about the same
D) The proposed system is somewhat worse than the current system
E) The proposed system is much worse than the current system

When you have answered all the questions, please do the following:

1. Check over your answer sheet:

   - Make sure that the rated individual's name and SSAN and your SSAN are coded properly
   - Make sure that you have answered every item
   - Make sure that there are no stray marks or incomplete erasures
   - Make sure that you have used each rank **once** and **only once** in Sections V, VI, VIII, and IX (ranking sections).

2. Put the following items in the return envelope:

   Job/Worker Characteristics Answer Sheet

   Job/Worker Characteristics Ratings Booklet (this booklet)

Make sure that you do not fold or wrinkle the answer sheet. Seal the envelope and return it to the Civilian Personnel Office.

APPENDIX C: PROMOTION POLICY DATA PANEL PROCEDURES AND PROMOTION WEIGHTING SYSTEM DEVELOPMENT

I. OVERVIEW

The CONUS-wide field test provided 12,856 usable data sets comprised of demographic information and rating data. As discussed in Appendix B, these two types of data had been identified as appropriate for use in an operational appraisal system (from a regulatory, legal, and psychometric standpoint). However, before the data elements could be presented to a panel for the development of an appropriate weighting system of desired promotion factors, the large number of candidate promotion system factors available from the data sets had to be reduced considerably. The 210 data elements in the Demographic Questionnaire-Worker (102 items) and Job/Worker Characteristics Ratings (108 items) booklets presented a formidable array of candidate variables for use in the operational CPAS. Although Promotion Policy Data Panels of experienced personnel were to be used to identify variables specifically related to performance in their job family, they could not be expected to handle such a large pool of items. Since these panel members could not be expected to evaluate the items on their psychometric characteristics and legal implications, a panel composed of industrial psychologists under contract and from AFHRL and personnel specialists from OCPO was tasked to reduce the pool of variables. These panel members were knowledgeable in the personnel system, applicable case law, and/or psychometrics.

Since a high proportion of selection systems have been determined to create adverse impact on minority groups (United States Office of Personnel Management, 1979; Cascio & Bernardin, 1981), particular attention was paid to the requirements of the Uniform Guidelines for Employee Selection during the variable reduction phase. The guidelines say in effect that a selection system which creates adverse impact is defensible if the development process tried to identify all sources of information which could be related to job performance and then selected for operational use those information items which minimized adverse impact; but only if the selected set of items provides a highly valid selection system. In other words, try to select items that minimize adverse impact but do not sacrifice system validity in the process.

To reduce the 210 demographic and rating variables to a workable subset, a large data matrix was constructed for rating each of the elements on a series of selection criteria. Four basic types of criteria were used: (a) estimated validity, (b) uniqueness, (c) bias, and (d) legal defensibility. Correlations of the variables with peer ratings of overall performance and projected performance at the next higher levels served as estimates of item validity. A computing process titled VARSEL (Gould & Christal, 1976), was used to develop indices of item uniqueness and redundancy from an item intercorrelation matrix. Comparisons of mean ratings by race and sex category were used to evaluate item bias. Thus objective measures of each item's validity, uniqueness, and bias were available. Subjective ratings of legal defensibility were made by personnel specialists and psychologists based on case law.

After the objective measures were available, a panel of eight research psychologists and two personnel specialists was convened to select a workable subset of variables from the data matrix, using the criterion indices for guidance. All data items were rated on a continuum of their legal defensibility using the guidelines interpretable from case law on equity and fairness in selection procedures, and those with low ratings were deleted. This procedure significantly reduced the pool of variables. This first procedure reduced the pool of variables to observable behaviors and deleted demographic variables most related to past opportunities and thus associated with past discriminations. A consensus of panel judgments then selected the final subset of variables consisting of 24 rating elements: three overall ratings (job performance, supervisory, managerial); 12 behavioral ratings such as responsiveness to directions, self-sufficiency, etc; three ability ratings (quantitative, reading, data interpretation); four motivation indicators (productivity, initiative, speed of completion, and amount of working time spent in productive efforts); and two composite variables which combined behavioral and motivational measures. The specific elements chosen were all contained in the Job/Worker Characteristics Ratings booklet: Section I items 1, 4, and 5; Section III items A through L; Sections IV items A, C, and H; and Section VII items 1 through 4 (see Appendix B-2 for detailed item descriptions). Once the final subset of 24 rating elements was selected, the next task was to identify the relative relationship of each element to job performance in each job family and specify how those ratings were to be used in the operational CPAS. This appendix outlines in considerable detail the process by which candidate promotion factors applicable for each of the job families were identified and appropriate weights developed for each of the factors. Included are the panel member selection criteria and procedures, the list of candidate factors, subject sample and data preparation, administrative procedures used for the panels, the results of the analysis of the panel data, and the resulting promotion weighting systems. Twenty-three panels, one for each civilian job family, were assembled to provide a content-valid promotion system that would consist of a restricted set of 6 to 10 weighted promotion factors. Each panel performed the two basic tasks of first selecting 6 to 10 promotion factors from a list of 24 candidate factors and then rank-ordering (sorting) a selected random sample of employees in terms of the employees' promotability as reflected by these factors. Inconsistent raters were identified and removed from further analyses. Judgment analysis techniques were used to capture mathematically the weights that panel members applied to the promotion factors in rank-ordering employees. The resulting promotion factors and weights identified in these analyses are unique combinations for each of the 23 job families by supervisory or nonsupervisory category. The Directorate of Civilian Personnel has declared that the actual promotion weights are "Privileged Information" and cannot be included in the body of this paper.

II. INTRODUCTION

Major Objectives

The primary purpose of the Promotion Policy Data Panel (PPDP) exercise was to capture the promotion policy of a group of experienced Federal

Service career-field representatives, so that their policy (when converted to a mathematical algorithm) might be specified and used in conjunction with the Promotions and Placements Referral System (PPRS). The PPRS is a centralized computer system that contains the current background, experience, and job performance ratings on all appropriated fund Air Force civilian employees and is used to identify and rank all eligibles for each vacancy. It was decided that CPAS would be used as the last ranking factor when the number of eligibles exceeded the feasible number that could be referred for a vacancy consideration. For this type of application, it was mandatory that a common set of rating factors for all eligibles must be identified even if not all factors are used for all jobs. Given this purpose, there were three specific objectives of the panel exercise. The first objective was to develop restricted lists of rating elements that would be maximally relevant to each of the 23 civilian job families. The second objective was to obtain a job-family-specific weight for each factor, so that the factors might be combined into a single promotion system, or "promotability score," for each job family. The third objective was to obtain interim evidence for the content validity of this ranking system, until a full-scale, criterion-related validity study could be completed after the CPAS became operational.

After selection of the workable subset of variables from the data collection instruments, some methodology had to be used to identify and weight the specific promotion factors (i.e., variables). Several techniques were considered for possible use. However, in the absence of an external criterion of promotability, the traditional multiple regression-based technique was not considered appropriate for the selection of the final factors and their weights. Another possibility considered was the use of a panel of management/personnel experts who could identify the final list of factors; however, this technique would have given no assurances about the content relevance or validity of the final factors. The use of an equal-weighting scheme, whereby all of the original factors would have been retained and unit weighted, was also rejected since it would have little face validity or job-family-specific relevance. After an evaluation of the advantages and disadvantages of these techniques, it was decided that a promotion policy panel exercise would provide the best technique to select and weight the final set of job-relevant promotion factors.

General Process

The research strategy used judgment analysis or "policy capturing," a statistical technique developed at the Manpower and Personnel Division. The procedure has been used in several previous studies (Black, 1973; Gott, 1974; Koplyay, Albert, & Black, 1976). Basically, the technique consisted of convening a series of job-family-specific experimental promotion boards (the Promotion Policy Data Panels, or PPDPs) to perform two tasks: (a) select a list of 6 to 10 promotion factors for use in ranking employees in that particular job family and (b) rank-order (sort) a randomly selected sample of promotion records for employees in that job family according to the employees' promotability. Then the ranking policy of the boards was mathematically determined by weighting the factors such that the sum of each

factor rating multiplied by its weight resulted in a score that replicated the panel's rankings.

III. PROCEDURE

Panel Member Selection

To ensure the reliability and validity of the development of promotion factor weights, a great deal of attention was directed toward selection of individuals to serve as panel members in the development of job-family-specific policy equations and resulting factor weights. The decisions and judgments which had to be made in developing the equations and factor weights required the selection and participation of a balanced mix of highly competent, experienced job family representatives. A final list of criteria for selecting the panel members for each job family was jointly developed by a working group of AFHRL scientists and Office of Civilian Personnel Operations (OCPO) specialists. Listed in order of importance, the criteria were as follows:

1. Panel Size. It was decided that each panel was to be composed of a maximum of 12 members. A panel size of 12 members was selected as the optimal balance between convenience and representation. In this exercise, it was vitally important to represent fully the views of many subgroups, according to job series, supervisory/nonsupervisory status, major command, minority group, and sex category background. It was thought that a group size of less than 12 would prevent adequate representation of various employee subgroups. On the other hand, group membership of more than 12 would be both expensive to bring in on temporary duty to participate in the panel process and unwieldy to handle in necessary panel activities.

2. Experience. Each panel member was to have had at least 3 years experience in a specific job series. A 3-year experience requirement was consistent with the minimum experience qualification required for various personnel classification/qualification actions.

3. Job Series Representation. It was necessary to ensure adequate representation of the major job series in each job family. Therefore, each job series was given one panel member for every 8.3 percent represented in the job family's total population. (The value of 8.3 percent was used as the representation criterion since it equals 1/12 of the family's population and is equivalent to one panel member on the 12-person panel.) All series with less than 8.3 percent of the family's total population were pooled, and the remaining panel members were randomly selected from this pool. This technique allowed for both a certain degree of control over the series which were represented and a chance for each series to be represented.

4. Grade-Level Representation. Panel members were drawn from only the upper half of the grade levels within their job series. The standard of the upper grade levels in each series, rather than each family, was used, in order to give all job series in the family the opportunity to be represented on the panels. Furthermore, at least one panel member was selected from each of the top three grades in the job family. This criterion was designed to ensure sufficient expertise and job-series experience for the panel

members to make promotion decisions about their job family and to ensure that each panel would have the expertise to make promotion decisions about the upper grade levels.

5. Minority/Sex Group Representation. The three major ethnic groups (Black, Hispanic Surnamed, and Nonminority/Others) and the two sex categories were to be equally represented on each panel. Thus, two members of each 12-person panel were to be selected from each of the six ethnic/sex category combinations. This would result in six males and six females, with three of the members Black, three Hispanic Surnamed, and three Nonminority/Others. Equal, rather than proportional, race and sex representation was used, on the recommendation of the AFHRL Conference on Human Appraisal (Mullins, 1981). Proportional representation would mean few minorities would be represented and their views could be "outvoted," whereas equal representation would mean an equal voice for groups regardless of any disproportionate group makeup of the job families. Equal representation should provide the most legally defensible position, in terms of equal employment opportunity considerations. An additional advantage is that minority representation was assured for many families in which the minority population is low. In the event that the minority and sex criteria could not be met, the following deviations were permitted: (a) if both race and sex criteria could not be satisfied, a member who met the minority-group criterion was selected; (b) if the minority-group criterion alone could not be met, a member who met the sex-category criterion was selected; and (c) if no member could be found who met either criterion, a member was selected randomly, who met the other criteria listed in paragraphs 1 to 5.

(6) Supervisory/Managerial Balance. Panels were selected such that at least half of the members would be supervisors/managers. However, for job families in which there was a large percentage of supervisors/managers, more than half of the panel members were supervisors/managers. This overrepresentation was built into the selection process, since supervisors/managers are the people responsible for making policy and evaluating the workers. At the same time, the panels were not composed entirely of supervisors/managers, in order to give the worker -- the nonsupervisor -- some voice in developing the new promotion system.

Job Families 18 through 23 (Wage Supervisor and Wage Grade families) were necessarily treated differently in terms of the supervisory/managerial balance. For Job Family 18 (Wage Supervisor), all of the members were supervisors. For Job Families 19 through 23 (Wage Grade), half of the members selected from the job family of interest were nonsupervisors; the other half of the members were selected from the corresponding job series in Job Family 18. Therefore, there was a 50/50 supervisory/nonsupervisory balance in Job Families 19 through 23.

(7) Local/Nonlocal Area Representation. For each panel, three members were selected from the local (Bexar County) area, and the other nine were selected from outside the local area. This criterion was a compromise between economic necessity (i.e., amount of TDY costs) and proportional CONUS-wide representation. Nonlocal representation was random, to give all

geographical areas an equal opportunity for representation depending on the percentage of job family representation.

(8) Awards. Panel members who had a history of awards were chosen, to the fullest extent possible. It was considered highly desirable for each panel member to have at least one Outstanding Performance Report (OPR), Quality Step Increase (QSI), Sustained Superior Performance (SSP) Award, or Cash Suggestion Award. However, since this criterion was the lowest in the hierarchy, and since only a small percentage of the total population receive such awards, panel members with no awards were selected when necessary.

These criteria were combined in a computer-based selection procedure in the following manner: First, the sample of all CONUS Federal Service employees was reduced to a pool of eligibles, according to the experience and grade-level representation criteria. A six-way distribution was provided for each job family (job series by minority group by sex category by supervisory/nonsupervisory category by local/nonlocal area group by awards/nonawards category). Only those cells having three or more cases that met the remaining experience and grade-level criteria were selected in order to provide two alternate selections for each primary panel member designated. However, in some cases, it was necessary to select from a cell with only one or two cases and select the alternate(s) from a closely (but not perfectly) matching cell. These alternates generally matched the primary on all criteria but one or two (e.g., sex group, ethnic group, award status). Once the cells for sampling had been specified, the 12 panel members and alternates for each job family were randomly selected by computer. The final product of the panel member selection procedure was a listing of 36 potential panel members for each job family, consisting of 12 primary selections and a first and second alternate for each primary.

At this point, the names of the PPDP selectees (primaries) were sent to the local Central Civilian Personnel Offices (CCPOs) for confirmation and verification through the employee's supervisor: (a) that the employee was available for panel duty, (b) that the employee was willing to participate and was free from personal problems, and finally (c) that the employee was suitable for panel duty, in terms of experience and skill. The CCPOs replied with the confirmations/declinations, and alternate panel members were requested as necessary. In some cases, it was necessary to sample additional alternates to fill a panel position; the largest number of additional alternates sampled for any one position was 10.

