DOCUMENT RESUME

ED 114 500 CE 005 182

AUTHOR Christal, Raymond E.
TITLE Systematic Method for Establishing Officer Grade Requirements Based Upon Job Demands.
INSTITUTION Air Force Human Resources Lab., Lackland AFB, Tex. Occupational and Manpower Research Div.
SPONS AGENCY Air Force Human Resources Lab., Brooks AFB, Texas.
REPORT NO AFHRL-TR-75-36
PUB DATE Jul 75
NOTE 42p.

EDRS PRICE MF-$0.76 HC-$1.95 Plus Postage
DESCRIPTORS *Job Analysis; Measurement Techniques; Military Personnel; *Occupational Information; *Officer Personnel; Personnel Management; *Personnel Selection; Policy Formation; Promotion (Occupational); Task Performance
IDENTIFIERS Officer Grade Requirements; OGR

ABSTRACT

This report presents interim results of a study developing a methodology for management engineering teams to determine the appropriate grade requirements for officer positions based on job content and responsibilities. The technology reported represents a modification and extension of methods developed between 1963 and 1966. Results indicated that Manpower and Management Engineering personnel can accurately apply the Officer Grade Requirements (OGR) determination procedure. Recommendations are made for operational implementation and for determining the total distribution of non-aircrew officer grade requirements. (The document concludes with a 15-item bibliography and three appendixes: definitions of job requirement factors, a partial list of predictions evaluated during development of the OGR policy, and illustrations of job descriptions and ratings.) (Author/BP)

AFHRL-TR-75-36

AIR FORCE HUMAN RESOURCES LABORATORY

SYSTEMATIC METHOD FOR ESTABLISHING OFFICER GRADE REQUIREMENTS BASED UPON JOB DEMANDS

By
Raymond E. Christal

OCCUPATIONAL AND MANPOWER RESEARCH DIVISION
Lackland Air Force Base, Texas 78236

July 1975
Interim Report for Period 1 August 1974 – 28 February 1975

AIR FORCE SYSTEMS COMMAND
BROOKS AIR FORCE BASE, TEXAS 78235

NOTICE

When US Government drawings, specifications, or other data are used for any purpose other than a definitely related Government procurement operation, the Government thereby incurs no responsibility nor any obligation whatsoever, and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data is not to be regarded by implication or otherwise, as in any manner licensing the holder or any other person or corporation, or conveying any rights or permission to manufacture, use, or sell any patented invention that may in any way be related thereto.

This interim report was submitted by Occupational and Manpower Research Division, Air Force Human Resources Laboratory, Lackland Air Force Base, Texas 78236, under project 7734, with Hq Air Force Human Resources Laboratory (AFSC), Brooks Air Force Base, Texas 78235.

This report has been reviewed and cleared for open publication and/or public release by the appropriate Office of Information (OI) in accordance with AFR 190-17 and DoDD 5230.9. There is no objection to unlimited distribution of this report to the public at large, or by DDC to the National Technical Information Service (NTIS).

This technical report has been reviewed and is approved.

JAMES B. CARPENTER, Colonel, USAF
Chief, Occupational and Manpower Research Division

Approved for publication.

HAROLD E. FISCHER, Colonel, USAF
Commander

REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

1. REPORT NUMBER: AFHRL-TR-75-36	2. GOVT ACCESSION NO. / 3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle): SYSTEMATIC METHOD FOR ESTABLISHING OFFICER GRADE REQUIREMENTS BASED UPON JOB DEMANDS	5. TYPE OF REPORT & PERIOD COVERED: Interim, 1 August 1974 – 28 February 1975
	6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s): Raymond E. Christal	8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS: Occupational and Manpower Research Division, Air Force Human Resources Laboratory, Lackland Air Force Base, Texas 78236	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS: 62703F, 77340207
11. CONTROLLING OFFICE NAME AND ADDRESS: Hq Air Force Human Resources Laboratory (AFSC), Brooks Air Force Base, Texas 78235	12. REPORT DATE: July 1975
	13. NUMBER OF PAGES: 42
14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office)	15. SECURITY CLASS. (of this report): Unclassified
	15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; distribution unlimited.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

job evaluation
officer grade requirements
job requirement factors
policy simulation
multiple regression analysis
criterion development
rating scales
equi-percentile conversion
prediction accuracy
management engineering teams
job descriptions
interrater reliability

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report presents interim results of a study developing a methodology for management engineering teams to determine the appropriate grade requirements for officer positions based upon job content and responsibilities. The technology reported represents a modification and extension of methods developed between 1963 and 1966. Results indicated that Manpower and Management Engineering personnel can accurately apply the Officer Grade Requirements (OGR) determination procedure. Recommendations are made for operational implementation and for determining the total distribution of non-aircrew officer grade requirements.

PREFACE

This report presents interim results of a study conducted under AFHRL Work Unit 77340207, Development of Methods for Evaluation of Appropirate Grades for Officer Positions. This work unit was established in response to a Request for Personnel Research (RPR 74-20) submitted by Hq USAF/PRMRE and DPXX, entitled "Development and Testing of an Officer Grade Evaluation Technology." In general, the RPR called for developing and testing a method by which management engineering teams could determine the appropriate grade requirements for individual officer positions based upon job content and responsibilities. The technology which was tested represents a modification and extension of methods developed during the 1963–1966 time period under Project 7734, Development of Methods for Describing, Evaluating, and Structuring Air Force Occupations; Task 773402, Development and Appraisal of Methods for Job Evaluation. The present investigation draws freely from a series of reports which documented the original Officer Grade Requirements (OGR) project.

Due to the scope of the inital OGR project, it was not feasible to fully describe the OGR project in a single report. However, for a general overview, the first of the series of reports (Christal, 1965) is recommended. This first report also mentions the many scientific, military, and support personnel who contributed to the OGR study, and the author wishes to again express his appreciation to these individuals.

The author served as general director of the present study and was responsible for writing this report. However, the actual work to accomplish the requirements of RPR 74-20 must be credited to the following individuals:

Hq USAF - Maj Joseph S. Kittle, RPR Requirements Manager, AF/PRMRE

AFHRL - Dr. Joe T. Hazel, Chief, Career Development and Job Evaluation Branch, Project Monitor

Mr. William J. Stacy, RPR 74-20 Principal Investigator

Dr. Gary N. Matthews, Task Scientist

Col James B. Carpenter, Chief, Occupational and Manpower Research Division

Mrs. M. Joyce Giorgia, Scientific Assistant

Mrs. Maria M. Courtney, Cold Type Composing Machine Operator

Sgt Johnny J. Weissmuller, Lead Computer Specialist

A1C Bruce B. Barton, Computer Specialist

This report essentially describes the continuity between the initial OGR project and research results accomplished under RPR 74-20. Other reports will follow which give more detailed information concerning application of the method by management engineering teams. This study does not constitute authority to alter existing Air Force officer grades. Further action towards such objectives is a function of Hq USAF, and is recommended only after certain prescribed additional research.

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

LIST OF TABLES

SYSTEMATIC METHOD FOR ESTABLISHING OFFICER GRADE REQUIREMENTS BASED UPON JOB DEMANDS

I. INTRODUCTION

This report describes the development and testing of a technology by which management engineering teams (MET) can determine the appropriate grade requirements for individual officer positions based upon job requirement factors. It represents a modification and extension of research previously conducted under AFSC Project 7734. This earlier research will be described in order to facilitate the reader's understanding of the present study.

II. BACKGROUND

There was a time when determination of grade requirements was a simple matter. In the Roman army a consul commanded two legions. Each legion had a standard complement of officers, including six tribunes and sixty centurions. Even in the American army, grade determination was not a problem until sometime after the Civil War. The fighting force was composed primarily of cavalry and foot soldiers, and grade was a simple function of the size of the unit commanded. But advances in technology have led to the creation of many new jobs which cannot be graded simply on the basis of size of the unit commanded. Ground rules for attaching a grade level to a particular job[1] have become less and less clear.

Rather than justifying grade requirements on the basis of job requirements, in recent years there has been a tendency for the Armed Forces to request and defend grade authorizations to support career planning objectives. The philosophy is that qualified officers normally should be promoted after specified intervals of time, and specific numbers of authorizations must be maintained at each grade level in order to avoid promotion stagnation and to insure orderly career progression. Congress and the Office of the Secretary of Defense (OSD) have concerned themselves with equating promotion opportunities in the various services, and have looked at grade as the vehicle for awarding and controlling pay. The result is that the relationship between job requirements and grade requirements became rather vague.

A study was conducted by the Personnel Research Laboratory[2] during the 1963–1965 time period, in which an attempt was made to determine the appropriate distribution of officer grades for the Air Force, based upon job requirements. This was one of the largest, most systematically accomplished, and best documented job evaluation studies ever accomplished. It involved application of a "policy capturing model"[3] (Christal 1963, 1968) and yielded a set of job evaluation factors which simulataneously defined the meaning of grade and provided a basis for evaluating officer positions in terms of their grade requirements. The Officer Grade Requirements (OGR) Project provided the basis for constructing the grade "yardstick" currently proposed for application by management engineering teams. For this reason it will be discussed in some detail.

III. THE OFFICER GRADE REQUIREMENTS (OGR) PROJECT

The Officer Grade Requirements Project was conducted in three phases, as follows. (1) obtaining policy decisions concerning the appropriate grades for a selected "criterion" sample of jobs (Hazel, 1965), (2) development of an OGR policy equation which assigns the same grades to these jobs as was given by the Policy Board (Hazel, Christal, & Hoggatt, 1966), and (3) application of policy equation to jobs in the Air Force population to determine the total distribution of officer grade requirements.

---

[1] In this report the words "job" and "position" are used interchangeably.

[2] Later integrated into the Air Force Human Resources Laboratory (AFHRL).

[3] Subsequently used by scientists in many important applications. A form of this model was used to develop the Air Force Weighted Airman Promotion System (WAPS).

Phase I. Policy Board Grade Ratings for Jobs in the Criterion Sample

Development of an objective system for grade determination depends upon a stable statement of appropriate grades for a sample of jobs. The grade levels assigned to jobs in this criterion sample by a USAF Policy Board are used to calibrate the job evaluation system, which in turn is applied to the remaining bulk of Air Force jobs. They are like the benchmarks maintained by the Bureau of Standards to calibrate surveyor tapes; they must be accurate and unbiased, since they become the Air Force standards for determining grade requirements.

Six steps were involved in the first phase of the OGR project: (1) collection of detailed information describing approximately 80,000 officer jobs; (2) selection of a "criterion" sample of three to four thousand descriptions representing all levels and types of Air Force officer jobs; (3) selection of a USAF Policy Board, (4) obtaining grade ratings for jobs in the criterion sample from members of the Policy Board, (5) analysis of the Policy Board's ratings to determine that they are reliable, reasonable, and unbiased, and (6) acceptance or rejection of the ratings as a basis for establishing Air Force policy concerning grade determination. Each of these steps is discussed.

Collection of Job Descriptions

The first major step of the project was to collect accurate and detailed information describing the work performed by Air Force officers in grades lieutenant through colonel. Preliminary forms and instructions were drafted and tried out at Langley Air Force Base in late August 1963, and final forms were reproduced and sent to the commands in November 1963. Job descriptions were obtained from all officers except generals, student officers, patients, air attaches, officers in the medical-professional and dental utilization fields, and selected officers in the operations career area, where the number of incumbents is large and where many jobs are known to be identical. In all, descriptions were received from 79,750 officers.