Table C-1 shows the characteristics of the PPDP members for each job family. It is obvious from this table that the criteria were not met in a number of instances. Two major impediments were encountered in finding panel members meeting the exact criterion specifications. First, members with certain necessary characteristics either did not exist or existed in extremely small numbers. Second, frequently the alternate selections provided less than optimal matches. Deviations required varied by job family. Panel sizes varied from 10 to 12, due either to last-minute cancellations or inability to find an acceptable alternate. Also, it was sometimes impossible to obtain members from the top three grades in certain job families. In other families, there were very few women or minority

TABLE C1. CHARACTERISTICS OF PROMOTION POLICY DATA PANEL MEMBERS

Characteristic	JOB FAMILY 1 Engineering, Physical Science, and Mathematical Professional	2 Medical and Biology Professional	3 Miscellaneous Professional	4 Computer Technical	5 Personnel
Panel Size	11	10	11	12	12
Job Series	806 830 855 (3) 861 1310 1330 1520 (2) 1529	403 602 610 (5) 644 660 6210	170 180 493 510 (6) 1410 1710	330 332 (3) 334 (6) 335 (2)	160 (3) 201 (3) 205 212 221 230 233 501
Grade Level	GS-12 (3) GS-13 (3) GS-14 (4) GS-15	GS-09 (3) GS-10 GS-11 (3) GS-12 GS-13 GS-15	GS-09 GS-11 (2) GS-12 (2) GS-13 (3) GS-14 (3)	GS-07 GS-08 GS-09 (2) GS-11 (3) GS-12 (2) GS-13 (8)	GS-11 (2) GS-12 (2) GS-13 (8)
Avg Grade Level	13.27	11.00	12.36	10.75	12.60
Sex Group	Male (8) Female (3)	Male (4) Female (6)	Male (6) Female (5)	Male (6) Female (6)	Male (7) Female (5)
Minority Group	Black (4) Spanish Surnamed (2) Other (5)	Black (3) Spanish Surnamed (4) Other (3)	Black (2) Spanish Surnamed (4) Other (5)	Black (4) Spanish Surnamed (3) Other (5)	Black (4) Spanish Surnamed (4) Other (4)
MAJCOM	AF Comm Com AF Eng Svc Ctr AF Log Com (2) AF Sys Com (7)	AF Log Command (3) AF Sys Command (4) Tactical Air Com (3)	AF Audit Agency (2) Air Training Com (4) AF Commissary Svc AF Eng Svc Ctr AF Log Com (3)	AF Actng & Fin Ctr Air Training Com (3) AF Comm Com (2) AF Log Com (4) AF Man & Pers Ctr Tactical Air Com	Air Training Com (5) AF Log Com (4) Mil Alft Cmd AF Man & Pers Ctr Tactical Air Com
Education Level	Bachelor's (2) Grad Work, No Degree (5) Master's or Ph.D (4)	High Sch w/Grad College, No Degree (2) Associate Grad Work, No Degree (4) Master's or Ph.D (2)	Associate (2) Bachelor's Grad Work, No Degree (5) Master's or Ph.D (3)	High Sch w/Grad (4) College, No Degree (2) Associate Bachelor's Grad Wk, No Degree (2) Master's or Ph.D	High Sch w/Grad College, No Degree (3) Associate (2) Grad Work, No Degree (4) Master's or Ph.D (2)
Supervisory Status	Supervisor (5) Nonsupervisor (6)	Supervisor (6) Nonsupervisor (4)	Supervisor (6) Nonsupervisor (5)	Supervisor (6) Nonsupervisor (6)	Supervisor (8) Nonsupervisor (4)
Local Area Status	Local (3) Nonlocal (8)	Local (4) Nonlocal (6)	Local (7) Nonlocal (4)	Local (4) Nonlocal (8)	Local (6) Nonlocal (6)
Avg Time in Service	18.83 years	18.45 years	19.89 years	18.26 years	26.01 years
Avg Time in Series	16.65 years	15.42 years	17.60 years	13.67 years	9.07 years
Avg Time in Grade	6.43 years	5.81 years	5.80 years	6.86 years	5.31 years
Avg Age	44.45 years	50.17 years	49.18 years	44.82 years	48.58 years

NOTE: Numbers in parentheses to the right of entries indicate the frequency, if more than one.

TABLE C1. (Continued)

Characteristic	JOB FAMILY 6 Supply and Transportational	7 Biological and Medical Technical	8 Miscellaneous Technical	9 Engineering, Physical Science, and Mathematical Professional	10 Accounting and Finance Technical
Panel Size	11	12	12	10	11
Job Series	346 2001 2003 (2) 2010 (5) 2130 2150	621 (4) 645 (2) 667 669 (2) 675 683 (2)	081 (2) 132 301 (2) 1411 1412 1421 1712 1910 (2) 2032	? 802 (2) 818 856 (3) 895 (3)	501 504 520 525 (5) 544 545 560
Grade Level	GS-11 (4) GS-12 (4) GS-14 (3)	GS-04 GS-05 (6) GS-07 GS-09 (2) GS-10 (2)	GS-06 GS-07 GS-09 (3) GS-11 (3) GS-12 GS-13 GS-14 (2)	GS-09 (3) GS-11 (3) GS-12 (3) GS-13	GS-05 GS-07 (5) GS-08 GS-09 (2) GS-13 (2)
Avg Grade Level	12.18	6.58	10.50	10.90	8.36
Sex Group	Male (6) Female (5)	Male (6) Female (6)	Male (6) Female (6)	Male (7) Female (3)	Male (5) Female (6)
Minority Group	Black (4) Spanish Surnamed (4) Other (3)	Black (4) Spanish Surnamed (4) Other (4)	Black (4) Spanish Surnamed (4) Other (4)	Black (3) Spanish Surnamed (3) Other (4)	Black (3) Spanish Surnamed (4) Other (4)
MAJCOM	AF Log Com (10) Mil Airlift Com	Air Training Com (2) AF Log Com (3) Mil Airlift Com AF Sys Com (4) Tactical Air Com (2)	Air Training Com (2) Elec Sec Com HQ USAF AF Log Com (3) Mil Airlift Com (2) Strategic Air Com AF Sys Com (2)	AF Log Com (5) Mil Airlift Com (2) Strategic Air Com AF Sys Com (2)	AF Acting & Fin Ctr Air Training Com (2) AF Log Com (2) Mil Airlift Com (3) AF Sys Com (2) Tactical Air Com
Education Level	High Sch w/Grad (3) College, No Degree (4) Associate (2) Grad Work, No Degree (2)	High Sch, No Grad high Sch w/Grad (3) College, No Degree (4) Associate (2) Bachelor's (2)	High Sch w/Grad (3) College, No Degree (3) Associate (3) Bachelor's Master's or Ph.D (2)	High Sch w/Grad (2) College, No Degree (6) Associate Grad Work, No Degree	High Sch w/Grad College, No Degree (7) Associate Bachelor's (2)
Supervisory Status	Supervisor (6) Nonsupervisor (5)	Supervisor (4) Nonsupervisor (8)	Supervisor (4) Nonsupervisor (8)	Supervisor (6) Nonsupervisor (4)	Supervisor (6) Nonsupervisor (5)
Local Area Status	Local (3) Nonlocal (8)	Local (4) Nonlocal (8)	Local (4) Nonlocal (8)	Local (3) Nonlocal (7)	Local (3) Nonlocal (8)
Avg Time in Service	25.75 years	12.83 years	22.66 years	26.92 years	20.39 years
Avg Time in Series	14.62 years	9.39 years	10.72 years	11.68 years	12.86 years
Avg Time in Grade	6.32 years	3.74 years	3.81 years	3.48 years	7.31 years
Avg Age	47.64 years	42.78 years	45.92 years	50.50 years	48.00 years

NOTE: Numbers in parentheses to the right of entries indicate the frequency, if more than one.

TABLE C1. (Continued)

Characteristic	JOB FAMILY 11 Business Technical	12 Arts and Recreation Technical	13 General Management/ Administration	14 Spec. Management/ Administration	15 Administrative Support
Panel Size	11	11	11	11	12
Job Series	1101 1102 (2) 1106 1670 (2) 2001 (4) 2005	188 (2) 1016 1020 (2) 1060 1081 1082 1083 1084 (2)	301 (5) 341 343 (2) 345 (3)	080 345 346 (4) 673 1101 (2) 1144 1601	203 (3) 204 (3) 344(2) 990 (2) 1702 1087
Grade Level	GS-07 GS-09 (5) GS-11 (2) GS-13 GS-14 (2)	GS-09 (2) GS-10 GS-11 (2) GS-12 (4) GS-13 GS-14	GS-11 GS-12 (4) GS-13 (2) GS-14 (3) GS-15	GS-07 GS-10 GS-12 (4) GS-13 (4) GS-15	GS-05 GS-06 GS-07 (3) GS-08 (3) GS-09 GS-10 GS-11 GS-12
Avg Grade Level	10.46	11.36	12.91	12.00	8.17
Sex Group	Male (5) Female (6)	Male (7) Female (4)	Male (7) Female (4)	Male (9) Female (2)	Male (5) Female (7)
Minority Group	Black (4) Spanish Surnamed (3) Other (4)	Black (4) Spanish Surnamed (3) Other (4)	Black (2) Spanish Surnamed (4) Other (5)	Black (4) Spanish Surnamed (4) Other (3)	Black (4) Spanish Surnamed (4) Other (4)
MAJCOM	AF Log Com (6) Strategic Air Com (2) AF Sys Com Tactical Air Com (2)	USAF Academy AF Reserves 1947 Admin Sup Gp Air Training Com (2) AF Info & News Ctr AF Log Com (2) AF Man & Pers Ctr AF Sys Com (2)	Air Training Com AF Communication Com HQ USAF (2) AF Log Com (5) AF Sys Com (2)	USAF Academy AF Commissary Svc AF Log Com (6) AF Sys Com (3)	USAF Academy AF Actng & Fin Ctr AF Reserves (3) Air Training Com (2) AF Legal Svc Ctr Mil Airlift Com AF Man & Pers Ctr AF Sys Com (2)
Education Level	High Sch w/Grad (3) College, No Degree (4) Associate Bachelor's Master's or Ph.D (2)	High Sch, w/Grad (3) College, No Degree (4) Bachelor's (3) Master's or Ph.D	High Sch w/Grad College, No Degree (4) Bachelor's Grad Work, No Degree Master's or Ph.D (4)	High Sch, No Grad High Sch w/Grad College, No Degree Associate (2) Bachelor's Grad Work, No Degree (3) Master's or Ph.D (2)	High Sch w/Grad (4) College, No Degree (8)
Supervisory Status	Supervisor (7) Nonsupervisor (4)	Supervisor (6) Nonsupervisor (5)	Supervisor (5) Nonsupervisor (6)	Supervisor (7) Nonsupervisor (4)	Supervisor (6) Nonsupervisor (6)
Local Area Status	Local (4) Nonlocal (7)	Local (4) Nonlocal (7)	Local (4) Nonlocal (7)	Local (3) Nonlocal (8)	Local (5) Nonlocal (7)
Avg Time in Service	21.20 years	20.18 years	23.34 years	22.51 years	22.28 years
Avg Time in Series	11.75 years	15.22 years	11.11 years	10.30 years	10.81 years
Avg Time in Grade	3.73 years	6.44 years	4.89 years	4.90 years	1.66 years
Avg Age	46.82 years	49.09 years	46.64 years	48.36 years	46.50 years

NOTE: Numbers in parentheses to the right of entries indicate the frequency, if more than one.

TABLE C1. (Continued)

Characteristic	JOB FAMILY 16 General Clerical	17 Keyboard Clerical	18 Wage Supervisory	19 Electrical Repair and Service	20 General Mechanical
Panel Size	11	10	10	11	11
Job Series	301 303 (2) 305 2006 (4) 2091 2134 2151	303 312 318 (4) 322 388 390 678	2600 3500 3800 5400 5700 6600 6900 7400 (2) 8200	2500 2600 (9) 2800	3400 3600 3700 3800 (2) 4100 4200 4600 8800 (3)
Grade Level	GS-04 GS-05 (5) GS-06 (3) GS-07 GS-09	GS-06 (2) GS-07 (4) GS-08 (2) GS-09 (2)	WS-06 WS-07 WS-08 WS-09 (2) WS-10 WS-11 WS-15 (2) WS-16	WG-10 WG-11 (2) WG-12 (3) WG-13 WS-12 (2) WS-14 WS-15	WG-09 (2) WG-10 WG-13 WG-14 WS-09 WS-10 (2) WS-13 (3)
Avg Grade Level	5.73	7.40	10.60	WG 11.57 WS 13.25	WG 11.00 WS 11.33
Sex Group	Male (6) Female (5)	Male (2) Female (8)	Male (10) Female (1)	Male (9) Female (2)	Male (9) Female (2)
Minority Group	Black (4) Spanish Surnamed (4) Other (3)	Black (3) Spanish Surnamed (3) Other (4)	Black (3) Spanish Surnamed (3) Other (4)	Black (4) Spanish Surnamed (3) Other (4)	Black (4) Spanish Surnamed (3) American Indian Other (3)
MAJCOM	Air Training Com (2) AF Commissary Svc AF Log Com (3) Mil Airlift Com Strategic Air Com AF Sys Com Tactical Air Com (2)	Air Training Com AF Communication Com (2) HQ USAF AF Log Com (2) AF Man & Pers Ctr AF Off Spec Inves AF Sys Com (2)	Air Training Com AF Commissary Svc AF Log Com (7) Mil Airlift Com	Air Training Com AF Communication Com Elec Sec Com AF Log Com (5) Mil Airlift Com (2) Tactical Air Com	USAF Academy AF Reserves AF Log Com (6) Mil Airlift Com AF Sys Com (2)
Education Level	High Sch w/Grad (5) College, No Degree (4) Associate (2)	High Sch, w/Grad (6) College, No Degree (5)	High Sch, No Grad High Sch w/Grad College, No Degree (7) Associate	High Sch w/Grad (3) College, No Degree (4) Associate (3) Bachelor's	High Sch, No Grad (3) High Sch w/Grad (3) College, No Degree (2) Associate (2) Bachelor's
Supervisory Status	Supervisor (7) Nonsupervisor (4)	Supervisor (4) Nonsupervisor (6)	Supervisor (10)	Supervisor (5) Nonsupervisor (6)	Supervisor (6) Nonsupervisor (5)
Local Area Status	Local (3) Nonlocal (8)	Local (4) Nonlocal (6)	Local (2) Nonlocal (8)	Local (4) Nonlocal (7)	Local (3) Nonlocal (8)
Avg Time in Service	17.08 years	23.41 years	20.98 years	22.80 years	17.84 years
Avg Time in Series	6.88 years	10.05 years	13.58 years	11.54 years	12.32 years
Avg Time in Grade	4.04 years	3.70 years	4.29 years	6.51 years	2.80 years
Avg Age	44.27 years	43.89 years	46.80 years	48.64 years	39.67 years

NOTE: Numbers in parentheses to the right of entries indicate the frequency, if more than one.

TABLE C1. (Continued)

Characteristic	JOB FAMILY 21 Basic Shop Operations	22 System Repair and Services	23 General Equip Operations
Panel Size	11	12	12
Job Series	3500 (2) 4400 (2) 6700 (6) 6900	3300 (2) 5300 (2) 5800 (2) 6600 8200 (3) 8600 (2)	4700 (4) 5400 5700 (7)
Grade Level	WG-07 (3) WG-10 WG-11 WS-07 WS-08 (3) WS-09 (2)	WG-10 (3) WG-11 (2) WS-10 (3) WS-11 WS-12 WS-14 (2)	WG-07 (2) WG-08 (2) WG-09 WG-10 WS-10 WS-11 (2) WS-13 (2) WS-14
Avg Grade Level	WG 8.40 WS 8.17	WG 10.40 WS 11.67	WG 8.17 WS 12.00
Sex Group	Male (7) Female (4)	Male (9) Female (3)	Male (11) Female (1)
Minority Group	Black (3) Spanish Surnamed (6) Oriental (1) Other (3)	Black (4) Spanish Surnamed (4) Other (4)	Black (4) Spanish Surnamed (4) Other (4)
MAJCOM	USAF Academy Air Training Com AF Commissary Svc AF Log Com (7) Mil Airlift Com	AF Log Com (10) Mil Airlift Com AF Sys Com	Air Training Com (3) AF Log Com (4) Mil Airlift Com (3) Strategic Air Com Tactical Air Com
Education Level	High Sch, No Grad High Sch w/Grad (6) College, No Degree (3) Associate Bachelor's	Eight Grade or lower High Sch, No Grad High Sch w/Grad (4) College, No Degree (4) Bachelor's Grad Work, No Degree	High Sch w/Grad (6) College, No Degree (4) Associate (2) Grad Work, No Degree
Supervisory Status	Supervisor (5) Nonsupervisor (6)	Supervisor (6) Nonsupervisor (6)	Supervisor (6) Nonsupervisor (6)
Local Area Status	Local (3) Nonlocal (8)	Local (4) Nonlocal (8)	Local (3) Nonlocal (9)
Avg Time in Service	21.31 years	20.81 years	24.67 years
Avg Time in Series	10.70 years	14.61 years	14.46 years
Avg Time in Grade	4.20 years	3.14 years	6.19 years
Avg Age	38.20 years	46.92 years	46.82 years

NOTE: Numbers in parentheses to the right of entries indicate the frequency, if more than one.

group candidates who met the desired experience, job series, and grade-level criteria. Panel membership from the Bexar County area was frequently overrepresented, since local employees were used as replacements for last-minute cancellations.

Promotion Potential Factors

The 24 possible promotion potential factors presented to all job families are given in Table C-2. A full description of the factors was given earlier in Appendix B. A copy of this list, along with the Job/Worker Characteristics Ratings booklet (which defines each factor and its rating scale), was given to each panel member for use in the selection task.

Table C-2. List of Candidate Factors

FACTOR NUMBER	SURVEY BOOKLET NUMBER	FACTOR DESCRIPTION
1	I - 1	OVERALL JOB PERFORMANCE IN PRESENT JOB
2	I - 4	CAPABILITY TO SERVE IN A SUPERVISORY POSITION
3	I - 5	CAPABILITY TO SERVE IN A MANAGERIAL POSITION
4	III - A	ENERGY
5	III - B	SKILL
6	III - C	COMPLETION
7	III - D	SELF-SUFFICIENCY
8	III - E	LEADERSHIP
9	III - F	RESPONSIVENESS
10	III - G	UNDERSTANDING OF OTHERS
11	III - H	ORIGINALITY
12	III - I	PRIDE IN WORK
13	III - J	LEARNING ABILITY
14	III - K	SPEAKING ABILITY
15	III - L	WRITING ABILITY
16	IV - A	ARITHMETIC COMPUTATION
17	IV - C	DATA INTERPRETATION
18	IV - H	READING ABILITY
19	VII - 1	SPEED IN COMPLETING WORK
20	VII - 2	PRODUCTIVITY DURING WORK TIME
21	VII - 3	PERCENTAGE OF TIME ON THE JOB WORKING
22	VII - 4	INITIATIVE IN STARTING & COMPLETING PROJECTS
23	III	SUM OF TRAIT RATINGS
24	VII	SUM OF MOTIVATION MEASURES

Preparation of Sample Promotion Records

All promotion records presented to the PPDPs were drawn from those who participated in the CONUS-wide field test of the expanded Civilian Potential Appraisal System in November 1979 - May 1980. Full details of the sampling procedures and response rate for this field test are given in Appendix B. The records of all job family employees who had a complete Demographic Questionnaire-Worker and either a complete supervisor's or a complete co-worker's Job/Worker Characteristics Rating were presented to the appropriate panel. All records displayed to the panels came from this field test; no artificial data were generated.

For purposes of the PPDP exercise, the relevant data for each employee were presented on 6.5 by 3.5 inch cards that displayed the relevant promotion factors representing one employee (see Figure C-1). Each card displayed the panel member's name and number, deck number, job family name and number, and case number. The promotion factors (those chosen by the panel during the factor selection activity), along with the employee's scores on these factors, were given at the bottom of the card. To provide anonymity to the employee and prevent any unnecessary distractions or possible charges of rater bias, no employee demographic or identifying information such as name, race, sex, or series, was placed on the card.

PANEL MEMBER	07	MARIAN MARTENS	CASE 52
DECK NUMBER	07		
JOB FAMILY	11	BUSINESS TECHNICAL	

SCORE	FACTOR . . . . .
7	OVERALL JOB PERFORMANCE IN PRESENT JOB
6	SKILL
9	SELF-SUFFICIENCY
9	RESPONSIVENESS
6	PRIDE IN WORK
8	LEARNING ABILITY
9	READING ABILITY
3	PRODUCTIVITY DURING WORK TIME
5	INITIATIVE IN STARTING & COMPLETING PROJECTS
16	SUM OF TRAIT RATINGS

Figure C-1. Sample Card

The total set of cards for each panel member was divided into decks of 48 to 100 cards each, with a target size of 70 to 80 cards. Each deck represented a single grade level or group of adjacent grade levels, depending on the grade-level combinations needed to compose decks of the desired size. In some instances, the cases for a single grade level were randomly split into two or more decks because of the large number of cases for that grade level.

In addition to the basic data decks, each job family panel member was given one reliability deck and (with the exception of the five Wage Grade families) two to five supervisory decks. The reliability deck was a duplicate of one of the nonsupervisory data decks and was included to determine each panel member's consistency in applying a particular promotion policy to different data decks. This reliability deck was selected from the largest grade-level grouping in each family; thus, it was usually one of the decks near the middle of the grade-level range. The supervisory decks also duplicated certain decks that were used in the nonsupervisory set; however, the cards in the supervisory decks reflected the factors the panelists had chosen during the supervisory portion of the factor selection process. The number of supervisory decks reflected the proportion of supervisors in the job family, and the decks were chosen to reflect the grade levels with the highest densities of supervisors. Panel members were not told that the reliability or supervisory decks contained cases they had seen previously, and no panel member questioned whether or not these were unique cases.

Table C-3 presents the data deck compositions for the 23 job families. The number of total case records per family ranged from 538 to 1053; however, these were not all unique cases, due to the presence of the reliability and supervisory decks. The Wage Grade families (Job Families 19 through 23) had no supervisory decks, since there are no supervisory positions in these families. Job Family 18 (Wage Supervisor) had nine basic decks (since all employees in this family are supervisors) and four "upgrade" decks, to provide a policy for promotion from a Wage Grade nonsupervisor to a Wage Supervisor position.

Table C-3. Data Deck Composition

Job Family	Deck Type	Grade Range	Number of Decks	Total Number of Cases
1	Nonsup	GS 5-15	10	797
	Sup	GS 12-15	3	256
2	Nonsup	GS 7-15	5	396
	Sup	GS 7-15	2	167
3	Nonsup	GS 5-15	9	587
	Sup	GS 10-15	3	189
4	Nonsup	GS 2-15	9	615
	Sup	GS 6-15	5	324
5	Nonsup	GS 5-15	8	529
	Sup	GS 11-15	3	206
6	Nonsup	GS 4-15	9	631
	Sup	GS 8-15	3	198
7	Nonsup	GS 3-13	6	418
	Sup	GS 5-13	2	141
8	Nonsup	GS 3-14	10	724
	Sup	GS 7-14	4	278
9	Nonsup	GS 3-13	9	660
	Sup	GS 7-13	3	214
10	Nonsup	GS 3-15	8	657
	Sup	GS 6-15	4	315
11	Nonsup	GS 2-15	11	782
	Sup	GS 6-15	3	229
12	Nonsup	GS 3-14	7	504
	Sup	GS 8-14	3	225
13	Nonsup	GS 5-15	9	605
	Sup	GS 5-15	4	283
14	Nonsup	GS 4-15	8	495
	Sup	GS 4-15	5	315
15	Nonsup	GS 3-11	10	634
	Sup	GS 6-11	3	209
16	Nonsup	GS 1-9	9	717
	Sup	GS 4-9	2	162
17	Nonsup	GS 2-11	12	799
	Sup	GS 5-11	2	114
18	WS to WS[a]	WS 1-16	9	637
	WG/WL to WS[b]	WS 1-8	4	232
19	Nonsup	WG/WL 5-13	11	750
20	Nonsup	WG/WL 4-14	8	538
21	Nonsup	WG/WL 1-12	9	611
22	Nonsup	WG/WL 3-13	7	558
23	Nonsup	WG/WL 4-14	8	646

[a]These decks were used to develop the policy for a promotion within the Wage Supervisor schedule.

[b]These decks were used to develop the policy for a promotion from the Wage Grade to the Wage Supervisor schedule. Grade range indicates the possible grade range of the position to be filled, rather than the promotion candidates.

Administrative Procedures

Each panel member, who was confirmed by the CCPO, received an information packet describing the purpose of the PPDP exercise, the techniques to be used for selecting and weighting the promotion factors, the application of the final CPAS system, panel member selection procedures, and logistical details. The packet also contained a listing of the job series in the member's job family and information on the Randolph AFB area, where the panels were to be assembled.

All panels were assembled at Randolph AFB on successive weeks from 22 July through 21 September 1980. Most panels met for 4 work days. The first three panels met successively during the first three weeks and were specially chosen to represent anticipated problems so the lessons learned could be applied to subsequent panels. The first panel to meet was Job Family 10, Accounting and Finance Technical. This panel was chosen because it was likely to experience those difficulties common to any job family having a wide grade spread and heterogeneity of job series. Similarly, Job Families 1 (Engineering, Physical Science, and Mathematical Professional) and 14 (Specialized Management/Administration), also judged to be representative families, were the next to convene. All other panels followed in numerical sequence, with four panels meeting each subsequent week of the project.

The panels were greeted en masse and given a brief keynote address by a representative of the Office of Civilian Personnel Operations (OCPO). The panels were then separated and turned over to the respective panel leaders. (Two representatives of AFHRL and two representatives of McFann-Gray & Associates served as panel leaders for each week in which there were four panels meeting.) The panel leader covered administrative details and delivered a thorough briefing concerning the purpose of the PPDP, history of the CPAS development, application of the CPAS to PPRS, job family definition, panel member selection, and basics of the PPDP procedures (select-sort). The panel leader emphasized that the panel's primary task was to answer the question: "Which workers will perform their jobs best if promoted to the next grade level?" The panel was to answer this question by, first, selecting a set of relevant promotion factors and, second, sorting a number of case records of employees in the order of their promotion potential. It was emphasized that the promotions concerned were to the next-highest grade level, in order for the panels to have a firm reference in their promotion decisions. The distinction between current job performance (as covered by the Job Performance Appraisal System, or JPAS) and promotion potential was made clear, and the panels were instructed to concentrate on the aspect of promotion potential. In short, they were to identify those factors that are observable in the current job and are most related to performance at the next higher level in the job family.

An area of some concern to many panel members was how the decisions of a small group of panel members would be generalized to a large number of diverse job series. Panel members were told that they did not need to know the details of job duties and tasks of the other series in their job family beyond those details known through their personal experience.

The select portion of the PPDP exercise was conducted on the afternoon of the first day. The panel leader gave a brief but detailed description of the rules for the selection process. The panel's primary task was to reduce the List of Candidate Factors to the 6 to 10 factors that would be used in the panel's own sorting exercise and in the operational promotion system. Panels were limited to 10 factors because experience with policy capturing indicates that members cannot really consider more than 10 factors (Black, 1973; Gott, 1974; Koplyay, Albert, & Black, 1976). Where a panel thought that more than 10 of the factors were important, they were advised to construct composite factors so that no more than 10 appeared for consideration. Each panel (except the Wage Grade panels) was to select two such sets of factors: the first for nonsupervisory jobs and the second for supervisory jobs. The prescribed technique was to consider all the factors, take an initial vote on the members' preferences, discuss each factor, and come to a consensus on which factors to use. The panel leader went over each group of items in the List of Candidate Factors (see Table C-2) and showed the panel members how to refer from the list to the corresponding items in the Job/Worker Characteristics Rating booklet. The leader also discussed Factor 23 (Sum of Trait Factors) and Factor 24 (Sum of Motivation Measures), emphasizing that Factor 23 might be composed of any or all of Factors 4 through 15, and Factor 24 might be composed of any or all of Factors 19 through 22. The panel was told that they could select the factors to make up each composite. However, neither of these two composite measures could include any items that had been selected as individual trait/motivation factors.

The panels were given 2 hours to select the set of nonsupervisory factors and 1 hour to select the supervisory factors. Throughout the discussion, the panel leader remained in the conference room to answer questions and provide direction to the groups. The panel leader also had a series of computer printouts showing the frequency distribution, intercorrelations, and index of potential adverse impact for the candidate factors. The leader would occasionally use this information to advise the group on any item that showed undesirable statistical characteristics. However, for the most part, the panel members were given a free rein in the selection process. As soon as each set of factors was selected, the list was communicated to the AFHRL computer programmers who began overnight preparation of the data decks for use by the panels in the sort procedure the following day.

The sort portion of the exercise began on the second morning and continued until the panel members completed work on their individual decks. The panel leader gave a brief, detailed description of the sort rules. The task for each panel member was to rank-order each deck from the most-promotable worker to the least-promotable worker. The panel members were instructed to work individually and avoid any discussion about which factors they preferred, which workers should be ranked high, etc. Panelists were also informed of helpful techniques for working through the decks. It was emphasized that the panelists should be consistent within a grade level and try to apply the same policy to all cases at that level; however, they could change their policy from grade level to grade level, if they thought it appropriate.

At the start of the sort process, the panel leader displayed (a) the minimum and maximum values for each factor, and (b) the data deck compositions, including deck number, number of cases, grade level(s), and supervisory/nonsupervisory status, for each deck. The panel leader remained in the conference room with the panel at all times for immediate availability and to ensure that the decks were passed out and collected in an orderly manner. The panel members worked independently, at their own rates, rank-ordering each deck. For each deck, the cards were arranged by individual panel members in descending order of promotability, from the most promotable worker to the least promotable worker. Each panel member worked with only one deck at a time and examined the decks in numerical sequence beginning with Deck 1. The panel leader recorded the starting and finishing times for each member and briefly scanned the decks for obvious discrepancies (e.g., a deck ranked in reverse order, out of proper numerical sequence, or only partially completed). If necessary, the decks were returned for reaccomplishment. The average time spent on each deck was approximately 45 minutes, and most panel members finished the sort process by the end of the third workday or the middle of the fourth workday. A great deal of variation in individual working time per deck was noted. An individual average of 25 minutes per deck was found to be the fastest working time, while 115 minutes was the slowest.

Quality Control and Data Reduction of Panel Rankings

Twice each day during the sort portion of the exercise, the completed decks were collected from the panel leaders and carried to the AFHRL Technical Services Division for immediate keypunching of the ranking data. A total of three keypunched cards contained the essential information on each deck: panel member identification number, deck number, job family identification number, and case identification numbers of each of the rank-order positions within a single deck. Keypunchers also provided backup editing functions, such as checking for missing cards, spotting misplaced cards, etc. Approximately 75% of the ranked decks were keypunched, briefly edited, and corrected (if necessary) before the panel members left Randolph AFB. In three instances, deck errors were spotted after the panel members had left. These decks were then mailed out to the appropriate panel members, following a telephone contact, and returned within 2 weeks.

All of the edited ranking data were merged with the display data for each deck and each board member, and "criterion ranking value" was generated for each record. This criterion value was generated by converting the ranks to percentile scores, so that the cases with the highest rankings (i.e., lowest numerical values) received the highest percentile scores. This procedure allowed rank-ordered decks of different sizes to be directly compared and avoided an inevitable string of negative correlations.

IV. RESULTS OF PANEL DATA ANALYSES

Promotion Factor Selection

The majority of the 24 candidate promotion factors were used by one policy panel or another, as either a primary factor or part of a composite factor

(i.e., Factor 23 or 24). Only Factor 16, Arithmetic Computation, was not used by any panel. Factor 2, Supervisory Capability, and Factor 3, Managerial Capability, were used frequently for the supervisory selections but only once for the nonsupervisory selections. With the exception of these three factors, all other factors were used frequently for both the supervisory and nonsupervisory selections.

The number of factors used per job family was also quite high. For the nonsupervisory selections, the median number of factors used (as either a primary or as part of the composite) was 15, with a range of 7 through 20. For the supervisory selections, the median was 14, with a range of 8 through 22.