Each incumbent was asked to provide a job title, a verbal description of the location of his job in the Air Force organizational structure, a detailed description of his job in terms of the duties and tasks he performs, and information describing any unusual requirements of the job not reflected in his duty and task statements. In addition, he was required to provide the name and base location of his organization, the UMD[4] authorized grade for his position, his present grade and the grade of his supervisor, his primary and duty AFSC; the length of experience in his present job, in his duty AFSC, and in the Air Force; the organizational level of his job and the level of his job within his organization, his command affiliation, his duty phone numbers, and his educational background. The incumbent's supervisor was asked to review the completed job description and supplementary information for accuracy and completeness and to provide his judgment concerning the appropriate grade authorization for the job.

Selection of the Criterion Sample

Upon receipt, the job descriptions were numbered, sorted into UMD authorized grade-by-AFSC categories, and counted. A representative criterion sample consisting of 3,575 cases was selected in the following manner. (a) two descriptions were pulled at random from each UMD grade-by-AFSC category for which six or more officers were assigned, (b) one description was pulled from each category containing less than six but more than two officers assigned, and (c) additional cases were selected to supplement those categories where the number of incumbents was large or where the AFSC was known to contain a large number of job types.

Selection of the Policy Board

A Policy Board which included representatives from twelve major commands was selected by Hq USAF. The Board was composed of 22 colonels, and Lt Gen James E. Briggs, USAF (Ret), was appointed chairman. Each member was selected on the basis of his overseas and zone of interior experience in particular career areas. For any one of the 3,575 jobs in the criterion sample, there was at least one board member who could serve as an expert consultant to the rest of the board.

[4]Currently referred to as UDL authorized grade.

Ratings by the Policy Board

The Policy Board was convened at Hq USAF on 10 February 1964 for five days. During this period, members of the board were charged with the responsibility for determining the appropriate grade level for each of the 3,575 jobs in the criterion sample. Each job was rated independently by five members of the Policy Board.

The following measures were taken to assure that ratings would be reliable, valid, and unbiased.

a. *The board members were instructed by General Briggs and the Director of M&O concerning the importance of their mission.*

"This project will provide data to support decisions concerning an optimal grade structure for the Air Force. The judgments made by this board during the coming week will play an important role for a long time in the future in determining the number of colonels, lieutenant colonels, majors, captains, and lieutenants needed by the Air Force to carry out its mission.

"... it is essential for you to be as objective and impartial as possible. This board has been convened to make an accurate statement of Air Force grade requirements. It is important that members resist any tendency to exaggerate these requirements."[5]

b. *The board had access to any information needed to make accurate judgments.*

Board members were asked first to rate the appropriate grade level for a job and then to indicate on a 3-point scale their level of confidence in such ratings.

If they needed more information concerning a particular job, the following sources for additional information were available.

(1) Board members could consult the one or more members on the board with experience in the career area containing the job.

(2) Organization level, command, and base or installation of a job was furnished any member on request. Members could obtain organizational charts from clerks in the room for commands and subcommand units in order to better identify the organizational location of the job.

(3) Members could telephone special air staff consultants in Hq USAF.

(4) Members could telephone the supervisor of the incumbent in the job being rated.

Ratings were to be independent and were to reflect the unbiased judgment of the rater alone. The board members *were not allowed* to have knowledge of the current UMD grade authorized for the job being rated nor of the grade stated by the incumbent's supervisor as being appropriate for the job. They were not informed of the grade held by the incumbent in the job or by his supervisor. Board members were instructed not to ask any other board member or consultant concerning the appropriate grade for the job.

c. *Grade ratings for particular jobs were obtained independently from five separate board members.*

Previous research indicated that the average of five independent ratings would provide a stable estimate of grade requirements (Christal, Madden, & Harding, 1960).

d. *Each job was rated in a context of other jobs.*

Research on context effects (Madden, 1960) has indicated that most accurate ratings of job level are obtained when a job is considered with other jobs of varying content and level. When a job is rated with high level jobs it tends to be underestimated; when it is rated with low level jobs it tends to be overestimated, when it is rated alone, the obtained ratings tend to be unstable. Care was taken in the OGR study to vary the types and levels of jobs in each rating booklet to control the effects of context.

e. *Board members were required to rate grade requirements using a 16-point rating scale.*

Rating results are more stable when judges make the finest discriminations of which they are capable. Most officers can easily distinguish between a job which is appropriately filled by a junior colonel and one which should be filled by a colonel with considerable experience and time in grade. Therefore, in this project, Policy Board members were required to use a 16-point rating scale (Table 1). This scale recognizes

[5] Extracted from introductory remarks of board chairman.

three levels of experience requirements within each grade from lieutenant through colonel, and one level for general.

Table 1. Criterion Board Rating Scale

Grade			Code
General			16
Colonel	–	Senior	15
Colonel	–	Middle	14
Colonel	–	Junior	13
Lt Colonel	–	Senior	12
Lt Colonel	–	Middle	11
Lt Colonel	–	Junior	10
Major	–	Senior	9
Major	–	Middle	8
Major	–	Junior	7
Captain	–	Senior	6
Captain	–	Middle	5
Captain	–	Junior	4
Lieutenant	–	Senior	3
Lieutenant	–	Middle	2
Lieutenant	–	Junior	1

Analyses of the Policy Board Rating Data

Since ratings provided by the Policy Board were to be the basis for establishing Air Force grade requirements, it was important to demonstrate that these ratings were stable, that there was high agreement among board members concerning the appropriate grade requirements for particular jobs, that the raters had confidence in their ratings, and that the raters were not biased for or against jobs in various AFSCs or commands. To this end, a series of analyses of the Policy Board ratings was accomplished. The main results of these analyses are summarized in the paragraphs below:

a. *There was high agreement among the Policy Board members concerning grade requirements for jobs in the criterion sample.* The reliability coefficient for the mean grade ratings provided by the Policy Board was .92 (Linquist, 1953, p. 361), a figure which indicates a high level of agreement. Another statistic useful in interpretation of the results is the standard error of estimate, which was .79 for the criterion board data (on the 16-point scale). This value indicates that, if judgments of a large number of similar boards were obtained, 95 percent of the mean grade ratings would be within plus or minus one-half of a grade level of the mean grade ratings computed from the policy Board data (± 1.55 on the 16-point scale).

b. *Members of the Policy Board expressed confidence in their ratings of job grade requirements.*

Figure 1 presents a distribution of mean level of confidence expressed by board members in their ratings of 3,575 jobs in the criterion sample. For 2,387 of the jobs, at least four of the five raters expressed the highest level of confidence in their judgments. Only 59 of the 3,575 jobs had an associated mean confidence rating of less than 2.00 on the 3-point scale. Board members tended to have most confidence in ratings of well established jobs, such as those in the aircrew areas. They showed somewhat less confidence in ratings of the newer and less well established jobs, such as those in the scientific areas.

c. *Individual members of the Policy Board did not exhibit a bias toward jobs in particular commands or AFSCs.*

Table 2 shows summary results of an analysis designed to identify raters exhibiting a bias for or against jobs in a particular command or occupational grouping. The values in this table were computed by taking the difference between the average of ratings assigned by a rater (on the 16-point scale) to jobs in a particular category from an average of ratings assigned by all raters to jobs in that category. Since three points on the 16-point scale represents one grade level, a value of 3.0 in Table 1 would indicate that a board member rated jobs in a given category approximately one grade higher than other board members. Similarly, a value of -3.0 would indicate judgments averaging approximately one grade lower than those of

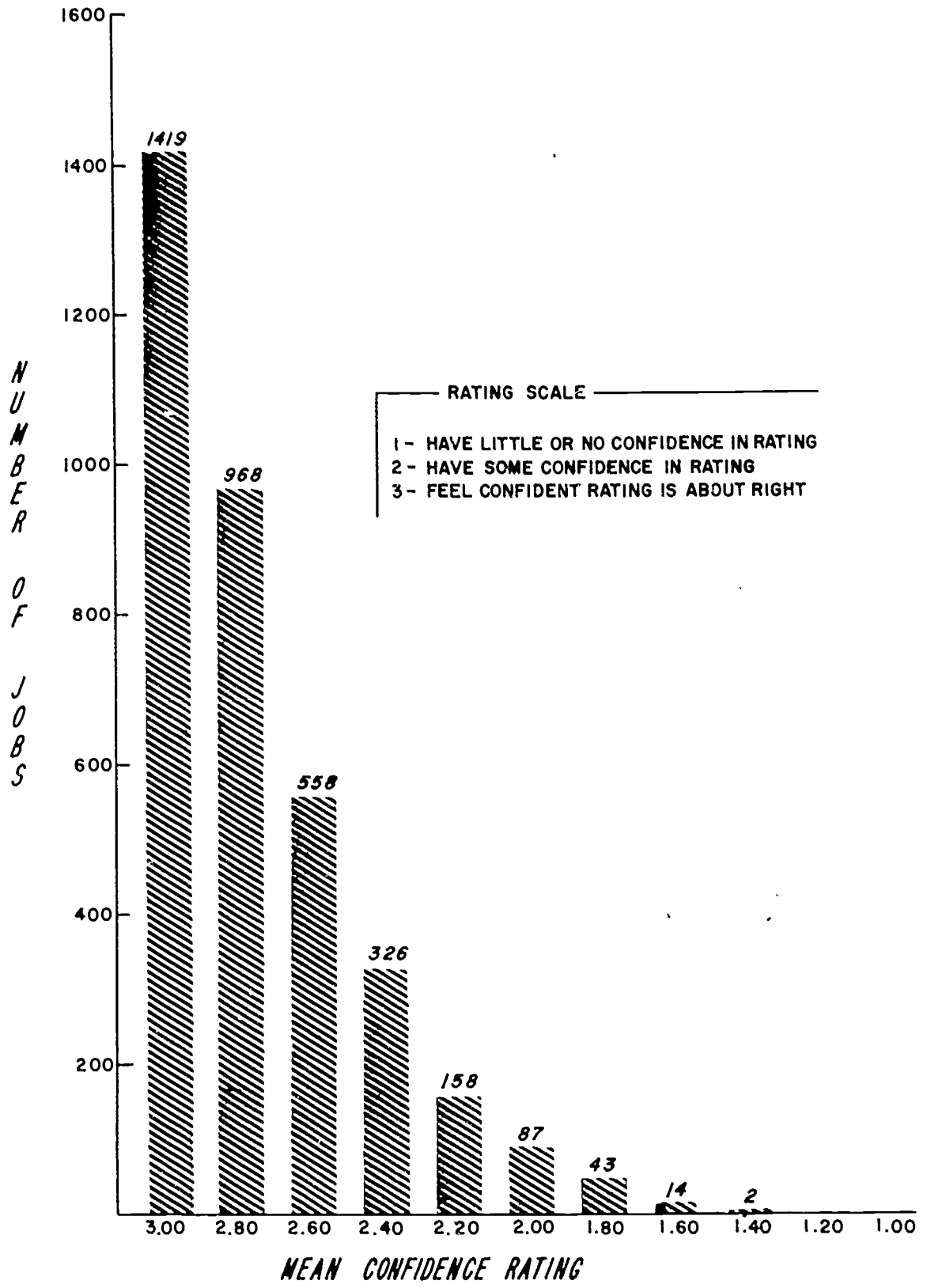

Fig. 1. Confidence of board members in grade judgments.