These findings were quite important in the final development of the rating form which was to be used in the operational CPAS system. A single, universal rating form -- one that would apply to all promotion-eligible candidates in the Air Force -- was highly desirable. Although the difference in the number of factors used by each job family would favor a separate form for each job family and for each supervisory/nonsupervisory category, the high incidence of crossflow between different job families would make the costs and logistics of using numerous forms almost prohibitive. Evidence of the high crossflow in the current civilian personnel force was empirically demonstrated by a study conducted by the Office of Civilian Personnel Operations. They showed that more job vacancies are filled by persons working in another job family than are filled by persons promoted within a job family.

From a practical or economical standpoint, the development and use of a single form for all job families would mean that all employees would have a current rating on all CPAS factors; thus, a promotability ranking score (CPAS score) could be generated for any employee for any job family. Such a system would allow an employee to be considered for any job whenever the occasion arose without the need for completing another rating form. On the other hand, even though a single form is desirable, it does have some disadvantages. A large number of rating factors will have the tendency to decrease the amount of attention the rater gives to each rating, thereby increasing the possibility of halo effect. Consequently, the value of the ratings on the "key" promotion factors for any given job family may be diluted. These disadvantages to the development of a universal rating form had to be considered in the final development of the operational CPAS form.

Many of these disadvantages to a single rating form were eliminated as subsequent analyses were accomplished in the development of the weighted algorithms. For example, those factors found to be consistently zero-weighted in the policy equations were eliminated, reducing the total number of factors appearing on the final form.

Identification of actual promotion factors selected by job family category has been removed from this paper in compliance with the Directorate of Civilian Personnel's decision that the specific job family factors would be considered "Privileged Information."

Promotion Weighting Systems Developed

Development of the operational CPAS promotion factor weighting systems or algorithms involved four basic actions: (a) evaluation of the consistency with which panel members ranked the promotion records and removal from further consideration of any member who did not show intra-rater consistency, (b) evaluation of the degree to which a panel member's policy could be replicated mathematically and remove any member from further consideration whose policy could not be replicated, (c) identification of the minimum numbers of grade-level and supervisory and nonsupervisory within job family policies necessary for accurate rankings, and (d) reduction of the resulting policies or algorithms to the simplest form possible for operational use without sacrificing accuracy.

Consistency Analysis. One of the initial concerns in the analysis of the policy-capturing data is whether each panel member maintained an acceptable level of consistency throughout the rank-ordering task. Specifically, if during the CPAS exercises a panel member's policy shifted across several decks pertaining to the same grade level category, the resulting policy equation (based on all the decks that member ranked) would be inconsistent. As a result, the validity of this policy equation would be questionable, and its use in developing the CPAS would be undesirable. To check panel member consistency, two identical decks, about which the panel members had no prior knowledge, were included among the set of decks ranked by each panel member. The consistency of the rankings assigned to cases in the duplicate decks was checked for each panel member by computing the Pearson product-moment correlation coefficient for the two sets of rankings. Table C-4 summarizes the results of the consistency analysis for all 23 job families, with an interval frequency distribution of the resulting correlation coefficients by job family. For example, all of the correlation coefficients that resulted from the 11 Job Family 3 panel members fell in the interval .95 through 1.00.[1] While all the correlations represented in Table C-4 are statistically significant, in a consistency analysis, statistical significance is not the exclusive criterion for determining an acceptable level of consistency. The general practice is to screen out from consensus policy development any panel members whose duplicate deck correlations deviate greatly from 1.0 and are substantially different from those of the other panel

[1]The possible range of values for a Pearson correlation coefficient is -1.0 to 1.0 with -1.0 indicating a perfect negative relation, .0 indicating no relation, and 1.0 indicating a perfect positive relation.

members. Although setting a specific minimum cutoff correlation is an arbitrary decision, past studies conducted by the AFHRL development team have typically used a correlation of .80 as the cutoff for intra-rater consistency. The same cutoff was used for this study. For example, in Table C-4 the data for Job Family 20 indicate that one of the panel members had a correlation of less than .80 (actual correlation was .68) while the other 10 members on the panel had correlations of .90 or more. Consequently, the data for the panel member in question were not considered to be satisfactorily consistent and were not used in the subsequent analysis for consensus policy development. None of the other coefficients represented in Table C-4 were considered to be unsatisfactory. In fact, 96% of them were in the highly satisfactory range of .90 through 1.00, with the remaining correlations falling no lower than .80.

Identification of Consensus Panel Members. The objective of this phase was to determine if a single equation could effectively be used to represent the rank-ordering policies of all the members of a panel and to provide that equation for operational use. If the panel equation differed from that of an individual panel member or members, the reason for the deviation must be explored and resolved. Since, for most job families, the panels provided data for both a nonsupervisory and a supervisory policy, this investigation was carried out twice for each job family. The procedure consisted of, first, developing a separate nonsupervisory (and supervisory) policy equation for each panel member, and then inputting each respective set of policy equations (nonsupervisory and supervisory) to a hierarchical grouping analysis to determine which panel members (hopefully all) had similar policies.

Table C-4. Consistency Analysis as Reflected by Correlations Between Duplicate Deck Rankings

Job Family	Number of Panel Members Having Correlation Coefficients in the Interval				
	less than .80	.80-.84	.85-.89	.90-.94	.95-1.00
1	0	1	0	0	10
2	0	0	0	2	8
3	0	0	0	0	11
4	0	0	0	2	10
5	0	1	1	0	10
6	0	0	0	0	11
7	0	0	0	0	12
8	0	0	0	1	11
9	0	0	0	1	9
10	0	0	0	0	11
11	0	0	0	1	10
12	0	1	0	0	10
13	0	0	0	1	10
14	0	0	2	0	9
15	0	0	0	0	12
16	0	0	0	1	10
17	0	0	0	0	10
18	0	0	0	0	10
19	0	0	0	2	9
20	1[a]	0	0	3	7
21	0	0	0	2	9
22	0	0	2	1	9
23	0	0	0	1	11

[a]The value of this correlation is .68. The data for this panel member were not used for CPAS development.

Development of individual panel member equations was accomplished using regression analysis. A description of regression analysis as applied in this study can be found in Bottenberg and Ward (1963). In this application of regression analysis, the objective is to develop a system of weights for the given set of promotion factors (or independent variables). The weights, when applied in a weighted sum with the respective promotion factor scores for a given employee, should approximate or predict the ranking (or dependent variable value) assigned to the employee by a given panel member.

The dependent or criterion value for the CPAS regression analyses consisted of the set of percentile ranks derived separately by deck from the panel member's rank-orderings.[2] To avoid negative correlations between the promotion factors and the percentile rank criterion, records with the highest rankings (i.e., lowest numerical values) received the highest percentile scores. The set of independent or predictor variables used in a given regression analysis consisted of the set of variables derived by multiplying each promotion factor by a set of binary (0, 1) variables corresponding to the grade-level categories involved. In each analysis, there were a x b predictors, where a = the number of promotion factors and b = the number of pertinent grade-level categories.[3] This "promotion factor by grade level" regression model was necessitated by the fact that the panel members were allowed to change their policies for different grade-level categories. However, this regression model was used only for this phase of the policy-capturing analysis, with subsequent regressions in later phases involving only one grade-level category at a time.

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[2]Percentile ranks were used as the criterion values in lieu of the actual rank-order values assigned by the panel members since deck sizes varied. For example, since the promotion factor scores for a case ranked 50th in a deck of 50 records probably do not reflect the same level of promotability as those of a case ranked 50th in a deck of 90 records, the regression criterion values for two such cases should not be the same. An acceptable alternative to the actual rank-ordering was the use of percentile ranks.

[3]The values for an employee on the predictor variables, Pij, for this model were defined as follows: Pij = score on promotion factor i if the employee is in grade-level category j; 0, otherwise for i = 1, 2, 3, . . ., a and j = 1, 2, 3, . . ., b.

In reviewing the results of the regression analyses that produced the individual panel member policy equations, the primary concern was the predictive accuracy of each equation (i.e., how well did the policy equation replicate a panel member's policy). The measure of predictive accuracy of a regression equation is the squared multiple correlation coefficient (R^2 or coefficient of multiple determination), and it indicates the proportion of the total variation about the criterion mean explained by the regression model or equation. In general, the predictive accuracy of a policy equation is a function of the adequacy of the regression model (i.e., the set of predictor variables) and the internal consistency of the panel member who provided the rank-orderings. Based on past experience, the AFHRL developers set an arbitrary R^2 value of .81 as the minimum acceptable multiple correlation for a panel member's measure of internal consistency. Values below .81 indicate that 20 percent or more of the variability in ranking assigned by that panel member is not consistent with the information available in making those rankings; hence, the member is not using the information consistently. Thus, in the process of reviewing the predictive accuracies, low R^2s were carefully scrutinized to determine whether they were the result of a generally inadequate regression model or were the result of an inconsistent panel member. The R^2s which resulted for the 23 sets of nonsupervisory policy equations developed in this phase are reported in Table C-5, which displays an interval frequency distribution of the R^2s by job family. For example, for Job Family 1, it is shown that 10 of the 11 Job Family 1 panel members had nonsupervisory policy equations with predictive efficiencies in the interval .90 through .93. This indicates that these 10 policy equations contain 90% to 93% of the information necessary to make perfect predictions of the panel member rankings. All but one of the R^2s displayed in Table C-5 fall in an acceptable range of values (.81 through .97). The unsatisfactory value, .66, resulted for one of the 12 panel members for Job Family 22. Since the R^2s for the remaining Job Family 22 members are in the interval .86 to .97 and indicate no general problem with the adequacy of the regression model for Job Family 22, it was concluded that the low R^2 value was the result of inconsistent ranking procedures employed by the panel member in question. Consequently, the data for this panel member were not used in the development of the Job Family 22 nonsupervisory CPAS.

Table C-5. Predictive Efficiency of Panel Member Nonsupervisory Policy Equations

Job Family	Number of Panel Members Having Policy Equations with Predictive Efficiencies (R^2s) in the Interval				
	less than .81	.81-.85	.86-.89	.90-.93	.94-.97
1	0	0	1	10	0
2	0	0	5	5	0
3	0	1	6	4	0
4	0	0	0	4	8
5	0	1	2	9	0
6	0	0	0	11	0
7	0	0	3	9	0
8	0	0	0	6	6
9	0	0	0	8	2
10	0	0	1	2	8
11	0	1	1	9	0
12	0	0	1	9	1
13	0	0	10	1	0
14	0	0	1	10	0
15	0	0	0	7	5
16	0	0	1	3	7
17	0	0	6	4	0
18	0	0	0	5	5
19	0	0	1	6	4
20	0	0	3[a]	7	1
21	0	0	1	1	9
22	1[b]	0	2	3	6
23	0	1	0	3	8

[a]One of these panel members was not used for CPAS development as a result of having a .68 correlation between duplicate deck rankings (see Table C-4).

[b]The value of this R^2 is .66. The data for this panel member were not used for CPAS development.

Information on the predictive efficiencies of the supervisory policy equations developed in this phase is summarized in Table C-6. The information given in Table C-6 is analogous to that provided in Table C-5, with the exception that data are displayed for job families 1 through 18 only, since a supervisory CPAS was needed only for those job families. All of the R^2 values reflected in Table C-6 fall in a highly satisfactory range, .85 to .98. As a result, these supervisory policy equations (represented in Table C-6) were used in the development of the supervisory CPAS.

As previously indicated, the next step in this phase of the analysis was to determine if, and how, the individual panel member policies can be combined to form a single panel policy. The process was to input each respective set of member policy equations (nonsupervisory and supervisory) for a job family to a separate hierarchical grouping analysis. The results of such an analysis provide the basis for determining how to combine the separate panel member policies into a single policy which best represents the consensus opinion of the panel. The hierarchical grouping analysis begins with the separate policy equations of the panel members and iteratively combines two equations or two groups of equations present at the previous iteration. The process continues until all the policy equations are combined into a single group. The two systems that are combined at a given stage of the process are those that are the most similar to one another at that point. They are selected on the basis of minimum loss in overall predictive accuracy when a compromise or joint equation is substituted for the separate systems. The overall predictive accuracy is a maximum at the start of the grouping process when separate policy equations are employed for each panel member. At subsequent iterations, the predictive efficiency decreases by successively larger amounts when compromise policies are substituted for the separate policies being combined. An appreciable decrease in overall predictive accuracy is an indication that the policies being combined are dissimilar and signals the stage of the analysis which identifies the largest, most homogeneous groupings of the panel members. A decision point for how much loss in predictive accuracy is excessive is usually an arbitrary decision made by the research scientist. For purposes of this analysis, no arbitrary a priori cutoff was set. An R^2 of less than .75 would, however, have caused concern that the predictive accuracy of a grouping had lost sufficient precision to warrant corrective action. A drop of .10 in any one grouping stage would also have been cause for concern. Typically, in a hierarchical grouping analysis, there is a large subset of panel members found to have similar policies, and it is this group that is used in subsequent analyses for the development of the "consensus" policy equation.

Table C-6. Predictive Efficiency of Panel Member Supervisory Policy Equations

Job Family	Number of Panel Members Having Policy Equations with Predictive Efficiencies (R^2)s in the Interval			
	less than .88	.85-.89	.90-.93	.94-.98
1	0	0	10	1
2	0	1	9	0
3	0	0	1	10
3	0	0	0	12
5	1[a]	0	10	1
6	0	0	1	10
7	0	1	11	0
8	0	0	10	2
9	0	0	0	10
10	0	0	0	11
11	0	0	0	11
12	0	1	7	3
13	0	1	5	5
14	0	0	11	0
15	0	0	1	11
16	0	0	0	11
17	0	0	7	3
18	0	0	3	7
19	Nonapplicable[b]			
20	Nonapplicable[b]			
21	Nonapplicable[b]			
22	Nonapplicable[b]			
23	Nonapplicable[b]			

[a]The value of this R^2 is .85.

[b]In job families 19 to 23, only nonsupervisory policies were developed.

The results for the 41[4] hierarchical grouping analyses performed in this phase of CPAS development are summarized in Table C-7. The information displayed for each job family consists of the overall predictive efficiencies which resulted at the initial and final stages of each grouping analysis (nonsupervisory and supervisory). For comparison purposes, the magnitude of the difference between the initial and final R^2s is also given. For example, in the grouping analysis for Job Family 1 the initial R^2 is .91, whereas the predictive accuracy at the final stage of the grouping analysis is .88, a decrease of only .03. That is, the accuracy in predicting the nonsupervisory rankings provided by the Job Family 1 panel drops by only .03 when one joint policy equation is substituted for the 11 individual policy equations of the Job Family 1 panel members. The outcome of the grouping analysis for the supervisory policy equations of Job Family 1 is similar, with initial and final stage predictive efficiencies of .92 and .87, respectively, which represents a drop of .05 in overall predictive accuracy. The results for Job Family 1 are typical of the results for the remaining 22 job families whose nonsupervisory policy equation groupings resulted in predictive accuracy losses ranging from .02 to .06 (average loss = .04) and whose groupings achieved final stage R^2s in the range of .84 to .89. Similarly, in the supervisory equation grouping results shown in Table C-7, the R^2 drops range from .03 to .07 (average loss = .04) with final stage R^2s in the range of .87 to .93. Such losses in predictive accuracy were considered by the AFHRL developers to be minimal and acceptable for this type of analysis.

Although the standard procedure in most policy-capturing studies is to select the largest, most homogeneous grouping of policy makers present at the stage prior to an appreciable drop (i.e., 1.0 or greater) in the overall predictive accuracy, the results of the 41 grouping analyses in the present study necessitated a modification to that practice. It was concluded that all panel member policy equations should be used in "consensus" policy development since none of the drops in predictive accuracy observed in this study were of sufficient magnitude (from a practical standpoint) to warrant exclusion of any panel members. A review of the largest single drop in overall predictive accuracy within each of the 41 grouping analyses revealed that 90% (or 37 of 41) were of the magnitude .02 or less, with the single largest drop being .07.