Table 2. **Average Deviation of Each Board Member's Ratings by Job Category**

Job Category[a]	Rater Number																					
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
All jobs	-0.4	0.9	-0.0	1.2	0.2	-0.2	-1.0	0.2	-0.5	0.6	1.0	-0.5	-0.2	-0.4	-0.4	0.3	0.4	-0.2	0.2	-0.1	-0.8	-0.2
SAC	-0.7	1.4	-0.2	1.1	0.2	0.2	-1.0	0.1	-0.2	1.7	0.9	-1.0	-0.1	-0.8	-0.7	0.3	0.1	-0.4	0.2	-0.2	-0.9	-0.3
TAC	-0.2	1.0	-0.1	1.4	0.6	-0.2	-1.1	0.1	-0.7	0.4	1.3	-0.8	-0.3	-0.7	-0.1	0.4	0.2	-0.2	0.6	-0.4	-1.0	0.1
PACAF, USAFE, USAFSS	-0.2	0.8	-0.2	1.3	0.1	-0.2	-0.8	0.4	-0.9	0.7	1.0	-0.8	-0.4	-0.3	-0.1	0.2	0.1	-0.1	0.2	-0.1	-0.6	-0.0
Hq Comd, Hq USAF	-0.4	0.8	0.3	0.8	-0.3	-0.3	-1.0	-0.2	-0.3	-0.1	0.7	0.1	-0.2	0.1	0.1	0.2	0.9	0.2	-0.5	-0.1	-0.4	-0.3
AFSC, OAR	-0.2	0.5	0.8	1.3	-0.1	-0.8	-1.4	0.1	-1.1	-0.2	1.1	0.8	-0.5	0.0	-0.5	0.2	1.5	-0.3	-0.0	-0.1	-0.6	-0.6
AFLC, AFAFC, AFCS	-0.3	0.2	-0.3	1.1	-0.1	-0.6	-0.7	0.5	-0.5	-0.1	0.9	-0.1	-0.0	-0.3	-0.5	0.3	0.8	-0.3	-0.1	-0.2	-0.3	0.5
AAC, SOU, ADC, CONAC	-0.1	0.8	-0.4	1.4	0.0	-0.1	-0.7	0.5	-0.7	0.5	0.9	-0.8	-0.3	-0.4	-0.2	0.1	0.4	-0.2	-0.0	-0.0	-0.7	-0.1
ATC, AU, USAFA	-0.4	0.6	-0.4	1.4	0.6	-0.6	-0.9	0.2	-0.7	-0.5	1.0	-0.1	-0.1	-0.7	-0.4	0.4	0.1	0.1	0.8	0.5	-0.8	-0.1
Other Commands	-0.4	0.9	0.2	1.2	0.3	0.1	-1.0	0.5	-0.3	0.4	1.0	-0.7	-0.4	-0.3	-0.4	0.4	0.5	-0.2	-0.1	-0.5	-1.3	-0.1
Pilot and Navigator	-0.4	1.7	-0.2	1.2	0.6	-0.3	-1.2	0.4	-0.4	1.0	1.3	-0.6	-0.3	-0.7	-0.3	0.7	-0.1	-0.1	-0.5	-0.6	-1.3	-0.2
Air Operations	-0.8	0.6	0.0	1.1	-0.3	0.4	-0.9	0.2	-0.3	1.6	1.0	-0.8	-0.3	-0.2	-0.3	-0.0	0.3	-0.3	-0.0	-0.5	-0.7	0.1
Scientific and Eng.	-0.4	0.8	0.3	1.3	-0.3	-0.4	-1.2	0.1	-0.6	0.6	0.8	0.0	-0.3	-0.4	-0.7	0.2	0.9	-0.3	0.2	-0.0	-0.5	-0.1
Materiel and Compt.	-0.1	0.6	-0.4	0.9	-0.1	-0.4	-0.8	0.4	-0.3	0.1	0.5	-0.8	-0.1	-0.2	-0.3	0.0	1.0	-0.1	0.2	0.2	-0.1	-0.3
Professional	-0.1	1.2	0.1	1.0	1.1	-0.6	-1.2	0.0	-1.4	-0.8	1.5	-0.6	-0.0	-0.4	-0.5	0.5	0.6	-0.4	1.0	0.0	-1.0	-0.4
Admin. and Support	-0.4	-0.1	-0.2	1.7	0.1	0.1	-0.3	0.1	-0.6	0.3	0.7	-0.5	-0.3	-0.8	-0.3	0.0	0.3	-0.1	0.8	0.5	-0.7	-0.3

[a]Pilot and Navigator AFSCs: 10XX, 11XX, 12XX, 13XX, and 15XX, except omit 1515.
Air Operations AFSCs: 14XX, 1515, 16XX, 17XX, 18XX, and 19XX.
Scientific and Engineering AFSCs: 25XX, 26XX, 27XX, 28XX, 30XX, 31XX, 32XX, 43XX, 47XX, 55XX, and 57XX.
Materiel and Comptroller AFSCs: 60XX, 63XX, 64XX, 65XX, 67XX, 68XX, and 74XX.
Professional AFSCs: 88XX, 89XX, 90XX, 91XX, 92XX, 97XX, and 99XX.
Administrative and Support AFSCs: 02XX, 03XX, 23XX, 70XX, 73XX, 75XX, 79XX, 80XX, 81XX and 82XX.

other members. The highest reported value is only 1.7, and most of the values are less than 1.0. The largest values tend to be associated with judges who rated all categories somewhat high or low, and these judges did not show a bias toward jobs in particular categories.

d. *Policy Board members agreed that many officer jobs are inappropriately graded.*

Detailed analyses of the Policy Boards ratings indicated that each job was considered on its own merits. There was no systematic tendency on the part of raters to confirm current UMD grade authorizations or to inflate their ratings of grade requirements. Many jobs were downgraded as much as one or two full grade levels. Others were upgraded. Futhermore, the reliability analysis indicates there was strong agreement among board members as to which particular jobs should be upgraded or downgraded.

Acceptance of the Policy Board Ratings

The Personnel Research Laboratory was prepared to abort the OGR study, if for any reason the Policy Board's ratings were not defensible. Fortunately, the ratings appeared to be defensible from every point of view. To summarize:

a. The board was composed of experienced colonels who had a clear concept of the meaning of military grade as related to Air Force jobs.

b. Board members knew the jobs they rated. They had access to job descriptions, organization information, technical consultants, and job incumbents or supervisors, as necessary.

c. Board members were confident in their grade ratings.

d. Board members were not biased toward jobs in particular commands or specialties.

e. Board members agreed with each other concerning the appropriate grade level of particular jobs.

f. Board members did not give inflated ratings and did not simply confirm current UMD authorizations. Each job was rated on its own merits.

Since the board ratings were acceptable as standards for grade determination, the Personnel Research Laboratory proceeded with the second phase of the OGR Project – the development of a mathematical equation to express the board policy in terms of weighted measures of job characteristics. To be acceptable, this equation must assign the same grade to a job as did the Policy Board. Its effectiveness can be gauged by the extent to which it predicts the grades assigned by the board to the 3,575 jobs in the criterion sample.

Phase II. Development of the Officer Grade Requirements Policy Equation

Success of the OGR study hinged on development of a mathematical equation which would predict grade ratings made by the Policy Board. Four steps were involved in this phase of the study: (1) hypothesizing the job requirement factors considered by Policy Board members in making their ratings, (2) evaluation of the criterion jobs in terms of these factors, (3) development of a policy equation which weights the job requirements factors into a composite to predict the Policy Board's grade ratings, and (4) evaluation of this policy equation. Each of these steps is discussed next.

Hypothesizing Job Requirement Factors Considered by the Policy Board

Perhaps the most challenging part of the OGR study was identifying the factors considered by the Policy Board in making their grade decisions. The fact that board members agreed with each other, concerning the appropriate grade requirements for jobs in the criterion sample, indicated they considered the same or highly related factors in making their decisions.

It was hypothesized that four classes of variables might be used to predict the Policy Board ratings:

a. *Job requirement factors.* These are demands of the job which have a bearing on grade determination. Interviews with members of the Policy Board provided a number of clues concerning factors which influenced their judgments. Over and over again, board members mentioned factors such as the complexity, variety, and level of activities which must be managed by the job incumbent; the possible impact of decisions made by the incumbent on Air Force mission, the types of planning activity required of the incumbent; and the types of knowledges and experiences which the incumbent should possess.

b. *Factors relating to the position of the job in the Air Force organizational structure.* It was hypothesized that the location of the job in the Air Force organizational structure would have a bearing on grade requirements.

c. *Coincidental predictors.* It was hypothesized that certain non-relevant factors, such as the number of words in the job description or the verbal facility of the description writer, might have influenced judges in their rating of a job.

d. *Command or specialty affiliation.*

Evaluation of the Criterion Jobs in Terms of Hypothesized Predictors

Data concerning some of the factors to be considered for inclusion in the policy equation could be obtained from the job description forms. These variables included such things as the supervisor's grade rating, the organizational level in which the job occurs, and the level of the job within this organization. Previous research (Christal & Madden, 1961; Hazel & Madden, 1965; Madden, 1963a; Madden, 1963b) and interviews with members of the Policy Board indicated that certain job evaluation factors, such as the types of decisions and judgments required by the job would have relevance for grade determination. These factors could only be measured through use of rating scales, and a procedure had to be established for obtaining such ratings. The 3,575 job descriptions were sorted into 143 booklets, each containing 25 job descriptions. Each booklet was sent to five or more majors or lieutenant colonels in the field, who were selected at random throughout the Air Force on the basis of the last two digits of their service number. Over 700 officers participated in this phase of the study. Each officer rated each job on the ten job evaluation factors listed in Appendix A. He also rated each job on the same 16-point scale which was used by the Policy Board in making their grade determination.

A mean rating score for each of the ten job evaluation factors and the grade rating were computed for each job. These scores were utilized, along with other variables, in deriving the final policy equation.