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[4]There were 23 nonsupervisory policy equation grouping analyses and 18 supervisory policy equation grouping analyses; a total of 41 grouping analyses.

Table C-7. Initial and Final Stage Overall Predictive Efficiencies Resulting from Hierarchical Groupings

Job Family	Nonsupervisory Policy Grouping			Supervisory Policy Grouping		
	Initial Stage R^2	Final Stage R^2	Decrease in R^2	Initial Stage R^2	Final Stage R^2	Decrease in R^2
1	.91	.88	.03	.92	.87	.05
2	.89	.87	.02	.92	.89	.03
3	.89	.84	.05	.95	.92	.03
4	.94	.91	.03	.96	.89	.07
5	.91	.86	.05	.92	.88	.04
6	.90	.86	.04	.94	.91	.03
7	.91	.88	.03	.91	.87	.04
8	.93	.89	.04	.93	.89	.04
9	.93	.89	.04	.96	.93	.03
10	.94	.91	.03	.96	.93	.03
11	.91	.87	.04	.94	.91	.03
12	.91	.87	.04	.92	.87	.05
13	.88	.85	.03	.93	.90	.03
14	.91	.88	.03	.91	.87	.04
15	.93	.91	.02	.95	.91	.04
16	.93	.89	.04	.96	.90	.06
17	.89	.85	.04	.92	.88	.04
18	.93	.88	.05	.94	.90	.04
19	.93	.88	.05	Nonapplicable		
20	.91	.89	.02	Nonapplicable		
21	.94	.88	.06	Nonapplicable		
22	.92	.89	.04	Nonapplicable		
23	.94	.89	.05	Nonapplicable		

Computation of Promotion Policy Equations. The next task in the development of the CPAS weighting systems was the computation of the policy equations which actually would serve as the source of the weighting systems themselves. Three basic activities were performed in arriving at the final promotion policy equations. First, the consensus policy equations were computed for each grade>level category within a job family. Second, the separate grade category policies within a job family were compared to determine their degree of similarity, and third, additional policy equations were computed when warranted to "collapse" the similar promotion policies across several grade>level categories into a single policy. Since for most job families the panels provided data both for a nonsupervisory and a supervisory policy, this series of activities was carried out for both types of policies.

Consensus policy equation development for each grade>level category within a job family involved the use of regression analysis, with the input to the analysis consisting of the pooled data of the consensus panel members within a job family. The dependent (or criterion) variable values for the regression analyses consisted of the set of percentile ranks derived separately by deck from the panel members' rank>orderings; however, the only employee records used in a given analysis were those belonging to the pertinent grade>level category. The set of independent or predictor variables used in a given regression analysis consisted of the set of promotion potential factors (nonsupervisory or supervisory) selected by the job family panel. The results of the analyses which produced the (consensus) nonsupervisory and supervisory grade>level policy equations are summarized in Tables C>8 and C>9, respectively. In each table, information is provided by job family indicating the number of grade>level categories for which policy equations were derived and the magnitude of the predictive efficiencies (R^2s) for those policy equations in an interval frequency distribution. As an example, Table C>8 indicates that separate nonsupervisory policy equations were derived for five grade>level categories in Job Family 1, all five of which had predictive efficiencies in the range of .86 to .95. These high predictive efficiencies are an indication that the 11 Job Family panel members were indeed using similar policies, and that a single policy equation based on the "pooled" grade>level rank>orderings of the panel members could satisfactorily replicate the judgments of all 11 individual panel members. The data presented in this table for the remaining 22 job families reveal similar results with 80% (81 of 101) of the R^2s falling in the range of .86 to .95 and 19% (19 of 101) falling in the range of .82 to .85. The information in Table C>9 for the supervisory grade level policy equations reveals that 93% (53 of 57) of the R^2s fall in the range of .86 to .95 and 7% (4 of 57) of the R^2s fall in the range of .81 to .85.

Table C-8. Predictive Accuracy of Grade-Level Nonsupervisory Policy Equations

Job Family Categories	No. of Grade	Number of Grade-Level Policy Equations Having Predictive Accuracies (R^2s) in the Interval			
		less than .82	.82 to.85	.86 to .90	.91 to .95
1	5	0	0	2	3
2	2	0	0	2	0
3	4	0	3	1	0
4	6	0	0	1	5
5	5	0	2	2	1
6	4	0	2	1	1
7	3	0	0	3	0
8	7	0	1	3	3
9	4	0	1	3	0
10	6	0	0	3	3
11	5	0	2	2	1
12	4	0	1	3	0
13	4	1[a]	1	2	0
14	5	0	1	4	0
15	5	0	0	2	3
16	3	0	0	2	1
17	4	0	1	3	0
18	7	0	1	3	3
19	4	0	0	4	0
20	4	0	0	3	1
21	6	0	1	4	1
22	3	0	1	1	1
23	6	0	1	1	4

[a]The value is .79.

Table C-9. Predictive Efficiency of Grade-Level Supervisory Policy Equations

Job Family	No. of Grade Categories	Number of Grade-Level Policy Equations Having Predictive Efficiencies (R^2s) in the Interval			
		less than .84	.84 to .85	.86 to .90	.91 to.95
1	3	0	1	1	1
2	2	0	0	1	1
3	3	0	0	0	3
4	5	0	0	3	2
5	3	0	0	2	1
6	3	0	0	1	2
7	2	0	0	2	0
8	4	0	1	1	2
9	3	0	0	0	3
10	4	0	0	0	4
11	3	0	0	1	2
12	3	0	0	3	0
13	4	0	0	2	2
14	5	1[a]	1	1	2
15	3	0	0	1	2
16	2	0	0	1	1
17	2	0	0	2	0
18	3	0	0	0	3
19		Nonapplicable[b]			
20		Nonapplicable[b]			
21		Nonapplicable[b]			
22		Nonapplicable[b]			
23		Nonapplicable[b]			

[a]The value is .81.

[b]In job families 19 to 23, only nonsupervisory policies were developed.

As indicated previously, the next activity in this phase was to compare the separate grade category policy equations within a job family to determine their degree of similarity. The objective here was to simplify the proposed CPAS as much as possible and to identify those grade category policy equations within a job family which were highly correlated and would rank-order promotion eligibles in the same sequence and, hence, could be combined. If combination of grade category policy equations were possible, it would be desirable to implement a single policy equation that can do the same job as two or more which are highly similar. To carry out this investigation within a given job family, "promotion scores" were computed for each employee in the job family sample using each of the separate grade category policy equations.[5] Then, Pearson product-moment correlations between the obtained promotion scores were computed for each grade category subsample separately within supervisory or nonsupervisory classifications. (Nonsupervisory subsample sizes ranged from 48 to 315, whereas supervisory subsample sizes ranged from 48 to 114.) While the intercorrelations obtained are too numerous to report individually, Tables C-10 and C-11 contain interval frequency distributions of the correlations obtained by job family. Table C-10 contains the results for the nonsupervisory policy intercorrelations, and Table C-11 contains the results for the supervisory policy intercorrelations. Both Tables C-10 and C-11 reflect a high degree of similarity among the separate grade-level policy equations developed. Of the 420 intercorrelations computed between the nonsupervisory grade-level policies, 98% are .970 or greater, with 87% being .985 or larger. The smallest intercorrelation reported in Table C-10 is .942. In Table C-11 for the supervisory grade-level policies, 98% of the correlations are .970 or greater, with 80% of them being .985 or higher. The smallest intercorrelation reported among the 138 correlations in Table C-11 is .954. In view of the high similarity between the grade-level policy equations observed generally across all 23 job families, the decision was made by the AFHRL developers to use a single nonsupervisory policy equation and a single supervisory policy equation for each job family to rank-order promotion eligibles within any grade level.

To "collapse" the grade-level (nonsupervisory and supervisory) promotion policies for a job family into a single, final policy equation, regression analysis was used once more. As before, the input to the analysis consisted of the pooled data of the consensus panel members within the job family, and the dependent variable values for the regression analysis consisted of the set of percentile ranks derived separately by deck from the panel members'

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[5]The promotion score for an employee based on a given grade category policy equation is the sum of the scores derived by applying the system of regression weights to his/her scores on the CPAS factors, where the weights are those derived from the regression analysis of the data for that grade category.

Table C-10. Similarity of Nonsupervisory Grade Category Policies as Reflected by Intercorrelations of Promotion Scores by Grade Category Subsample

Job Family	No. of Correlations Computed	Number of Correlations in the Interval			
		less than .955	.955-.969	.970-.984	.985-.999
1	20	0	0	0	20
2	2	0	0	0	2
3	12	0	0	0	12
4	30	0	1	7	22
5	20	0	0	5	15
6	12	0	0	0	12
7	6	0	0	3	3
8	42	0	0	3	39
9	12	0	0	1	11
10	30	0	0	0	30
11	20	0	0	4	16
12	12	0	0	1	11
13	12	0	1	3	8
14	20	1[a]	1	5	13
15	20	0	0	0	20
16	6	0	0	0	6
17	12	0	0	2	10
18	42	1[b]	3	13	25
19	12	0	0	0	12
20	12	0	0	0	12
21	30	0	0	1	29
22	6	0	0	0	6
23	30	0	0	0	30

[a] The value is .942.

[b] The value is .945.

Table C-11. Similarity of Supervisory Grade Category Policies as Reflected by Intercorrelations of Promotion Scores by Grade Category Subsample

Job Family	No. of Correlations Computed	Number of Correlations in the Interval			
		less than .955	.955-.969	.970-.984	.985-.999
1	6	0	0	0	6
2	2	0	0	0	2
3	6	0	0	0	6
4	20	0	0	6	14
5	6	0	0	2	4
6	6	0	0	1	5
7	2	0	0	0	2
8	12	0	0	2	10
9	6	0	0	0	6
10	12	0	0	0	12
11	6	0	0	0	6
12	6	0	0	3	3
13	12	0	0	0	12
14	20	1[a]	1	7	11
15	6	0	0	0	6
16	2	0	0	0	2
17	2	0	0	0	2
18	6	0	0	4	2
19		Nonapplicable			
20		Nonapplicable			
21		Nonapplicable			
22		Nonapplicable			
23		Nonapplicable			

[a]The value is .954.

rank-orderings. However, instead of limiting the sample cases to those in a given grade category, the case data for all grade categories in the given job family were used in the policy equation development. The results of the analyses which produced the final (collapsed) nonsupervisory and supervisory policy equations for each job family are summarized in Table C-12. The information provided consists of the predictive efficiencies achieved by each policy equation. For the nonsupervisory policy equations, the range of R^2 values is .80 to .89, with 65% of the R^2 values falling in the range of .85 to .89. The supervisory policy equations have predictive efficiencies ranging from .83 to .92, with 78% of the R^2 values falling in the range of .85 to .92.

While these levels of predictive accuracy represent moderate losses from what was previously obtained with separate policy equations for each grade-level category, the simplicity afforded to the proposed CPAS as a result of collapsing policies across grade categories amply compensates for the decrease in R^2 values. Additionally, any reservations about the use of the collapsed policy equation in lieu of separate grade-level policy equations are immediately allayed after a review of the data in Tables C-13 and C-14 which contain, by job family, the correlations between the separate grade category policy equations and the collapsed policy equation. (Table C-13 contains information for the nonsupervisory policies, and Table C-14 pertains to the supervisory policies.) In each table, the information shown for each job family consists of the number of grade-level categories for which separate policies were developed and an interval frequency distribution of Pearson product-moment correlations. The correlations reported were computed for each grade category subsample separately (sample size ranges are the same as for Tables C-10 and C-11) between the final policy equation promotion scores and the scores based on the given subsample's own grade-level policy equation. For example, Table C-13 reports that each of the five grade category subsamples comprising the Job Family 1 sample yields a value in the range of .995 to .999 when correlating its respective grade-level policy with the final policy equation for Job Family 1. Both Tables C-13 and C-14 reflect high correlations between the collapsed policy equations and their separate grade-level counterparts, with 94% and 95% of the correlations, respectively, falling in the range of .990 to .999.

Table C-12. Predictive Accuracy of the Final Nonsupervisory and Supervisory Policy Equations

Job Family	Nonsupervisory Policy	Supervisory Policy
1	.85	.84
2	.86	.88
3	.83	.90
4	.86	.84
5	.81	.86
6	.84	.87
7	.84	.84
8	.85	.88
9	.88	.92
10	.89	.92
11	.85	.88
12	.86	.85
13	.83	.87
14	.87	.85
15	.89	.90
16	.88	.90
17	.80	.87
18	.82	.83
19	.86	Nonapplicable[a]
20	.86	Nonapplicable[a]
21	.84	Nonapplicable[a]
22	.88	Nonapplicable[a]
23	.88	Nonapplicable[a]

[a]In job families 19 to 23, only nonsupervisory policies were developed.

Table C-13. Intercorrelations Within Grade Category Subsamples of the Final Supervisory Policy Equations with the Separate Grade Category Policies

Job Family	No. of Grade Categories	Number of Correlations in the Interval				
		less than .980	.980-.984	.985-.989	.990-.994	.995-.999
1	5	0	0	0	0	5
2	2	0	0	0	0	2
3	4	0	0	0	0	4
4	6	1[a]	0	0	0	5
5	5	0	0	0	1	4
6	4	0	0	0	1	3
7	3	0	0	0	1	2
8	7	0	0	0	2	5
9	4	0	0	0	1	3
10	6	0	0	0	1	5
11	5	0	0	0	2	3
12	4	0	0	0	1	3
13	4	0	0	1	0	3
14	5	0	1	0	1	3
15	5	0	0	0	1	4
16	3	0	0	0	0	3
17	4	0	0	1	1	2
18	7	1[b]	0	1	0	5
19	4	0	0	0	0	4
20	4	0	0	0	0	4
21	6	0	0	0	2	4
22	3	0	0	0	1	2
23	6	0	0	0	0	6

[a]The value is .979.

[a]The value is .978.

Table C-14. Intercorrelations Within Grade Category Subsamples of the Final Supervisory Policy Equations with the Separate Grade Category Policies

Job Family	No. of Grade Categories	Number of Correlations in the Interval				
		less than .980	.980-.984	.985-.989	.990-.994	.995-.999
1	3	0	0	0	0	3
2	2	0	0	0	0	2
3	3	0	0	0	0	3
4	5	0	0	1	2	2
5	3	0	0	0	2	1
6	3	0	0	0	1	2
7	2	0	0	0	0	2
8	4	0	0	0	1	3
9	3	0	0	0	0	3
10	4	0	0	0	0	4
11	3	0	0	0	0	3
12	3	0	0	1	0	2
13	4	0	0	0	2	2
14	5	1[a]	0	0	1	3
15	3	0	0	0	0	3
16	2	0	0	0	0	2
17	2	0	0	0	0	2
18	3	0	0	0	2	1
19		Nonapplicable[b]				
20		Nonapplicable[b]				
21		Nonapplicable[b]				
22		Nonapplicable[b]				
23		Nonapplicable[b]				

[a]The value is .977.

[b]In job families 19 to 23, only nonsupervisory policies were developed.

Identification of Operational Weighting Systems. With two exceptions (described in detail below), the CPAS weighting systems to be proposed for operational use were derived by "rounding" the raw score regression weights to the nearest whole number using conventional rounding procedures. Raw score regression weights which were less than .5 (including several negative weights) were set to zero. When it was noted that a large percentage of the nonsupervisory and supervisory policies had rounded regression weights equal to zero for promotion factors 17 and 18 (data interpretation and reading ability, respectively), one further step was carried out in the development of the operational weights. The impact of eliminating promotion factors 17 and 18 was investigated for those policy equations which employed a nonzero weight for those factors. In every case, promotion scores based on the rounded regression weight system, with factors 17 and 18 removed, correlated by at least .99 with promotion scores generated by the original system of weights. Consequently, the decision was made to drop factors 17 and 18 from the proposed CPAS.