Derivation of the Policy Equation for Grade Determination

Success of the OGR study hinged on the development of an equation which accurately predicts grade ratings made by the Policy Board. In developing this equation, nearly two hundred predictor variables were considered (Appendix B). The final equation contains nine predictors which accurately reproduce the board policy. These nine predictors include five of the job evaluation factors listed in Appendix A, two predictors associated with organizational level of the job, the mean grade rating obtained from field judges, and the supervisors' recommended grade level. They are defined as follows:

a. *Management*: The level of executive, and managerial skills required by the job. Consider the complexity, variety, and level of the activities which are directed, organized, coordinated, controlled, commanded, or evaluated. (Ratings for each job were obtained from five field judges. Correlation between mean ratings and Policy Board ratings = .75.)

b. *Planning*: The extent to which planning is required by the job. Consider the scope and significance of work for which planning is done. The longer the time span for which planning is done, the higher the rating should be. (Ratings for each job were obtained from five field judges. Correlation between mean ratings and Policy Borad ratings = .71.)

c. *Special Training Work Experience*: The extent to which the job requires knowledges and skills which must be acquired through special training courses or on-the-job experience. Disregard general courses given by Squadron Officer School, Command and StaffCollege, or War College. (Ratings for each job were obtained from five field judges. Correlation between mean ratings and Policy Board ratings = .45.)

d. *Judgment and Decision Making*: The importance and independence of judgements and decisions required by the job. Consider the nature, variety, and possible impact of decisions. The less well-defined the guidance for decisions, the higher should be the rating; while the more specific and detailed the guidance, the lower should be the rating. (Ratings for each job were obtained from five field judges. Correlation between mean ratings and Policy ratings = .60.)

e. *Communication Skills*: The extent to which the job requires skill in oral and written communication. Consider the complexity and variety of information communicated, as well as the level of the individuals and agencies involved. (Ratings for each job were obtained from five field judges. Correlation between mean rating and Policy Board ratings = .63.)

f. *Level of Organization in Which Job Occurs*: The level of the organization in which the job occurs, defined by the following scale. (Correlation with Policy Board ratings = .53.)

DOD or Hq USAF	9
Hq Major Air Command	8
Numbered AF or equivalent	7
Air Division or equivalent	6
Wing or equivalent	5
Group or equivalent	4
Squadron or equivalent	3
Detachment or equivalent	2
Other	1

g. *Level of Job Within Organization*. The level of the job within the organization in which it appears, defined by the following scale. (Correlation with Policy Board ratings = .53.)

Command Element	7
Directorate, Department, Office or equivalent	6
Division or equivalent	5
Branch or equivalent	4
Section or equivalent	3
Unit or equivalent	2
Other	1

h. *Mean Grade Rating by Field Judges*: The mean of grade ratings for each job obtained from five field judges in the field. (Correlation with Policy Board ratings = .89.)

i. *Supervisor's Judgment of Appropriate Grade*: A statement from the supervisor of the job concerning its appropriate grade level. This correlates .63 with the Policy Board ratings when it is used as a single scaled variable. Since it is more predictive when broken down into six categorically-coded variables, it was used in the equation as follows:

(1) 1 if rated *general* by supervisor; 0 otherwise
(2) 1 if rated *colonel* by supervisor; 0 otherwise
(3) 1 if rated *lt colonel* by supervisor; 0 otherwise
(4) 1 if rated *major* by supervisor; 0 otherwise
(5) 1 if rated *captain* by supervisor; 0 otherwise
(6) 1 if rated *lieutenant* by supervisor; 0 otherwise

The Policy Board ratings can be predicted very well using the five job evaluation factors in combination with the two organization variables (correlation with Policy Board ratings = .84). It would be difficult to prove that these particular variables were the ones considered by the Policy Board in making their grade judgments. Since these seven variables have high "face validity" for grade, and they accurately predict the Policy Board's decisions, it can be assumed that they are primary determiners of grade requirements.

While the mean grade rating from five field judges had the highest relation with the criterion for a single variable, one should recognize that in making their ratings these judges also considered information measured by the job evaluation factors, such as the management and organizational levels of jobs, along with their requirements for planning, decision making, special work experience, and communication skills. In fact, the five job evaluation factors in combination with the two organizational variables correlated .92 with the grade ratings obtained from all field judges. Even so, grade ratings obtained from field judges make a unique contribution in predicting the Policy Board ratings. This is believed to be due to a large number of special factors associated with specific jobs which were considered by both the Policy Board and the field judges in arriving at grade requirements. Since any one of these factors may apply to only one or two jobs, it would be uneconomical to develop scales for applying them to all jobs.

The supervisor's judgments concerning grade makes a very small unique contribution to the system, and this contribution is believed due to an occasional job requirement factor considered by the supervisor and the Policy Board, but not considered by the field judges.

It is of interest to examine some of the variables which add nothing to the nine selected predictors in the final policy equation. These include the following:

a. Variables associated with AFSC affiliation
b. Variables associated with command affiliation
c. UMD authorized grade
d. Grade of the incumbent
e. Grade of the incumbent's supervisor
f. Variables expressing interaction between AFSC and organizational level
g. Educational level of the incumbent
h. Length of the job description

The fact that variables associated with AFSC and command affiliation did not enter into the policy equation is additional evidence that the Policy Board was not biased toward jobs in any one of these categories. While some of the variables listed previously (such as UMD authorized grade) are related to the criterion, their valid variance is already covered by one or more of the nine predictors included in the accepted policy equation.

Evaluation of the Policy Equation

When the policy equation was applied to jobs in the 3,575 case criterion sample, it was demonstrated to be highly accurate. In fact, data in Table 3 show that the policy equation pinpointed 82 percent of the jobs in this sample within one-third of a grade level of the ratings assigned by the board on the 16-point scale and that the policy equation predicted within two-thirds of a grade level for 96.7 percent of the jobs. The correlation coefficient between grades allocated by policy equation and grade ratings provided by the Policy Board was .92.

Table 3. Accuracy in Prediction of USAF Policy Board Job Ratings

Degree of Accuracy	Cumulative N	Cumulative %
Exactly on	1,292	36.1
Within 1/3 of a grade	2,931	82.0
Within 2/3 of a grade	3,457	96.7
Within 1 grade	3,557	99.5
Within 1 1/3 of a grade	3,572	99.9
Within 1 2/3 of a grade	3,575	100.0

Since a given job was rated by only five members of the Policy Board, it is probable that in a few instances individual inconsistencies and policy peculiarities combined to cause a job to receive a grade rating different from that which would have been obtained had the entire board rated the job. The policy equation represents the best single statement of policy for the board as a whole, and it was applied in a precise and invariant manner to every job. An "error" made by the policy equation in predicting the Policy Board's rating of a job does not necessarily indicate that the equation assigned a grade different from the one which would have been obtained had the entire board rated the job. In any event, such "errors" were few in number and small in magnitude. Furthermore, these errors were randomly distrubuted within AFSC categories. That is, the distribution of grade levels assigned to jobs in an AFSC category by the policy equation was in all instances approximately the same as the distribution of grades assigned to jobs in that AFSC category by the Policy Board.

As stated before, the nine variables in the final equation were selected after examining more than a hundred potential predictors. Some readers may wonder if this process did not involve a capitalization on chance relationships. To evaluate this possibility, the criterion observations were randomly divided into subsamples, A and B. Least squares weights for the nine final predictors were developed in a sample A and cross-applied to sample B. Similarly, weights were developed in sample B and cross applied to sample A. As indicated in Table 4, the resulting shrinkages in multiple correlations (Rs) averaged less than one point in the third decimal place.

Table 4. Cross Application of the OGR Policy Equation

Development Sample	N	Application Sample	Multiple R
A	1,788	B	.917
B	1,787	A	.918
A + B	3,575	A + B	.917

In summary, all data indicate that the policy equation is stable and that it does an excellent job of assigning grades judged appropriate by the Policy Board. Errors were few in number, small in magnitude, and randomly distributed. In view of these findings, the OGR Project moved to the next phase, application of the policy equation to determine the appropriate grade levels for an additional 10,000 officer jobs.

Phase III. Application of the Policy Equation to the 10,000 Case Sample and Projection of Results

Application of Equation

After the policy equation had been developed and demonstrated to assign the same grades to jobs as did the Policy Board, Phase III was undertaken. This phase involved application of the equation to determine the appropriate grade levels for a sufficiently large number of jobs to serve as a base for estimating the appropriate distribution of grades in various specialties and specialty groupings. Ten thousand jobs were selected for inclusion in this base sample. Of these, 1,750 were selected from the original 3,575 criterion job sample so the policy equation could be revalidated. The remaining 8,250 jobs were new jobs selected from the 79,750 population file to provide adequate representation of every AFSC-by-UMD grade category. Descriptions for the 10,000 jobs were randomly sorted into 400 booklets, each containing 25 job descriptions. Each booklet was rated by not fewer than five majors and lieutenant colonels, who were selected at random throughout the Air Force on the basis of the last two digits of their service numbers. Over 2,000 officers participated in this phase of the project. Each officer rated each job in his booklet on the appropriate job evaluation factors, and the same 16-point scale as used by the Policy Board in making its grade determination.

Mean score values on the job evaluation factors and field grade ratings were combined by the policy equation with organizational variables and supervisory grade ratings to determine the appropriate grade level for each of the 10,000 jobs. The grades assigned by the policy equation to the 1,750 criterion jobs were compared with the grades assigned to these same jobs by the policy equation using ratings collected from field judges in the development sample. These two sets of predicted grades correlated .93 and had approximately equal means and standard deviations. Thus, the policy equation was shown to have high stability across time and judges.

Projection of Results

At this stage of the OGR Project, appropriate grade requirements had been determined for 11,825 officer jobs. Of these, direct ratings from the Policy Board were available for 3,575 jobs, and ratings resulting from application of the policy equation were available for 8,250 jobs. This 11,825 was used as a base to determine the appropriate distribution of grades for various specialties and specialty groupings. The method for accomplishing these projections is described by Christal (1965).

Results of the OGR Project

Results of the OGR Project projections indicated that changes in grade allocations would have to be made in many officer utilization fields to bring statements of grade requirements into line with job demands. In some utilization fields grade requirements appeared to be grossly overstated, in others they were understated. In every utilization field some jobs were over classified while others were under classified by grade level.

For example, the study indicated that *too many* colonel positions were allocated to the Missile Operations, Safety, Weather, Missile Maintenance, Manpower Management, Education and Training, Information, and Legal utilization fields. At the same time, *too few* colonel positions were allocated to the Operations, Aircraft Control, Weapons Director, Scientific, Research and Development, Development Engineering, Communication-Electronics, Avionics/Munitions, Aircraft Maintenance, Civil Engineering, Trasportation, Logistics, Procurement, Financial, Administrative, Intelligence and Air Police utilization fields.

The OGR Project results indicated that the Air Force could get by with considerably fewer lieutenant colonels in Pilot and Navigator cockpit positions. It should be remembered however, that this project did not attempt to determine the appropriate pay levels for these positions, which would have demanded consideration of factors such as working conditions and risk. Nor did it consider the need for the Air Force to keep rated officers in the cockpit in order to amortize the cost of their training, which is considerable.

Overall, the OGR Project indicated that the Air Force was somewhat undergraded at the colonel and lieutenant colonel levels in 1964, and *considerably* undergraded at the major level. Readers who want more detailed information about study results should refer to the references.

Application of OGR Results

The Officer Grade Requirements Project results had an impact on the allocation of grades to officer positions, but they have never been implemented across-the-board. A number of lieutenant colonel cockpit positions were downgraded to major. Major positions in other areas, such as communication-electronics, were upgraded to lieutenant colonel. OGR results were used to evaluate requests for upgrading from the field for several years after the study was completed. Such requests were routinely rejected if they were not supported by OGR Project findings. The OGR Project also was instrumental in convincing the Department of Defense of the need for supporting and Air Force request for temporary relief at the major level.

IV. DEVELOPMENT OF BENCHMARK SCALES

The 1964 OGR Project produced a statement of the appropriate distribution of grades for each officer utilization field and for the Air Force as a whole. However, it did not yield a grade evaluation procedure which could be applied to individual officer positions. Previous research on context effects (Madden, 1960) indicated that the most accurate ratings of job level are obtained when a job is considered with other jobs of varying content and level. As stated earlier, when a job is rated with high level jobs it tends to be underestimated; when it is rated with low level jobs it tends to be overestimated; when it is rated alone, the obtained ratings tend to be unstable. In the OGR study, context effects were controlled by making sure that when job or job factor ratings were collected, the rater always executed his judgments on a carefully selected *set* of jobs.

In order to develop a system for evaluating individual officer positions, it first was necessary to construct job-factor scales with carefully anchored rating levels. That is, the rating scales had to provide the rater with an appropriate context within which he could nest his judgments. In the case of the OGR factors, a decision was made to develop scales using generally recognized job titles as benchmarks for level definitions. The efficiency of the scales could then be tested through application to a sample of jobs from the original OGR study. This effort is documented in an available publication (Brokaw & Giorgia, 1966) and will be dealt with only briefly here.

Selection of Job Titles

The list of 11,789 jobs evaluated in the Officer Grade Requirements Project were ordered in terms of their mean ratings on each of the ten job evaluation factors, Then each ordering was divided into nine sections, from high to low. Finally, eleven job titles were selected from each of the nine levels on each factor. These titles were selected to have minimum standard deviations and were so selected as to emphasize the range of ratings given. That is, for the fifth, or median group, the eleven titles were selected as near center of the range of means involved as possible; for groups other than the fifth, titles were chosen from the portion of the range remote from the median. This had the effect of identifying the highest possible mean rating for titles for use as the top or "9" category, and the lowest possible mean rating for titles for use as the lowest or "1" category.

Decks of manila cards were prepared for each factor. A deck contained 99 cards, each of which listed the title for one officer position, along with its organizational level and location. These decks were sent to volunteer rating officers (majors and lieutenance colonels) who were asked to order the jobs in a deck in terms of their requirement levels for a particular factor.

Intraclass correlations of the ratings on each factor were obtained for the 99 jobs (Haggard, 1958). The numbers of raters and factor reliability coefficients are reported in Table 5.

Table 5. Intraclass Correlations of Factor Ratings Across 99 Selected Job Titles[a]

	Factor	Number Of Ratings	Intraclass Correlation
1	Formal Education	15	.92
2	Special Training and Work Experience	9	.96
3	Working Conditions	15	.92
4	Originality, Ingenuity, and Creativeness	10	.94
5	Communication Skills	11	.94
6	Interpersonal Skills	11	.94
7	Judgment and Decision Making	11	.95
8	Planning	15	.92
9.	Management	9	.95
10	Risk	15	.96

[a]Only factors 2, 5, 7, 8 and 9 are weighted into the OGR Policy Equation. The remaining factor scales were developed for possible application in pay evaluation studies.

Each set of 99 job titles as ordered by the mean ranking was sub-divided into 9 groups of 11 titles. The three jobs with ratings of smallest variance in each subgroup were chosen for inclusion in the list of 27 titles composing the benchmark scale for each factor. When the 27 had been so identified, the derived scales were reviewed. In a number of cases, titles of slightly greater variance were substituted in order to represent more utilization fields in the scales.

Although data for the job titles had been collected in a context of specific organizational identification and geographical address, when the final benchmark scales were prepared, the organizational identification was altered to indicate a type of organization, and the geographical address was either deleted or changed to a general designator, such as "overseas." An example benchmark scale is presented as Figure 2.

Collection of Job Evaluations Using the Benchmark Scale

In order to test the efficiency of the benchmark scales, they were circulated to volunteer rating officers in the grade of major and lieutenant colonel, each of whom evaluated five job descriptions selected from the OGR criterion sample. One thousand such jobs were evaluated, and benchmark scale factor ratings were obtained for nearly all the jobs from not less than five raters.

Predictive Efficiency of the Benchmark Scales

Table 6 reports the correlations of benchmark scale factor ratings and grade ratings with the original OGR grade evaluations. They are generally as high or higher than validities obtained using the OGR adjuective scales. The validity for an equation combining benchmark factor ratings with field grade ratings, supervisory grade ratings, and organizational factors was computed to be .90. This is slightly lower than the .92 reported in the original OGR study. The modest loss in validity is attributable to the grade ratings obtained from officers participating in the benchmark scale study, which produced less validity than those obtained from officers participating in the OGR study (.86 vs .89).

Development of Integer Weight Equation

Demonstration of the predictive efficiency of the benchmark scales supported a decision to develop a system suitable for hand application by local manpower personnel. First, an integer weight was developed

FACTOR 9: MANAGEMENT: The level of executive, and managerial skills required in the job. Consider the complexity, variety, and level of the activities which are directed, organized, coordinated, controlled, commanded, or evaluated.

LEVEL 9

Director of Budget, Hq Major Air Command
Commander, Combat Support Gp (Overseas)
Wing Commander, Tactical Control Wg (Overseas)

LEVEL 8

Wing Commander, Aerospace Rescue & Recovery Wg
Chief of Operations, Strategic Missile Sq
Deputy Commander, Air Base Gp

LEVEL 7

Maintenance Supervisor, Avionics Maintenance Sq
Squadron Operations Officer, Combat Crew Training Sq
Base Accounting & Finance Officer, Flying Training Wg

LEVEL 6

Chief, Consolidated Base Personnel Office, Combat Support Gp
Base Procurement Officer, Pilot Training Wg
Helicopter Squadron Operations Officer, Flying Training Sq

LEVEL 5

Traffic Management Officer, Transportation Sq
Base Communications Maintenance Officer, Communications Sq (Overseas)
Missile Combat Crew Commander, Strategic Missile Sq

LEVEL 4

Chief, Utilities Operations Division, Civil Engineering Sq
Chief, Photo Evaluation Branch, Photographic Sq
Base Fuels Officer, Supply Sq

LEVEL 3

Primary Pilot Training Instructor, Pilot Training Sq
Space Surveillance Officer, Aerospace Support Sq
Air Traffic Controller, Communication Sq

LEVEL 2

Administrative Officer, Air Base Sq
Data Services Officer, Combat Support Gp
Tactical Fighter Pilot, Tactical Fighter Sq

LEVEL 1

Clinical Psychologist, USAF Hospital
Psychiatric Social Worker, USAF Hospital
Helicopter Pilot Single Rotor, Air Base Sq

Fig. 2. Example of benchmark scale.

Table 6. Correlations Between Mean Factor and Grade Ratings with OGR Criterion Board Action

	Factor	Correlations
1	Formal Education	.61
*2	Special Training and Work Experience	.61
3	Working Conditions	−.03
4	Originality, Ingenuity, and Creativeness	.67
*5	Communication Skills	.72
6	Interpersonal Skills	.69
*7	Judgment and Decision Making	.75
*8	Planning	.76
*9	Management	.79
10	Risk	−.22
11	Mean Grade Rating	.86

*Weighted into the grade evaluation composite.

for each level on the supervisory grade rating scale, as shown in Table 7. This permitted the supervisory grade ratings to be treated as a single variable in the final integer-weight equation, which is presented in Table 8. The predictive validity of this equation for the original Policy Board grade ratings was computed to be .90.

Table 7. Integer Weights for Various Levels of Supervisor's Judged Grade

Variable	Integer Weight
Supervisor's Judged Grade Lieutenant	−3
Supervisor's Judged Grade Captain	−2
Supervisor's Judged Grade Major	1
Supervisor's Judged Grade Lieutenant Colonel	5
Supervisor's Judged Grade Colonel	10

Table 8. Integer Weights for Final Grade Prediction Equation

Variable	Integer Weight
Rated Data From Field	
Special Training and Work Experience	3
Communication Skills	4
Judgment and Decision Making	2
Planning	1
Management	12
Mean Grade Rating from Field	4
Organizational Level of Job	1
Level of Job Within Organization	1
Supervisor's Judgment Subcomposite	4

Summary of 1966 Benchmark Scale Study

Benchmark Scales having rating levels defined by job titles were developed for factors entering into the 1964 OGR Policy Board grade equation. These scales were applied to a sample of 1,000 officer positions and were found to produce factor ratings having equal of higher validities than those obtained with the original OGR adjective scales, a simplified integer-weight grade equation was developed for possible operational application to officer positions. This equation produced a validity of .90 for Policy Board grade decisions.

V. OFFICER GRADE REQUIREMENTS RESEARCH, 1966–1974

Thus, by the end of 1966, a grade evaluation technology had been developed and partially tested which could be applied to individual officer positions. Only one more step was needed, and that was the construction of an equi-percentile conversion table. The prediction composite generated by the benchmark scale equation could be applied to order jobs from high to low in terms of merited grade. The conversion table was needed for converting composite score values into specific grade decisions. To put it another way, the conversion table is needed to make sure that the technology will assign the same *distribution of grades* to a set of positions as would have been allocated to that same *set* of positions by the 1964 Policy Board. The equation is needed to make sure that the grades within this distribution are attached to the proper positions. Both devices are required to complete the technology.

Be that as it may, the Air Force did not elect to implement the OGR technology at that time, and the conversion table was not developed. The reasons why the OGR technology was not implemented are unknown, although some can be hypothesized. First, the Air Force was underway with "The Road Ahead" studies to determine the optimum distribution of the officer force. This culminated in TOPLINE, which calls for a specific grade distribution to support career objectives. Also, implementation of the OGR technology would have created problems in many utilization fields. The need for keeping pilots and navigators in the cockpit in order to amortize training investments has already been mentioned. Another example is found in the scientific and engineering area where the OGR study indicated that many positions being filled by lieutenants and captains should have been filled by majors. Yet, there was no way this requirement could have been met without attainment of a much higher retention rate for junior officers in this area.

Regardless of the reasons, the Air Force elected not to implement the OGR technology, and research efforts were transferred from job evaluation to other programs. This condition held until 1974.

VI. TEST APPLICATION OF OGR TECHNOLOGY BY MANAGEMENT ENGINEERING TEAMS

In May 1974, AFHRL received a "Request for Personnel Research" (RPR 74-20), jointly sponsored by Hqs USAF PRMRE and DPXX, which asked for the development and testing of a "a technology by which management engineering teams can apply job evaluation factors to determine appropriate grade requirements for all officer positions, excluding those to be filled by line pilots and navigators, physicians, dentists, and personnel not subject to constraints of the Officer Grade Limitations Act (OGLA)." This research request was accepted, and work was initiated with a due date for completion in April 1975. The remaining portion of this report presents the status of the study as of 15 January 1975.

Approach

As indicated previously, two elements are needed for an acceptable grade evaluation system: (1) a "yardstick" which measures grade requirement levels, and (2) a method for reliably applying the yardstick to individual officer positions. If one does not trust the "yardstick," then he will not accept the final results – no matter how carefully that yardstick may have been applied. Fortunately, the Air Force had a yardstick (the OGR grade policy equation) on the shelf which was developed in the 1964 Officer Grade Requirements Project. A procedure for applying the yardstick to individual officer positions was developed in the Benchmark Scale study conducted in 1966. The only remaining requirement was for a procedure by which management engineering teams (MET) could reliably apply the yardstick to officer positions in the

current force. Whatever that procedure, it must be demonstrated that the grades it allocates to positions are the same as would have been allocated by the 1964 OGR Policy Board. The policy expressed by that Board is the foundation of the proposed system.