One minor problem arose as a result of the decision to drop factors 17 and 18 from CPAS. The procedure left only four promotion factors in one job family supervisory policy equation; a result which would not satisfy the Office of Civilian Personnel Operations requirement for all policy equations to utilize a minimum of five CPAS factors. To remedy the problem, the supervisory policy equation for the affected job family was recomputed using one final regression analysis with factors 17 and 18 eliminated from the set of independent variables. The regression analysis was carried out with the expectation that one of the factors which previously received a raw weight less than .5 would receive a larger weight with the modified set of independent variables. The analysis did produce the desired results and yielded a supervisory policy for the affected job family with five promotion factors in it.

To ensure that the CPAS weighting systems for operational use were truly representative of the judgments of the respective policy panels, two additional analysis activities were accomplished. The first procedure entailed generating the ranking (within a deck) that the job family sample cases would receive on the basis of their nonsupervisory and supervisory weighting systems and correlating them with the actual rankings[6] assigned by the job family panel members. The results of this investigation are reported in Table C-15, which contains the Pearson correlation coefficients by job family which resulted for both the nonsupervisory and supervisory weighting systems. For example, for Job Family 1, a value of .997 was obtained for the correlation between the nonsupervisory rankings assigned by the Job Family 1 panel members and the rankings generated by the operational weights for the nonsupervisory Job Family 1 CPAS. The operational weights developed for Job Family 1 supervisory promotions performed exceptionally well too, with a correlation of .995 occurring between the panel judgments on supervisory promotions and the rankings generated by the weighting system. All of the correlations displayed in Table C-15 indicate that the weighting systems developed for operational use

[6]For this investigation a "collective" rank-order variable was generated, based on the sum of the ranks assigned by the individual panel members.

Table C-15. Intercorrlelations by Job Family Between Panel Rankings and the Rankings Generated by CPAS Weighting Systems for Operational Use

Job Family	Correlation Between Panel Rankings and Rankings Generated by Nonsupervisory Weighting System	Supervisory Weighting System
1	.997	.995
2	.990	.993
3	.993	.994
4	.992	.991
5	.995	.993
6	.996	.992
7	.989	.984
8	.994	.992
9	.995	.995
10	.997	.996
11	.992	.994
12	.989	.990
13	.995	.993
14	.985	.991
15	.996	.996
16	.995	.995
17	.994	.994
18	.992	.995
19	.995	Nonapplicable
20	.994	Nonapplicable
21	.992	Nonapplicable
22	.991	Nonapplicable
23	.996	Nonapplicable

can simulate the decisions of the policy panels extremely well, with 90% (or 37 of 41) of them falling in the range of .990 and .997 and the remaining 10% falling no lower than .984.

In the second analysis activity to check the precision of the operational form of the CPAS weighting systems, the two sets of rankings generated in the first activity were compared on a case-by-case basis to determine whether the top five employees who were identified within each deck by the panel members were also among the top five employees identified by the corresponding operational weighting system[7]. This analysis was carried out, both for the nonsupervisory and supervisory rankings; and the results are displayed by job family in Table C-16. The information displayed consists of the number of data decks (nonsupervisory and supervisory) for which the comparison is reported, along with the number of decks for which there was 100%, 80%, 60%, and 40% agreement (on the top five employees) in the two sets of rankings. Among the 23 nonsupervisory weighting systems, two (i.e., the systems for Job Families 2 and 19) were in 100% agreement with the panel rankings in all comparisons performed, and 16 systems maintained an overall minimum level of agreement of 80%, with incidences of 100% agreement occurring in at least half of the deck-ranking comparisons performed. Of the five weighting systems which had an occurrence of 60% agreement in a deck-ranking comparison, all but one system attained 100% agreement in at least half of the deck-ranking comparisons performed. Among the 18 supervisory weighting systems, six (i.e., the systems for job families 1, 2, 9, 10, 11, and 16) were in 100% agreement with the panel 60% agreement, but did not otherwise appear to differ seriously from the rankings in all comparisons performed, and nine systems maintained an overall minimum level of agreement of 80 percent. In all but one of the nine systems, incidences of 100% agreement occurred in at least half of the deck-ranking comparisons performed. Two of the supervisory weighting systems (i.e., the systems for Job Families 3 and 6) had an occurrence of panel rankings since they each achieved 100% agreement in another comparison. However, the low rates of agreement which occurred for Job Family 7 (i.e., 40% and 80%) raised some degree of concern and led to more analysis of the data to determine whether remedial action could be taken.

[7]The comparison is important because as the last ranking process in identifying promotion eligibles, only the top five candidates are frequently placed on the certificate of eligibles which is sent to the selecting supervisor.

Table C-16. Comparisons of Promotion Data Panel Rankings and Rankings Derived from the CPAS Weighting Systems[a]

Job Family	Nonsupervisory Weighting Systems Results				Supervisory Weighting Systems Results				
	No. of Comparisons Performed	No. of Comparisons with Indicated Percent Agreement			No. of Comparisons Performed	No. of Comparisons with Indicated Percent Agreement			
		60%	80%	100%		40%	60%	80%	100%
1	9	1	2	6	3	0	0	0	3
2	4	0	0	4	2	0	0	0	2
3	8	0	1	7	3	0	1	1	1
4	8	0	3	5	5	0	0	1	4
5	7	1	2	4	3	0	0	1	2
6	8	0	1	7	3	0	1	0	2
7	5	1	2	2	2	1	0	1	0
8	9	1	2	6	4	0	0	3	1
9	8	0	1	7	3	0	0	0	3
10	7	0	2	5	4	0	0	0	4
11	10	0	3	7	3	0	0	0	3
12	6	0	2	4	3	0	0	1	2
13	8	0	2	6	4	0	0	1	3
14	7	1	2	4	5	0	0	1	4
15	9	0	1	8	3	0	0	1	2
16	8	0	2	6	2	0	0	0	2
17	10	0	2	8	2	0	0	1	1
18	8	0	1	7	4	0	0	2	2
19	10	0	0	10		Nonapplicable[b]			
20	7	0	3	4		Nonapplicable[b]			
21	8	0	4	4		Nonapplicable[b]			
22	6	0	1	5		Nonapplicable[b]			
23	7	0	2	5		Nonapplicable[b]			
Total	177	5	41	131	58	1	2	14	41

[a]Information reported in this table is based on comparison of the top five cases within each set of rankings.

[b]In job families 19 to 23, only nonsupervisory policies were developed.

An investigation of the data used for Job Family 7 supervisory policy development revealed eight employees within a single deck who were tied at the maximum score on all the factors in the operational form of the Job Family 7 supervisory weighting system. However, the eight subjects had a variety of score combinations on three additional Job Family 7 supervisory promotion factors which subsequently became zero-weighted during the development of the operational weights. In the same data deck, there were three additional employees who scored the maximum on all selected promotion factors except one, with their performance on that factor being only one or two points below the maximum. These three cases were ranked higher by the panel members than six of the eight employees who got maximum promotion scores with the operational weighting system, thus causing only 40% agreement between the rankings of the operational weighting system and those of the Job Family 7 panel members.

To determine whether the precision of the Job Family 7 supervisory weighting system could be improved, rank-orderings of the supervisory cases were reaccomplished using three revised weighting systems. The revised weighting systems consisted of the original operational system with one of the previously zero-weighted factors again incorporated. One of the revised systems yielded 100% agreement (on the top five employees) for each of the two supervisory deck comparisons and was subsequently recommended for the operational Job Family 7 CPAS.

The operational algorithms generate an employee's CPAS score by applying the appropriate job family integer weighting systems (nonsupervisory or supervisory) to the employee's score on the respective CPAS promotion factors. For example, the CPAS score for an employee in a job family with five non-zero weighted factors would be:

$$\text{CPAS Score} = (F_{w1} \times F_{r1}) + (F_{w2} \times F_{r2}) + (F_{w3} \times F_{r3}) + (F_{w4} \times F_{r4}) + (F_{w5} \times F_{r5})$$

where F_{w4} represents the integer weight for a factor and
F_r represents the factor rating given the employee in the CPAS rating

The factor weights are whole integers and range from 1 to 10 for the nonsupervisory and 1 to 11 for the supervisory weighting systems. Tables C-17 and C-18 display the possible point ranges for the nonsupervisory and supervisory CPAS weighting system along with the CPAS score ranges, means, and standard deviations for the job family sample cases used in the development of the respective weighting systems. For example, in Table C-17 the minimum and maximum possible scores using the Job Family 1 CPAS nonsupervisory weighting system are 20 and 172, respectively, while the range of scores observed in the Job Family 1 sample (used in the nonsupervisory policy development) is 37 to 172, with a mean score of 131.3 and a standard deviation of 26.9.

Weighting Systems Comparisons

Analysis of the panel data and the development of the CPAS weighting systems were concluded with a final activity to determine the similarity among the 41 promotion policies which resulted. There were two types of comparisons performed.

To determine the degree of agreement among the 23 nonsupervisory weighting systems, Pearson correlations were computed. Input to the analysis consisted of promotion scores computed for each case in a job family sample using each of the 23 CPAS nonsupervisory weighting systems. For each job family sample, correlations were computed between the promotion scores based on the given job family's nonsupervisory weighting system and the scores generated with the 22 other nonsupervisory weighting systems. While the 23 sets of 22 correlations obtained are too numerous to report individually, Table C-19 contains an interval frequency distribution of the correlations obtained by job family. For example, the 22 correlations obtained for Job Family 1 fall into the three intervals, .95 to .96, .97 to .98, and .99 to 1.00, with frequencies of 1, 9, and 12, respectively, indicating that the Job Family 1 CPAS nonsupervisory weighting system correlates by .95 or higher with each of the weighting systems for Job Families 2 to 23 (for cases in the Job Family 1 sample). In general, the data in Table C19 indicate a considerable amount of similarity between the 23 CPAS nonsupervisory weighting systems, with 54% (272 of 506) of the correlations being .99 or higher. While no specific patterns for grouping the 23 job family policies are immediately apparent when reviewing the 506 correlations, it appears that several groupings could be developed with marginal losses in precision for the purpose of simplifying the nonsupervisory CPAS.

The process for comparing the 18 supervisory CPAS weighting systems was analogous to the process used for the nonsupervisory systems. For each job family sample, correlations were computed between promotion scores based on the given job family's supervisory weighting system and the scores generated with the 17 other supervisory weighting systems. The results of the correlation computations are summarized in Table C-20, where an interval frequency distribution of the 18 sets of 17 correlations is provided by job family. In general, the data in Table C-20 reflect considerably less agreement between supervisory weighting systems than was observed for nonsupervisory systems in Table C-19. A decision was made between the AFHRL developers and OCPO advisors that it was desirable to maintain separate weighting systems for each job family. Of the 41 resulting CPAS weighting systems, only 40 were delivered to USAF/MPK for operational implementation since there was no operational requirement for a nonsupervisory algorithm for Job Family 18, Wage Supervisor.

Summary of Analyses. A summary of the analyses used in developing the operational CPAS algorithms is presented in Table C-21. This table provides a brief description of the objective, statistical technique, and result(s) for each of 12 analyses used in the development process.

Table C-17. Possible Score Ranges and Sample Statistics for the Nonsupervisory CPAS Weighting Systems

Job Family	Possible Scores for Total Job Family Sample		Sample Statistics				
	Minimum	Maximum	Mean	S.D.	Min.	Max.	Na
1	20	172	131.3	26.9	37	172	714
2	27	219	180.1	30.4	68	219	320
3	21	173	134.1	28.0	35	173	513
4	24	204	152.8	32.4	52	204	545
5	18	162	123.9	24.6	54	162	460
6	18	158	119.6	25.0	21	158	555
7	22	174	136.7	27.6	40	174	353
8	23	195	149.5	29.9	50	195	650
9	22	190	138.2	29.9	32	190	587
10	20	172	124.9	30.2	35	172	574
11	20	160	122.3	26.1	40	160	700
12	25	209	158.1	33.2	25	209	422
13	20	164	132.4	24.4	28	164	543
14	15	119	93.6	20.2	25	119	439
15	19	163	124.7	27.6	28	163	576
16	19	163	121.7	27.9	37	163	640
17	17	137	105.9	25.2	19	137	726
18	20	180	137.6	28.1	27	180	547
19	20	164	119.1	27.4	42	164	669
20	20	164	118.7	27.2	20	164	488
21	24	176	126.7	27.8	38	176	545
22	24	192	139.9	31.2	34	192	480
23	25	193	139.8	29.3	45	193	565

[a]The sample size (N) reported represents the number of job family sample cases used in the development of the given weighting system.

Table C-18. Possible Score Ranges and Sample Statistics for the Supervisory CPAS Weighting Systems

Job Family	Possible Scores		Sample Statistics for Total Job Family Sample				
	Minimum	Maximum	Mean	S.D.	Min.	Max.	N[a]
1	18	162	121.0	26.6	45	162	256
2	24	204	163.2	30.9	56	204	167
3	15	135	95.4	25.7	15	135	189
4	21	177	126.5	29.0	57	177	324
5	18	162	124.4	25.2	47	162	206
6	19	167	117.8	30.0	27	167	198
7	28	236	189.0	37.0	82	236	141
8	17	153	116.9	24.9	39	153	278
9	20	180	120.2	29.9	43	180	214
10	16	144	97.4	27.7	25	144	315
11	19	163	111.1	29.2	29	163	229
12	17	153	109.3	26.1	34	153	225
13	16	140	102.4	25.5	16	140	283
14	14	126	94.2	22.6	22	126	315
15	20	172	122.2	29.5	31	172	209
16	17	153	110.8	26.9	30	153	162
17	19	155	117.6	28.1	33	155	114
18	22	198	150.8	30.9	35	198	232
19			Nonapplicable[b]				
20			Nonapplicable[b]				
21			Nonapplicable[b]				
22			Nonapplicable[b]				
23			Nonapplicable[b]				

[a]The sample size (N) reported represents the number of job family sample cases used in the development of the given weighting system.

[b]In job families 19 to 23, only nonsupervisory policies were developed.

Table C-19. Similarity of 23 Nonsupervisory CPAS Weighting Systems as Reflected by Intercorrelations of Promotion Scores by Job Family[a]

Job Family	Number of Correlations in the Interval			
	less than .95	.95 - .96	.97 - .98	.99 - 100
1	0	1	9	12
2	0	0	7	15
3	1[b]	5	14	2
4	0	0	6	16
5	0	7	15	0
6	0	0	6	16
7	0	0	10	12
8	0	0	6	16
9	0	1	8	13
10	0	1	12	9
11	0	2	4	16
12	0	0	5	17
13	0	1	13	8
14	0	1	8	13
15	0	0	6	16
16	0	1	7	14
17	0	0	6	16
18	1[b]	2	14	5
19	0	2	5	15
20	0	1	10	11
21	3[c]	6	9	4
22	0	2	7	13
23	0	2	7	13

[a]An interval frequency distribution is provided for the 22 correlations obtained when correlating promotion scores based on a given job family's nonsupervisory weighting system with promotion scores generated by the 22 other nonsupervisory weighting systems.

[b]The correlation represented is .94.