In order to tie the proposed system to the Board policy as directly as possible, the decision was made to have MET members provide factor ratings on a subset of positions from the original 3,575 criterion sample. These ratings would be obtained using the benchmark scales developed in the 1966 study. The simplified integer weights developed in the 1966 study would be applied, and the resulting grade composite scores would be correlated with the original Policy Board grade ratings. A high correlation would indicate that ratings obtained by the MET can be used to determine the appropriate grade requirements for individual officer positions. A decision was made to collect job descriptions and grade factor ratings on an additional sample of current jobs. These data could be treated to yield a very rough indication as to whether the procedure would likely result in statements of grade requirments which are grossly divergent from those currently specified in UDLs.

Selection of the Job Sample

As indicated previously, two samples of officer positions were required by the study design. One was a sample of the positions originally rated by the Policy Board in 1964. The second was a sample of positions which is representative of the total population of existing positions for which the technology is to be applicable.

The first sample was selected by simply accepting all non-aircrew positions in the "1,000 case" 1966 Benchmark Scale study which were deemed to still exist in the current Air Force inventory of jobs. This yielded a sample of 485 positions for which job descriptions, Policy Board grade ratings, 1964 field officer grade and factor ratings, and 1966 field officer grade and benchmark scale factor ratings were available.

For the second sample, approximately 1,800 currently-occupied positions were identified which were judged to be representative of the total population of existing non-aircrew positions. This sample contained at least one position from each UDL grade-by-AFSC category, with supplementary positions being added from the more populated categories.

Data Collection

Eighty-nine management engineering teams participated in the data collection phase. Each MET was asked to collect position descriptions for a specified subset of the 1,800-job sample, while subsets of descriptions from the 485-job sample were reproducted by AFHRL and distributed to each MET. Due to nonavailability of some officer job incumbents, descriptions were finally generated for 1,687 of the 1,800 job sample.

An average of 14.93 MET members provided grade and benchmark factor ratings for each position in the 485 job sample. An average of 7.53 MET members provided such data for each position in the 1,687 job sample. In all, 221,430 job-by-factor ratings were obtained from 671 MET participants.

Data Analyses

Data analyses can be divided into two sets. The first set was designed to evaluate whether information collected by the MET produced a grade composite having a high correlation with the 1964 Policy Board grade ratings. These analyses were conducted on the 485-job sample and involved weighing together the grade and benchmark scale ratings provided by the MET, together with supervisory grade ratings and data concerning the organizational level of each position. Since the system was being evaluated for possible operational implementation, the simplified integer-weight equation developed in the 1966 Benchmark study was applied. The second set of analyses involved applying the equations to the 1,687 job sample and comparing the resulting equation grades with those currently held by job incumbents and also with those authorized on the UDL.

Analysis of the 485 Job Sample

Table 9 presents validity coefficients for each of the equation variables, as well as for the final grade evaluation composite. The composite validity of .90 is essentially identical with that obtained in the 1966

Benchmark study, and is only slighly lower than the .92 obtained for the equation developed in the 1964 OGR study. At least part of the loss from .92 to .90 was due to the use of simplified integer-weights rather than least-square weights. A sixteen-point equi-percentile conversion table (Appendix C) was constructed and applied to the grade equation composites to eliminate the restriction in range due to regression effects. Figure 3 was constructed to display the relationship between the grades assigned by the equation and those assigned by the 1964 Policy Board to these 485 positions. It will be recalled that three points on the scale encompasses one grade level (except for lieutenants). Thus, for those positions in the diagonal squares, there was exact agreement between the equation and board ratings. Positions plotted one square off the diagonal are those for which the equation and board agreed within one-third of a grade level. Positions plotted two squares off the diagonal are those for which agreement was within two-thirds of a grade level. Data in the figure reveal that for 94% of the positions, agreement was perfect or within two-thirds of a grade, and for only one percent of jobs was there disagreement by more than one full grade level. In summary, it appears that the MET can accurately implement the 1964 criterion board policy, using the benchmark scale factors and the simplified integer weight equation.

Table 9. **Validities of Variables Included in the MET-Applied Integer Weight Grade Equation**

Variables	Validities
Factor 2, Special Training and Work Experience	.61
Factor 5 Communication Skills	.72
Factor 7 Judgment and Decision Making	.73
Factor 8 Planning	.78
Factor 9 Management	.82
Level of Organization	.48
Level of Job Within Organization	.49
Supv Judgment of Grade for Job	.79
Mean MET Judges Grade Ratings	.86
Final Grade Evaluation Composite R = .90	

If the technology were to be implemented operationally by MET, it is estimated that the validity of the grade equation would be somewhere near the .90 reported previously. However, this estimate is obtained by balancing a number of complex considerations into a single judgment. First, the mean grade and job factor ratings used in the test validation were based upon an average of nearly fifteen raters. It would be expensive for the Air Force to routinely involve fifteen raters in application of the technology to every officer position. Use of five raters would be a reasonable recommendation. Means based upon five raters are less stable than means based upon fifteen raters, and this reduction in stability would result in grade composites with less validity. Prophecy formulas (Guilford, 1956, p. 475) indicate that if only five raters had been used in the present study, the resultant validity would have been approximately .85 in the 485 case sample. This is high, but nevertheless is significantly lower than the reported .90. The *reliability coefficient* for the final composite based on five raters in the 485 job sample is computed to be .91. However, the reliability coefficient for the grade composite based on five raters in the 1,687 case sample was computed to be .94. This higher value was probably due to the fact that MET members were more familiar with the jobs in the latter sample. In this instance, they were rating jobs in their own command and located at or near their own installation. By accepting certain tentable assumptions, it can be estimated that for officer positions serviced by the MET, the validity based upon five raters would be at least .87. Finally, some error variance was introducted into the study data by raters who failed to follow instructions, either through misunderstanding or lack appreciation of the need for preciseness. In an operational system, this variance could be eliminated or greatly reduced by review procedures. To summarize, it is estimated that grade evaluation composites based upon five MET raters would have a validity of approximately .90 in a carefully monitored operational system.

Validity in an operational system could be further enhanced by making maximum use of officer raters. Fo the 485 job sample, the ratings provided by civilian MET members were somewhat more reliable than those provided by airmen MET members, while the ratings provided by officer MET members were more reliable than those provided by either airmen or civilians. Raters in the test study consisted of 374 enlisted, 130 civilian and 167 officer personnel.

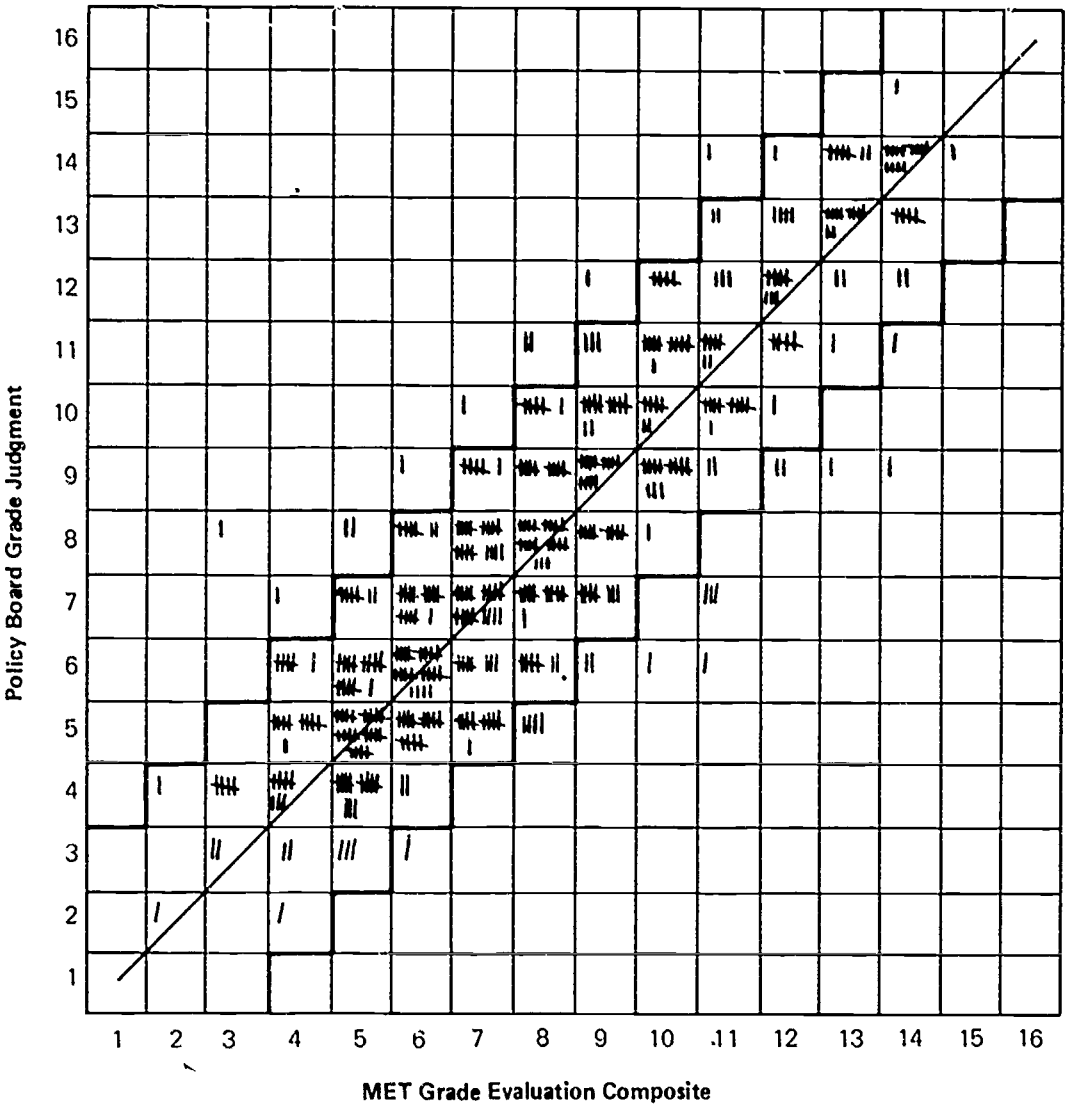

Fig. 3. Comparison of grades allocated to 485 jobs by the 1964 Policy Board and the MET applied grade evaluation equation.

As mentioned previously, an equi-percentile conversion table was developed so that equation grade evaluation composite scores could be converted into statements of grade requirements. Table 10 presents data comparing distributions of UMD grade allocations, Policy Board grade judgments, converted equation grade evaluations, and the actual grades held by officers in these 485 positions in 1964. Distributions of grades allocated by the equation and by the Policy Board are essentially identical. This is as it should be, since the conversion table was designed to bring the two distributions into alignment. It can be seen that the equation (and Policy Board) allocated about the same number of colonel positions as the number of colonels available in the 485-case sample. The equation called for a few more lieutenant colonel positions and a much larger number of major positions than reflected either in the UMD or held by the on-board population of officers. This is consistent with the general finding in the original 1964 OGR study that many Air Force jobs filled by captains and lieutenants should, in fact, be filled by majors.

Table 10. **Comparison of Grade Distributions for the 485 Job Sample**

Grade Level	Policy Board	Equation Grade	UMD Grade	Present Grade
Colonel	48	48	48	45
Lt Colonel	89	89	80	80
Major	178	177	126	121
Capt/Lt	170	171	231	239
Total	485	485	485	485

Analysis of the 1,687 Job Sample

Grade evaluation composite scores were computed for each position in the 1,687 job sample. These composite scores were then converted into estimated grade requirements using the equi-percentile conversion table developed in the 485 job sample. Table 11 presents the resulting distribution of equation grade requirements, along with the UDL requirements and grades currently held by officers in these positions.

Table 11. **Comparison of Grade Distributions for the 1,687 Job Sample**

Grade Level	Equation Grade	UDL Grade	Present Grade
Colonel	115	121	108
Lt Colonel	271	307	275
Major	604	420	415
Capt/Lt	697	799	889
Total	1,687	1,647[a]	1,687

[a]Plus 40 overages.

A degree of caution should be exercised in interpreting the equation grade requirements in Table 11. The 485 job sample was adequate for determining the relationship between the grade evaluation composite distribution and grades assigned by the 1964 Policy Board. However, this sample is considered to be too small to construct a stable conversion table. This means that the cutting points identified in the composite distribution to separate adjacent grades contain too much margin of error. Before the grade evaluation technology can be implemented operationally by MET, it will be necessary to obtain ratings on an additional 500 to 1,000 positions from the original 1964 criterion sample in order to construct a stable conversion table.

The data in Table 10 reveal apparent inflation in the UDL at the colonel and lieutenant colonel levels, and an understatement by the UDL for requirements at the major level. The equation allocates a few more colonel and slightly fewer lieutenant colonel positions than held by the incumbents in the 1,687 job sample. Again, the data reflect the need for more majors.

It is dangerous to generalize from 1,687 positions to the entire officer job population, especially knowing that the grade composite conversion table was constructed using only 485 cases. Yet, if one had to hazard a guess as to what the technology might yield for the total non-aircrew force, it would be most reasonable for one to assume that the trends in Table 10 hold true.

When one compares data in Table 10 with those in Table 9, there appears to be an inconsistency. In the 485 job sample, the number of equation grades at the colonel and lieutenant colonel levels is equal to or higher than the UMD. Yet in the 1,687 job sample, the number of equation grades is lower than the UDL at both of these levels.[6] An analysis was made to see if this inconsistency was due to biases in the job samples or inflation in authorized grade distributions. Data presented in Table 12 suggest that there has been a significant inflation in the levels of grades authorized for non-aircrew positions since 1964.

Table 12. **Comparisons of 1964 and 1974 UMD/UDL Grade Authorizations for Non-Aircrew Positions[a]**

Grade Level	1964		1974	
	Freq	%	Freq	%
Colonel	3,859	5.31	5,341	8.03
Lt Colonel	9,278	12.77	11,588	17.44
Major	16,454	22.64	16,839	25.34
Lt/Capt	43,084	59.28	32,673	49.18
Total	72,675		66,441	

[a]Excludes Aircrew personnel (10XX, 11XX, 12XX, 13XX, 15XX), Spec Inv (82XX), Physicians and Dentists (93XX, 94XX, 95XX, 96XX, 98XX), and special duty (000X, 01XX, 09XX).

VII. DISCUSSION OF RESULTS

Based upon the results presented, it appears that management engineering teams can evaluate grade requirements for non-aircrew officer positions through application of the benchmark scales and the integer-weight equation from the 1966 study. In effect, this procedure will assign the same grade level to each position as would have been assigned by the 1964 Policy Board. Thus, any inflationary trend in grade allocations which may have occurred since 1964 will be eliminated by implementation of the procedure.

The question might arise whether a new board should be established to express grade policy as of 1975. After all, many new types of officer positions have been introduced since 1964, and the original equation may not be valid for such positions.

There are many reasons for sticking with the 1964 board's policy statements. The Officer Grade Requirements Project was one of the largest and most-carefully executed job evaluation studies ever accomplished – in or out of the military services. Numerous analyses were conducted over a one-year period before the board judgments were accepted as a criterion. Ratings provided by board members were demonstrated to be reliable, reasonable, and unbiased. The job factors which were identified for replicating the board's judgments have high face validity for defining the meaning of grade. Every step in the project was carefully documented, and all raw data and analyses runs are still available for inspection. An atmosphere was created during the board rating sessions which would be difficult to reproduce in today's environment.

[6]In 1964, authorized grades were recorded on Unit Manning Documents (UMD). In 1974, grade authorizations were posted on Unit Document Listings (UDL). In the present report, UMD can be treated as the equivalent of UDL.

Furthermore, there is every reason to believe that the original equation is as valid for today's jobs as it was for jobs existing in 1964. During the 1964 study, tests were conducted to determine if different factors and weights were needed for expressing the board's grade policy for different classes of jobs. In 1974 data was rechecked across five job sets using restricted and full sets of variables, and no significant increases in the multiple regression coefficient were found. This implied that the factor variables selected in the final regression equation provided optimal predictive efficiency. It appears that grade has a universal meaning, and that the same factors and weights are applicable to all classes of jobs. There is no reason that the same equation should not be valid for any new types of job which have come into the inventory since that time.

Finally, tying grade requirements to a constant standard will protect the Air Force from any unjustified "grade creep." Assuming honest application of the benchmark scales, any increase in stated grade requirements will be associated with actual increased responsibility levels associated with jobs.

VIII. SUMMARY AND CONCLUSIONS

This report has described the development and test of a system by which Air Force management engineering teams (MET) can evaluate grade requirements for individual officer positions based upon job content and responsibility levels. The "yardstick" used for grade evaluation was developed in the 1964 Officer Grade Requirements (OGR) Project – one of the largest and best documented job evaluation studies ever accomplished. During the 1964 project, twenty-two highly experienced colonels provided grade requirement ratings for 3,575 positions which were carefully selected to represent nearly all types and levels of officer jobs in the Air Force. Subsequent analyses indicated that these "Policy Board" colonels had high interrater agreement concerning the appropriate grades for positions in the 3,575 job sample; that they did not display biases toward jobs in individual specialties or commands; that they did not produce inflated grade estimates; that they did not simply confirm existing authorized grades; and that they were confident in their judgments. It appeared that each job had been judged on its individual merits; so the board ratings were accepted as the basis for constructing a job evaluation system.

An equation system was developed, using the policy-capturing model, which was demonstrated to assign the same grade levels to officer positions as the Policy Board (validity = .92). It weighted together factors with high face validity for grade, including those measuring job requirements for managerial skills, planning, communication skills, judgment, decision making, special training, work experience and the organizational level of the job.

A follow-on study was conducted in 1966 in which "benchmark scales" were developed for use in evaluating individual officer positions in terms of requirement levels on factors entering into the policy equation. The present report summarizes the results of a test to see if management engineering teams can apply these benchmark scales and accurately determine grade requirements.

A total of 671 MET members participated in the test. They provided 221,430 factor-by-job ratings which made possible the computation of grade evaluation composites for 485 officer positions previously rated by the 1964 Policy Board, and deemed still to exist in the Air Force inventory. They also rated 1,687 current positions selected to be representative of the existing Air Force population of non-aircrew jobs. Analyses of the 485 job sample indicated that management engineering teams can accurately implement the 1964 board's grade "policy." Analyses of the 1,687 job sample indicated that if the system were implemented operationally it would probably reflect the need for fewer colonel and lieutenant colonel positions than currently authorized on the UDL, but about the same number as held by the present on-board officer population. Again projecting from the 1,687 job sample, the new system would probably indicate the need for more major positions than currently authorized. These projections are extremely tenuous because of the small base sample (1,687), and the weak conversion table, based only on 485 job samples, used for translating grade composite scores into grade decisions.

IX. RECOMMENDATIONS

If the Air Force management wishes to implement a system for evaluating grade requirements based upon job content and responsibilities, it is recommended that the technology described in this report be

adopted. It is backed by years of systematically-accomplished research and, considering the present state-of-the-art, it is the most defensible system likely to become available in the foreseeable future.

Before the technology becomes operational, it will be necessary for management engineering teams to evaluate another 500 to 1,000 officer positions from the original 1964 job criterion sample. These evaluation would be used to construct a stable conversion table for translating grade composite scores into grade decisions.

If the Air Force needs to determine the total distribution of non-aircrew grade requirements for planning purposes, evaluations on 10,000 to 15,000 officer positions by MET would be needed. Projections could be made from this base to determine the grade requirements for each non-aircrew utilization field.

It is recognized that certain grade authorizations are required for the Air Force to meet career planning objectives. It is recommended that the requirements based upon job demands be compared with those needed to support career planning objectives in order to determine the best grade structure to service both needs.

REFERENCES

Brokaw, L.D., & Giorgia, M.J. *Development of benchmark scales for Air Force officer position evaluation.* PRL-TR-66-9, AD-645 055. Lackland AFB, Tex.: Personnel Research Laboratory, Aerospace Medical Division, September 1966.

Christal, R.E. *JAN: A technique for analyzing group judgment.* PRL-TDR-63-3, AD-403 813. Lackland AFB, Tex.: Personnel Research Laboratory, Aerospace Medical Division, February 1963.

Christal, R.E. *Officer grade requirements project: I. Overview.* PRL-TR-65-15, AD-622 806. Lackland AFB, Tex.: Personnel Research Laboratory, Aerospace Medical Division, September 1965.

Christal, R.E. Selecting a harem – and other applications of the policy-capturing model. *Journal of Experimental Education,* 1968, **36**(4), 35-41.

Christal, R.E., & Madden, J.M. *Air Force research on job evaluation procedures.* ASD-TN-61-46, AD-267 346. Lackland AFB, Tex.: Personnel Laboratory, Aeronautical Systems Division, June 1961.

Christal, R.E., Madden, J.M., & Harding, F.D. *Reliability of job evaluation ratings as a function of number of raters and length of job descriptions.* WADD-TN-60-257, AD-251 837. Lackland AFB, Tex.: Personnel Research Laboratory, Wright Air Development Division, October 1960.

Guilford, J.P. *Fundamental statistics in psychology and education.* New York: McGraw-Hill, 1956.

Haggard, E.A. *Intraclass correlation and the analysis of variance.* New York: Dryden Press, 1958.

Hazel, J.T. *Officer grade requirements project: II. Job descriptions, sample selection, and criterion board.* PRL-TR-65-18, AD-629 575. Lackland AFB, Tex.: Personnel Research Laboratory, Aerospace Medical Division, November 1965.

Hazel, J.T., Christal, R.E., & Hoggatt, R.S. *Officer grade requirements project: IV. Development and validation of a policy equation to predict criterion board ratings.* PRL-TR-66-16, AD-656 125. Lackland AFB, Tex.: Personnel Research Laboratory, Aerospace Medical Division, November 1966.

Hazel, J.T. & Madden, J.M. *Evaluation of officer jobs versus evaluation of specialties.* PRL-TR-65-7, AD-617 334. Lackland AFB, Tex.: Personnel Research Laboratory, Aerospace Medical Division, March 1965.

Lindquist, E.F. *Design and analysis of experiments in psychology and education.* Boston: Houghton Mifflin, 1953.

Madden, J.M. *Context effects in job evaluation.* WADD-TN-60-220, AD-249 950. Lackland AFB, Tex.: Personnel Research Laboratory, Wright Air Development Division, October 1960.