[c]The correlations represented are .91, .93, and .94

Table C-20. Similarity of 18 Supervisory CPAS Weighting Systems as Reflected by Intercorrelations of Promotion Scores by Job Family[a]

Job Family	Number of Correlations in the Interval				
	less than .93	.93 - .94	.95 - .96	.97 - .98	.99 - 1.00
1	0	1	4	7	5
2	1[b]	5	2	7	2
3	1[d]	3	2	5	6
4	0	2	4	8	3
5	0	0	0	9	8
6	0	2	2	5	8
7	4[c]	3	2	7	1
8	0	0	1	10	6
9	2[e]	2	3	3	7
10	1[b]	3	1	5	7
11	1[e]	3	4	4	5
12	0	0	1	11	5
13	1[c]	3	2	6	5
14	0	0	7	4	6
15	0	0	1	6	10
16	0	6	1	8	2
17	0	0	2	11	4
18	0	4	4	8	1
19		Nonapplicable[f]			
20		Nonapplicable[f]			
21		Nonapplicable[f]			
22		Nonapplicable[f]			
23		Nonapplicable[f]			

[a]An interval frequency distribution is provided for the 17 correlations obtained when correlating promotion scores based on a given job family's supervisory weighting system with promotion scores generated by the 17 other supervisory weighting systems.

[b]The correlation represented is .92.

[c]The correlation(s) represented are no lower than .91.

[d]The correlation represented is .90.

[e]The correlation(s) represented are no lower than .89.

[f]In job families 19 to 23, only nonsupervisory policies were developed.

Table C-21. Summary of Analyses Developing the Operational CPAS Algorithm

Type Analysis	Objective	Tech Used	Results/Conclusions
Consistency Analysis	Assess panel member consistency in rank-ordering	Correlation between rankings from duplicate decks	One panel member had R^2 of .68; removed from sample and further analyses
Policy equation development	Simulate policy rankings	Regression analysis comparison of R^2s for panel member equations for each grade level	Nonsupervisory equations, one panel member with R^2 of .66, removed from further analyses. Supervisory equations; all reached arbitrary cutoff
Consensus policy equation feasibility	Determine feasibility of combining separate member policies into	Hierarchial grouping analyses	Loss in R^2 from combination not considered of practical significance so equations combined for job family. Pooled data from similar members used in subsequent analyses
Consensus policy equation	Develop consensus equation for each grade level within family	Regression analysis using panel promotion factors	Comparison of R^2s of grade-level equations for supervisory/nonsupervisory category within job family; results indicate use of single policy equation for various grade levels possible
Similarity of grade/category policy equations	Determine feasibility of single policy equation for supv/non-supv for each job family	Correlation between promotion scores for each grade/cat	Similarity in grade-level policy equations high; single policy equation for supervisory and non-supervisory categories within job family recommended

Final policy equation	Develop single equation for each job family for supv/nonsupv	Regression analysis to allow comparison of R^2s of both policies	Moderate decrease in R^2; sufficient predictive accuracy attained to warrant single equation
Comparison of separate/single equations	Assess similarity grade equations versus single equation	Correlation	Correlations indicate high positive relationship between two types of equation; use of single equation substantiated
Operational Weighting System	Determine integer number for promotion factor weights	Correlation between regression desired and panel ranks	Raw regression weights rounded to integers; less than .5 weight set to zero; promotion factors 17 and 18 found to have zero weights in majority of equations (both supv & nonsupv). Indicated further analyses to assess impact of dropping factors from equation
Simplification of policy equation	Comparison of reduced equation to full equation for each job family (omit factors 17/18)	Correlation of two equation scores	Correlations of .99 substantiated decision to remove factors 17 and 18 from final equation. Decision required modification of one policy equation to retain five factors in equation
Verification of final weights	Compare final ranking of employees by final policy equation with initial panel rankings	Correlation of two rankings	No correlation below .98; indicates very high positive relationship between two sets of rankings
Verification analyses (cont'd)	Compare top five employees identified under panel and final policy equation ranking	Percentage overlap in top five employees identified by two rankings	Percentage agreement considered adequate for all but Family 7; additional investigation required

	Recompute policy equation for Family 7 using additional factors in equation	Regression analysis Percentage overlap in top five employees identified by panel & policy equation	Of the three revised systems investigated; one reached 100% agreement and was used as final weighting system for Family 7
Comparisons of weighting systems	Compare 23 non-supervisory weighting systems; 18 supervisory systems	Correlations between scores generated from each of 23 non-supervisory equations; then between 18 supervisory equations	Greater relationship between nonsupervisory equations found than between supervisory ones. Based on high intercorrelations some grouping of job families might be appropriate at a later date

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UNITED STATES AIR FORCE
CIVILIAN POTENTIAL APPRAISAL

CPA

PART I – PERSONAL DATA

EMPLOYEE *(Last Name, First, Middle Initial)*	PERIOD OF APPRAISAL FROM	TO

ORGANIZATION ASSIGNED TO *(Also enter office symbol)*	REASON FOR APPRAISAL *(Check one)*
	☐ ANNUAL ☐ APPRAISAL CURRENT
	☐ OTHER *(Specify)* _____

SSAN	PAY PLAN AND JOB SERIES	GRADE

PART II – OFFICIALS'/EMPLOYEE'S SIGNATURES

REVIEWING OFFICIAL

DATE	NAME, GRADE, DUTY TITLE	SIGNATURE

RATING OFFICIAL *(Supervisor)*

DATE	NAME, GRADE, DUTY TITLE	SIGNATURE

ENDORSING OFFICIAL *(Optional)*

DATE	NAME, GRADE, DUTY TITLE	SIGNATURE

EMPLOYEE

DATE	SIGNATURE *(Does not indicate employee agreement or disagreement with the appraisal)*

PART III – RATING PURPOSE AND INSTRUCTIONS

PURPOSE: Part IV describes 19 behavioral dimensions. The ratings you assign to each of these dimensions will result in an overall employee ranking that will be used for competitive promotion, reassignment, change to lower grade, and/or selection for training. While ratings are based on observable behavior in the current position, an overall rating indicating employee potential will be derived based upon the requirements of the position to be filled.
INSTRUCTIONS: (1) Based on your observations of the employee, rate EVERY behavioral dimension. Although employees should receive a wide range of ratings showing their particular strengths and weaknesses, most ratings should be in the CENTRAL RANGE. (2) Use the following scale in making the ratings. Circle the scale number in the appropriate box next to each dimension. A rating of 1, 2, 8, or 9 requires justification. Justification must be legible and limited to the bracketed space provided.

LOW RANGE	CENTRAL RANGE	HIGH RANGE
1. VERY POOR	4. Slightly below average	7. Above average
2. FAR BELOW AVERAGE	5. Average	8. FAR ABOVE AVERAGE
3. Below average	6. Slightly above average	9. OUTSTANDING

PART IV – BEHAVIORAL DIMENSIONS

1. The employee is energetic on the job; is willing to exert effort accomplishing tasks. [1] [2] [3] [4] [5] [6] [7] [8] [9]

[ ]

2. The employee performs job-associated tasks well, whether they require physical, mechanical, technical, professional, or managerial skills; is considered very skillful on the job. [1] [2] [3] [4] [5] [6] [7] [8] [9]

[ ]

3. The employee follows through well; accomplishes all tasks required to complete a job in a timely manner on his/her own. [1] [2] [3] [4] [5] [6] [7] [8] [9]

[ ]

4. The employee works independently with little need for additional supervision or help. [1] [2] [3] [4] [5] [6] [7] [8] [9]

[ ]

5. The employee inspires others to action; accomplishes goals by having a positive influence on the behavior of others. [1] [2] [3] [4] [5] [6] [7] [8] [9]

[ ]

6. The employee understands and carries out oral or written instruction. [1] [2] [3] [4] [5] [6] [7] [8] [9]

[ ]

7. The employee understands the behavior of fellow workers, superiors, and subordinates; can "stand in other person's shoes." [1] [2] [3] [4] [5] [6] [7] [8] [9]

[ ]

8. The employee devises new solutions to problems; creates new methods and procedures for accomplishing objectives. [1] [2] [3] [4] [5] [6] [7] [8] [9]

[ ]

9. The employee takes pride in doing good work and producing a first-rate product; strives to be best at whatever he/she does. [1] [2] [3] [4] [5] [6] [7] [8] [9]

[ ]

PART IV – BEHAVIORAL DIMENSIONS *(Continued)*

10. The employee picks up new ideas and procedures quickly; is easy to instruct; can adapt to the demands of new situations. 1 2 3 4 5 6 7 8 9

11. The employee explains, instructs, and converses with others in a clear and effective manner. 1 2 3 4 5 6 7 8 9

12. The employee prepares written materials that are effective and easily understood. 1 2 3 4 5 6 7 8 9

13. The employee's overall job performance in his/her present job. 1 2 3 4 5 6 7 8 9

14. The employee's ability to direct and train others, oversee and document work activities, select and evaluate personnel, implement management directives, or substitute for absent supervisor. 1 2 3 4 5 6 7 8 9

15. The employee's ability to implement Air Force directives and regulations; plan, organize and monitor work projects; or represent the unit through demonstrations or briefings. 1 2 3 4 5 6 7 8 9

ADDITIONAL INSTRUCTIONS. Using the scale given, circle the appropriate rating on each statement below.

16. Compared to other individuals doing about the same type of work, does the employee complete his/her work (projects, duties and tasks) faster?

1	FAR SLOWER	4	Slightly slower	7	Faster
2	VERY MUCH SLOWER	5	The same speed	8	VERY MUCH FASTER
3	Slower	6	Slightly faster	9	FAR FASTER

17. Compared to other individuals doing about the same type of work, how is the employee's work productivity during his/her work time?

1	THE LEAST PRODUCTIVE	4	Slightly less productive	7	More productive
2	MUCH LESS PRODUCTIVE	5	The same productivity	8	MUCH MORE PRODUCTIVE
3	Less productive	6	Slightly more productive	9	THE MOST PRODUCTIVE

18. Compared to other individuals doing about the same type of work, does the employee spend a greater percentage of time on the job working, as opposed to socializing, sitting idle, involved in personal affairs, taking breaks, etc.?

1	THE LEAST TIME WORKING	4	Slightly less time working	7	More time working
2	MUCH LESS TIME WORKING	5	The same time working	8	MUCH MORE TIME WORKING
3	Less time working	6	Slightly more time working	9	THE MOST TIME WORKING

19 Compared to other individuals doing about the same type of work, does the employee show more initiative in starting, carrying out and completing projects?

1	THE LEAST INITIATIVE	4	Slightly less initiative	7	More initiative
2	FAR LESS INITIATIVE	5	The same initiative	8	MUCH MORE INITIATIVE
3	Less initiative	6	Slightly more initiative	9	THE MOST INITIATIVE

U.S. GOVERNMENT PRINTING OFFICE 1982 360-979/454

APPENDIX E

CIVILIAN POTENTIAL APPRAISAL SYSTEM SUPERVISORY BROCHURE

SECTION I
INTRODUCTION

The Civilian Potential Appraisal System (CPAS) was designed to provide an appraisal procedure for competitive actions such as promotion, reassignment, change to lower grade, and selection for training. Since, in many cases, the CPAS determines whether a person is referred for a job or not, the CPAS is extremely important to managers, supervisors, and employees. The CPAS was developed based on a thorough research and development effort. The purpose of CPAS is to make meaningful distinctions among qualified employees.

AFR 40-335, The Merit Promotion Program, authorizes CPAS as a ranking factor in competitive actions. Employees with a fully successful rating or higher on the Job Performance Appraisal System (JPAS) or the General Manager Appraisal System (GMAS) will be considered for placement using merit promotion. All appropriated fund employees must receive CPAS ratings except GS-16 through GS-18 and SES.

Your ratings must be based on observable behavior of the employee's current position. You will not be rating an employee's potential on the behavioral dimensions. The employee's potential will be determined by using formulas. These formulas were developed based on groups of Air Force civilian positions that possess similar job requirements. Twenty-three job families were identified which possess similar characteristics or job requirements. Subject matter experts from each of these 23 job families participated in the development of weights to be assigned to the various CPAS behavioral dimensions. These weights vary by job family and supervisory/nonsupervisory characteristics of the position being filled. A total of 40 different formulas are used in CPAS to predict employee's potential for success in various positions being filled. Therefore, since an employee may be in competition for positions in a variety of job families and supervisory/nonsupervisory positions, there is no single score which you can provide an employee as a result of CPAS ratings.

SECTION II
RATING EXPLANATIONS

A serious problem with previous appraisal systems has been inflation of the ratings to the top of the rating scale. When most of your employees receive the highest possible ratings, the appraisal process becomes ineffective. Your ratings under CPAS should not be influenced by any previous ratings given. It is up to you as a rater to make CPAS ratings meaningful.

In using the rating scale, you must keep in mind that the typical or "AVERAGE" Air Force employee works hard and is very proficient on the job. You should consider this behavior as what would be expected of most employees. Be sure to keep in mind this idea of "AVERAGE" when rating your employees. Most employees should receive a wide range of ratings showing their particular strengths and weaknesses; most ratings should be in the "CENTRAL RANGE." *Ratings of 1, 2, 8, or 9 require narrative explanation and approval by the reviewing official.*

The following example is provided to help you understand the different rating levels. Behavioral Dimension 3 is "The employee follows through well; accomplishes all tasks required to complete a job in a timely manner on his/her own."

> *An employee rated 1 (VERY POOR) in the LOW RANGE would have taken more than the time allowed to complete most tasks, and would have almost always failed to follow through on his or her own in completing the task.*
>
> *An employee rated 5 (AVERAGE) in the CENTRAL RANGE would have completed most tasks in less than the maximum time allowed, and almost always would have followed through well on his or her own in completing tasks in the time allowed.*
>
> *An employee rated 9 (OUTSTANDING) in the HIGH RANGE would have completed all tasks in far less than the maximum time allowed, and always would have followed through well on his or her own in completing tasks in the time allowed.*

CPAS Behavioral Dimensions 16-19 are also based upon a 9-point rating scale, with the points of the scale grouped into a "LOW RANGE" (ratings 1-3), "CENTRAL RANGE" (ratings 4-6), and "HIGH RANGE" (ratings 7-9). Note, however, that the definitions of the rating scales are slightly different than the scale used for the first 15 behavioral dimensions

The following examples are provided to help you understand the different rating levels applied in the last four behavioral dimensions. Behavioral Dimension 19 states "Compared to other individuals doing about the same type of work, does the employee show more initiative in starting, carrying out, and completing projects?"

An employee rated in the LOW RANGE (1-3) would have demonstrated the least to less initiative on the job in completing projects when compared to other individuals doing about the same type of work.

An employee rated in the CENTRAL RANGE (4-6) would have demonstrated slightly less to slightly more initiative on the job in completing projects when compared to other individuals doing about the same type of work.

An employee rated in the HIGH RANGE (7-9) would have demonstrated more to the most initiative on the job in completing projects when compared to other individuals doing about the same type of work.

When rendering ratings, you should remember that employees must be rated within the scope of their jobs. For example, Behavioral Dimension 15 is "The employee's ability to implement Air Force directives and regulations, plan, organize and monitor work projects, or represent the unit through demonstrations or briefings."

Wage schedule employees might not be concerned with many Air Force regulations and directives but would be quite involved with organizing and monitoring their own work projects. While they might not present formal demonstrations or briefings, they would explain and demonstrate work procedures to other employees.

Behavioral Dimension 12 is "The employee prepares written materials that are effective and easily understood."

There are some Air Force employees whose jobs do not require preparation of written materials. However, all employees are required, from time to time, to complete certain types of written matter, such as forms, talley sheets, etc. You, as the supervisor, should rate these employees on their observable abilities to successfully complete a written product. For example, a Food Service Worker may have to complete talley sheets of the inventory of dishes. This is a written product that the employee must complete.

There may be some instances in which you may be rating an employee who cannot write. In these cases, you must still give the employee a rating on the Behavioral Dimension. The rating must be in the 1-9 range. The most appropriate rating in this case would probably be "1" (VERY POOR).

In most cases, both of these types of employees will seldom be in competition for positions in which Behavioral Dimension 12 is given any significant weight in the formula for the position to be filled.

SECTION III
INSTRUCTIONS FOR COMPLETION OF
CIVILIAN POTENTIAL APPRAISAL FORM, AF FORM 1287

This section describes the sequence that you, the rating official, will follow in completing the CPA form.

Part I: Personal Data

This part contains pertinent employee, position and appraisal information. If a preprinted label does not accompany the Civilian Potential Appraisal Form, AF Form 1287, you must enter the employee's name, organization and office symbol, social security account number (SSAN), current pay plan, job series and grade in the appropriate blocks provided on AF Form 1287. All personal data should be verified. Enter in the blocks provided in the "Period of Appraisal" area the dates covering the period of time for which the employee is being rated. Check the appropriate reason for giving the appraisal rating in the "Reason for Appraisal" area. ANNUAL - Check this box if the rating is required for the regular annual CPAS rating cycle. APPRAISAL CURRENT - Check this box if there is no change in the current rating on record and it should continue in effect. If this is the case, do not complete Part IV of the appraisal form. However, you must complete Part II as described below. OTHER - Check this box if the rating is being given for other than the annual rating cycle. You must specify the reason for completing the rating; for example, assignment of a new Air Force employee with no CPAS rating and who needs a rating within 90 days of assignment.

Part III. Rating Purposes and Instructions

This part of the form should be read prior to completing Part IV.

Part IV: Behavioral Dimensions

Now, that you have read the instructions and rating scale given in Part III, complete Part IV in pencil. All 19 behavioral dimensions (elements) must be rated on each employee supervised. Remember to base your ratings on actual observations of the employee. Although most employees should receive a wide range of ratings showing their particular strengths and weaknesses, most ratings should be in the CENTRAL RANGE. Circle the rating scale number in the appropriate box for each behavioral dimension. *A rating of 1, 2, 8 or 9 will require written justification.* The justifications must be legible and limited to the bracketed space provided on the form. They should be clear, brief, include specific job examples and should not merely repeat the behavioral dimension. You may want to write your tentative justifications on bond paper in the event of change by the Reviewing Official. The following behavioral dimensions are provided as examples to aid you in writing justifications:

BEHAVIORAL DIMIENSION:

12 The employee prepares written materials that are effective and easily understood. 1 2 3 4 5 6 7 8 (9)

[Wrote AFR 1-112; clarification/interpretation letters not needed because regulation was written so clearly.]

BEHAVIORAL DIMENSION:

4. The employee works independently with little need for additional supervision or help. (1) 2 3 4 5 6 7 8 9

[Of 7 major projects assigned, none were completed without repeated instructions. Written instructions were not followed completely.]

Part II: Officials'/Employee's Signatures

This part contains the final actions required to complete a CPAS rating after you have completed Part IV as described above.

HIGHER LEVEL REVIEW - After you (the Rating Official) have completed Part IV in pencil, submit the AF Form 1287 to the Reviewing Official (normally your supervisor) for review and approval The Reviewing Official must sign and date the form in the appropriate blocks provided if there is agreement with the tentative rating that you have assigned. If disagreement occurs, efforts to resolve differences must be made; however, the decision of the Reviewing Official is final. ENDORSING OFFICIAL - This is an optional area and additional instructions will be issued if this is to be used. RATING OFFICIAL (SUPERVISOR) - After the reviewing official has reviewed and signed the CPA form, you must finalize the numerical ratings and the narrative justifications in ink (or typewritten) for all entries in Part IV. You must sign and date the form in the Rating Official Signature Block provided. EMPLOYEE DISCUSSION - The CPAS rating must be shown and discussed with the employee. Employee's signature should be obtained. This signature does not indicate employee agreement or disagreement with the appraisal. If employee refuses to sign the form, you must enter in the employee signature block that the employee has seen the rating and enter the date the discussion has occurred.

SECTION IV
RATER ACCURACY

The success of the CPAS depends on you - the rater - making unbiased, objective ratings.

CPAS ratings are important: They provide you and other supervisors with a tool to distinguish among the qualified candidates.

When rating your employees on the 19 Behavioral Dimensions:

DO

- Consider each dimension on its own merit.
- Rate all persons on the same behavioral dimension at one time; i.e., rate all employees on Behavioral Dimension 1 then everyone on Behavioral Dimension 2, etc.
- Identify each person's strengths and weaknesses and ensure they are reflected in your ratings.
- Analyze your feelings and motivations regarding the ratings.
- Have a clear understanding of the terms used.
- Be observant; make a point to observe the person at work.
- Contact the previous supervisor(s) if you have not had sufficient opportunity to observe the person being rated.

DON'T

- Rate based upon an overall impression of the person.
- Rate based upon a recent, non-typical event.
- Rate all employees in the high or low range.
- Rate based on the grade level of the person being rated.
- Rate everyone in the CENTRAL RANGE to avoid having to provide written justification.
- Assume that a logical connection exists between two or more behavioral dimensions.

SECTION V
RATING EVALUATIONS

After you have rated all of your employees, and before you forward the ratings to the reviewing official, you should review your success as a rater by completing the Rating Distribution Worksheet and the Rating Distribution Chart. Then analyze the results to ensure that you have not committed common rating errors.

COMPLETE THE FOLLOWING STEPS FOR ALL 19 BEHAVIORAL DIMENSIONS.

Step 1: Using a form like that shown in Figure 1, make a mark for each rating that you gave on the 19 behavioral dimensions.

The example below shows the ratings that a supervisor gave to 10 employees on Behavioral Dimension 1.

	LOW RANGE			CENTRAL RANGE			HIGH RANGE		
	1	2	3	4	5	6	7	8	9
Behavioral Dimension 1	0	2	2	1	1	1	2	1	0

Step 2: Total the number of marks in each of the rating columns. Figure 2 shows a good sample of this step.

Step 3: Using a format similar to Figure 3, plot the total ratings for each of the 9 levels. Figure 4 shows a good sample of this step.

Step 4: Analyze your Rating Distribution Worksheet and Rating Distribution Chart. Do they resemble Figures 2 and 4?

Now, if you are confident that your ratings are accurate and reflect the strengths and weaknesses of employees and will be useful in making meaningful distinctions for competitive actions, you are ready to forward your ratings to the reviewing official.

Review Process

If you are also a Reviewing Official, you are responsible for (1) ensuring that subordinate rating officials have accomplished their ratings in accordance with the principles and guidance in Section IV of this brochure and (2) resolving inconsistencies among subordinate raters. You should use Rating Distribution Worksheets and Rating Distribution Charts for evaluating the CPAS ratings given to all the employees in organizations that you supervise.

RATING DISTRIBUTION WORKSHEET

RATING SCALE	LOW RANGE			CENTRAL RANGE			HIGH RANGE		
	1	2	3	4	5	6	7	8	9
BEHAVIORAL DIMENSIONS (ELEMENTS) 1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
TOTALS									

Figure 1

RATING DISTRIBUTION WORKSHEET

RATING SCALE	LOW RANGE			CENTRAL RANGE			HIGH RANGE		
	1	2	3	4	5	6	7	8	9
BEHAVIORAL DIMENSIONS (ELEMENTS) 1			2	2	4	2	2		
2		1	1	1	2	3	2		
3					5	5			
4		1	1	2	6	1		1	
5			1	3	3		2	1	
6			1	1	5	1	1	1	
7			1	4	2	2	1		
8		1	2	2	2		2	1	
9			2	1	3	2	2		
10		1	1	2	3	1	2		
11			2	2	2	1	1	1	1
12			1	1	3	2	2	1	
13		1		1	3	2	2	1	
14			1	3	5	1			
15			3	1	3	1		1	1
16		1	1	1	3	3	1		
17			1	1	3	2	3		
18			1	1	3	4	1		
19			2	1	3	2	1		1
TOTALS	0	6	24	30	59	35	25	8	3

10 employees rated

Figure 2

Figure 3

RATING DISTRIBUTION CHART

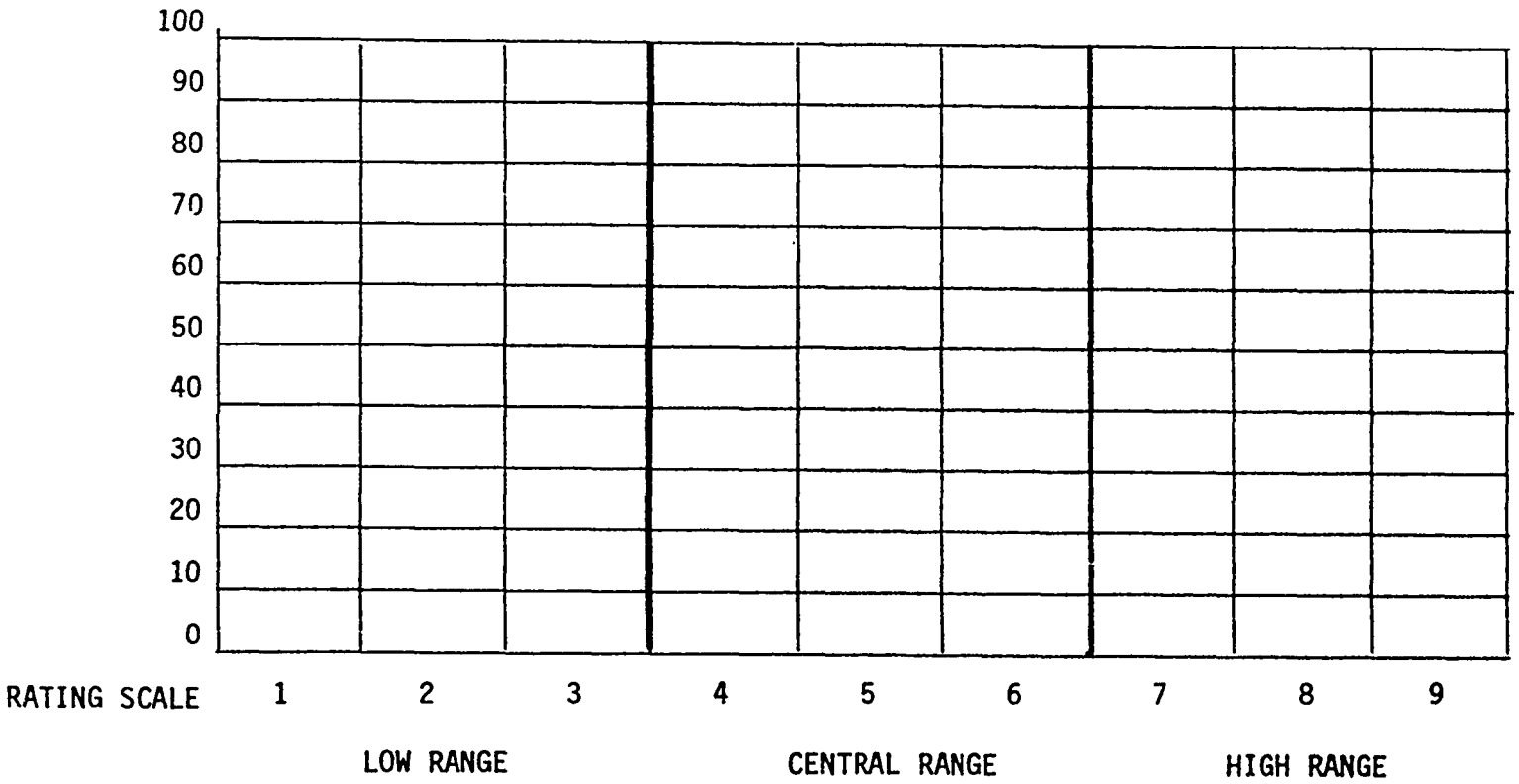
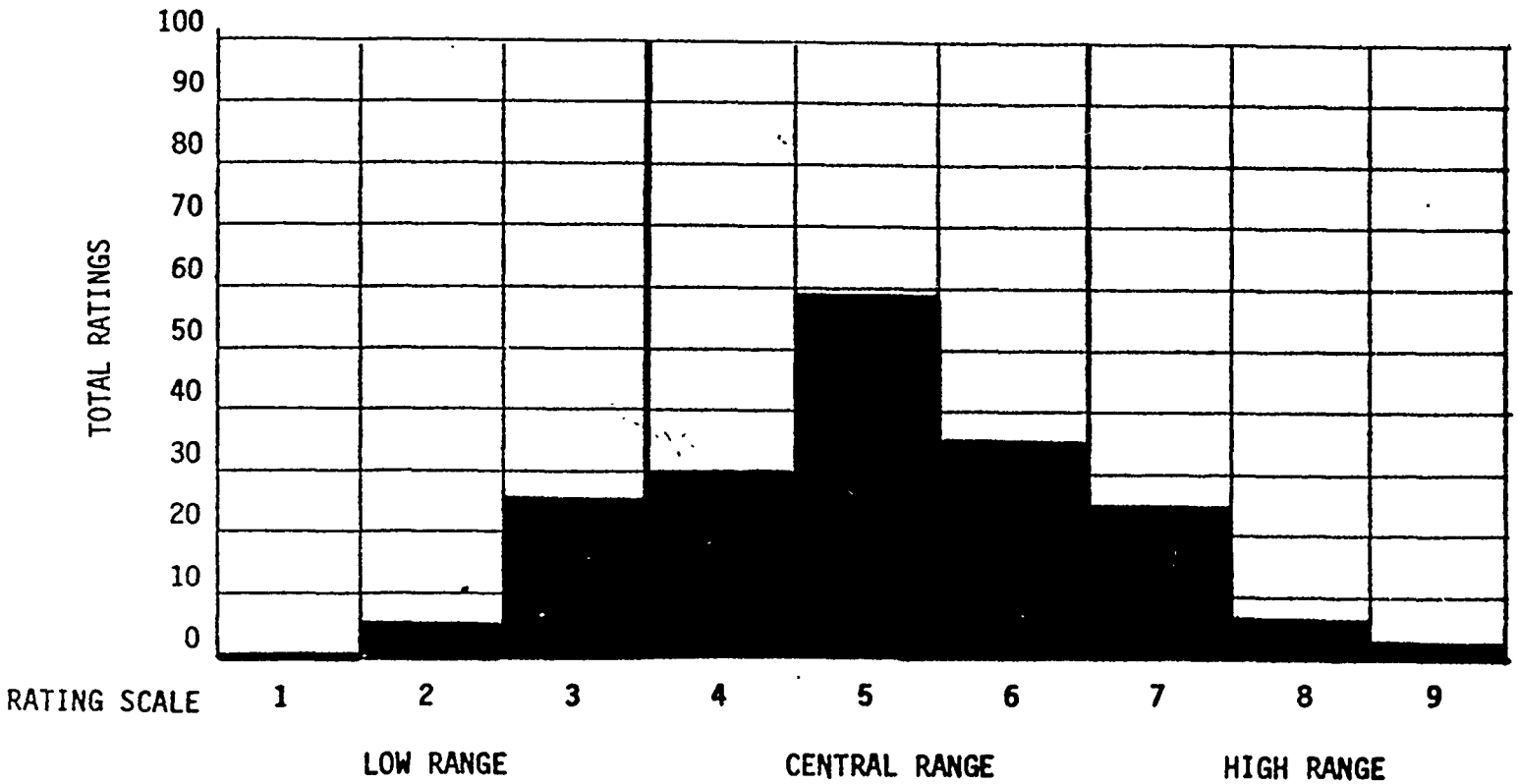


Figure 4

RATING DISTRIBUTION CHART



10 employees rated

10 X 19 (ratings) = 190 total ratings rendered