Madden, J.M. *A preliminary study of officer job evaluation factors.* PRL-TDR-63-14, AD-417 456. Lackland AFB, Tex.: Personnel Research Laboratory, Aerospace Medical Division, May 1963. (a)

Madden, J.M. *Prediction of officer job rankings from ratings of two sets of job evaluation factors.* PRL-TDR-63-13, AD-417 276. Lackland AFB, Tex.: Personnel Research Laboratory, Aerospace Medical Division, May 1963. (b)

APPENDIX A. DEFINITION OF JOB REQUIREMENT FACTORS

1. FORMAL EDUCATION: The amount of formal education required by the job. Consider the education obtained in high school, college, university, or professional school.

2. SPECIAL TRAINING AND WORK EXPERIENCE: The extent to which the job requires knowledges and skills which must be acquired through special training courses or on-the-job experience. Disregard general courses given by Squadron Officer School, Command and Staff College, or War College.

3. WORKING CONDITIONS: The extent to which the job involves uncomfortable working conditions. Consider such conditions as isolation, irregular hours, monotony, prolonged vigilance, extensive TDY, and pressure to meet deadlines.

4. ORIGINALITY, INGENUITY, AND CREATIVENESS: The extent to which the job requires new and unique methods, approaches, and solutions to problems. Consider the demand for novel ideas and inventiveness.

5. COMMUNICATION SKILLS: The extent to which the job requires skill in oral and written communication. Consider the complexity and variety of information communicated as well as the level of the individuals and agencies involved.

6. INTERPERSONAL SKILLS: The extent to which the job requires skill in dealing with people. Consider the need for sensitiveness, responsiveness, persuasiveness, self control, and tact, as well as the possible consequences when such skills are not employed.

7. JUDGMENT AND DECISION MAKING: The importance and independence of judgments and decisions required by the job. Consider the nature, variety, and possible impact of decisions. The less well defined the guidance for decisions, the higher should be the rating; while the more specific and detailed the guidance, the lower should be the rating.

8. PLANNING: The extent to which planning is required by the job. Consider the scope and significance of work for which planning is done. The longer the time span for which planning is done, the higher the rating should be.

9. MANAGEMENT: The level of executive, and managerial skills required in the job. Consider the complexity, variety, and level of the activities which are directed, organized, coordinated, controlled, commanded, or evaluated.

10. RISK: The extent to which the job requires exposure to risk of death or severe injury in peace-time.

APPENDIX B. PARTIAL LIST OF PREDICTIONS EVALUATED DURING DEVELOPMENT OF THE OGR POLICY

Predictor	Definition	Type of Score
X_1	Formal education	continuous
X_2	Special training and work experience	continuous
X_3	Working conditions	continuous
X_4	Originality, ingenuity and creativeness	continuous
X_5	Communication skills	continuous
X_6	Interpersonal skills	continuous
X_7	Judgment and decision making	continuous
X_8	Planning	continuous
X_9	Management	continuous
X_{10}	Risk	continuous
X_{11}	Grade rating from field judges	continuous
X_{12}	Pilot job	1 or 0
X_{13}	Commander or director job	1 or 0
X_{14}	Navigator job	1 or 0
X_{15}	Air operations job	1 or 0
X_{16}	Scientific or development engineering job	1 or 0
X_{17}	Electronic, maintenance, or civil engineering job	1 or 0
X_{18}	Materiel or comptroller job	1 or 0
X_{19}	Administrative or support job	1 or 0
X_{20}	Professional job	1 or 0
X_{21}	Level of organization	continuous
X_{22}	1 if X_{21}= 0; 0 otherwise	1 or 0
X_{23}	X_{21} squared	continuous
X_{24}	Level within organization	continuous
X_{25}	1 if X_{24}= 0; 0 otherwise	1 or 0
X_{26}	X_{24} squared	continuous
X_{27}	Supervisor's judgment of grade	continuous
X_{28}	X_{27} = Lieutenant	1 or 0
X_{29}	X_{27} = Captain	1 or 0
X_{30}	X_{27} = Major	1 or 0
X_{31}	X_{28} = Lt Colonel	1 or 0
X_{32}	X_{28} = Colonel	1 or 0
X_{33}	X_{28} = General	1 or 0
X_{34}	X_{28} squared	continuous
X_{35}	UMD authorized grade	continuous
X_{36}	X_{35} squared	continuous
X_{37}	X_{35} = Lieutenant	1 or 0
X_{38}	X_{35} = Captain	1 or 0
X_{39}	X_{35} = Major	1 or 0
X_{40}	X_{35} = Lt Colonel	1 or 0
X_{41}	X_{35} = Colonel	1 or 0

Predictor	Definition	Type of Score
X_{42}	Incumbent's present grade	continuous
X_{43}	X_{42} squared	continuous
X_{44}	X_{42} = Lieutenant	1 or 0
X_{45}	X_{42} = Captain	1 or 0
X_{46}	X_{42} = Major	1 or 0
X_{47}	X_{42} = Lt Colonel	1 or 0
X_{48}	X_{42} = Colonel	1 or 0
X_{49}	Incumbent's grade higher than UMD	1 or 0
X_{50}	Incumbent's grade = to UMD	1 or 0
X_{51}	Incumbent's grade lower than UMD	1 or 0
X_{52}	Grade of immediate supervisor	continuous
X_{53}	X_{52} squared	continuous
X_{54}	X_{52} = civilian	1 or 0
X_{55}	X_{52} = Lieutenant	1 or 0
X_{56}	X_{52} = Captain	1 or 0
X_{57}	X_{52} = Major	1 or 0
X_{58}	X_{52} = Lt Colonel	1 or 0
X_{59}	X_{52} = Colonel	1 or 0
X_{60}	X_{52} = General	1 or 0
X_{61}	Supervisor's grade higher than incumbent	1 or 0
X_{62}	Supervisor's grade equal to incumbent	1 or 0
X_{63}	Job is in SAC	1 or 0
X_{64}	Job is in TAC	1 or 0
X_{65}	Job is in PACAF, USAFE, or USAFSS	1 or 0
X_{66}	Job is in Hq Command or Hq USAF	1 or 0
X_{67}	Job is in AFSC or OAR	1 or 0
X_{68}	Job is in AFLC, AFAFC, or AFCS	1 or 0
X_{69}	Job is in AAC, SOU, ADC, or CONAC	1 or 0
X_{70}	Job is in ATC, AU, or USAFA	1 or 0
X_{71}	Job is in commands other than above	1 or 0
X_{72}	Command and staff job	1 or 0
X_{73}	Non-command and staff job	1 or 0
X_{74}	X_1 squared	continuous
X_{75}	X_2 squared	continuous
X_{76}	X_3 squared	continuous
X_{77}	X_4 squared	continuous
X_{78}	X_5 squared	continuous
X_{79}	X_6 squared	continuous
X_{80}	X_7 squared	continuous
X_{81}	X_8 squared	continuous
X_{82}	X_9 squared	continuous
X_{83}	X_{10} squared	continuous
X_{84}	X_{11} = 1 or 2	1 or 0
X_{85}	X_{11} = 3	1 or 0

(squared job evaluation factor scores; introduced to test for non-linearity)

Predictor		Definition	Type of Score
X_{86}	$X_{11} = 4$	(Variables associated with specific grade rating levels)	1 or 0
X_{87}	$X_{11} = 5$		1 or 0
X_{88}	$X_{11} = 6$		1 or 0
X_{89}	$X_{11} = 7$		1 or 0
X_{90}	$X_{11} = 8$		1 or 0
X_{91}	$X_{11} = 9$		1 or 0
X_{92}	$X_{11} = 10$		1 or 0
X_{93}	$X_{11} = 11$		1 or 0
X_{94}	$X_{11} = 12$		1 or 0
X_{95}	$X_{11} = 13$		1 or 0
X_{96}	$X_{11} = 14$		1 or 0
X_{97}	$X_{11} = 15$ or 16		1 or 0
X_{98}	$X_{21} = 7$	(Variables associated with specific levels of organization)	1 or 0
X_{99}	$X_{21} = 6$		1 or 0
X_{100}	$X_{21} = 5$		1 or 0
X_{101}	$X_{21} = 4$		1 or 0
X_{102}	$X_{21} = 3$		1 or 0
X_{103}	$X_{21} = 2$		1 or 0
X_{104}	$X_{24} = 7$	(Variables associated with specific levels of organization)	1 or 0
X_{105}	$X_{24} = 6$		1 or 0
X_{106}	$X_{24} = 5$		1 or 0
X_{107}	$X_{24} = 4$		1 or 0
X_{108}	$X_{24} = 3$		1 or 0
X_{109}	$X_{24} = 2$		1 or 0
X_{110}	$(X_{21})(X_{13})$	(Variables expressing interactions between level of organization and membership in various AFSCs)	1 or 0
X_{111}	$(X_{22})(X_{13})$		1 or 0
X_{112}	$(X_{24})(X_{13})$		1 or 0
X_{113}	$(X_{25})(X_{13})$		1 or 0
X_{114}	$(X_{21})(X_{14})$		1 or 0
X_{115}	$(X_{22})(X_{14})$		1 or 0
X_{116}	$(X_{21})(X_{15})$		1 or 0
X_{117}	$(X_{22})(X_{15})$		1 or 0
X_{118}	$(X_{21})(X_{16})$		1 or 0
X_{119}	$(X_{22})(X_{16})$		1 or 0
X_{120}	$(X_{21})(X_{17})$		1 or 0
X_{121}	$(X_{22})(X_{17})$		1 or 0
X_{122}	$(X_{21})(X_{18})$		1 or 0
X_{123}	$(X_{22})(X_{18})$		1 or 0
X_{124}	$(X_{21})(X_{19})$		1 or 0
X_{125}	$(X_{22})(X_{19})$		1 or 0
X_{126}	$(X_{21})(X_{20})$		1 or 0
X_{127}	$(X_{22})(X_{20})$		1 or 0
X_{128}	$(X_{24})(X_{98})$		1 or 0
X_{129}	$(X_{25})(X_{98})$		1 or 0

Predictor	Definition	Type of Score
X_{130}	(X_{24}) (X_{99})	1 or 0
X_{131}	(X_{25}) (X_{99})	1 or 0
X_{132}	(X_{24}) (X_{100})	1 or 0
X_{133}	(X_{25}) (X_{100})	1 or 0
X_{134}	(X_{24}) (X_{101})	1 or 0
X_{135}	(X_{25}) (X_{101})	1 or 0
X_{136}	(X_{24}) (X_{102})	1 or 0
X_{137}	(X_{25}) (X_{102})	1 or 0
X_{138}	(X_{24}) (X_{103})	1 or 0
X_{139}	(X_{25}) (X_{103})	1 or 0
	(Variables expressing interactions between level of organization and level within organization)	
X_{140}	Highest education = Non high school	1 or 0
X_{141}	Highest education = high school	1 or 0
X_{142}	Highest education = 1 year college	1 or 0
X_{143}	Highest education = 2 year college	1 or 0
X_{144}	Highest education = 3 year college	1 or 0
X_{145}	Highest education = BA	1 or 0
X_{146}	Highest education = BA+	1 or 0
X_{147}	Highest education = MA	1 or 0
X_{148}	Highest education = PhD	1 or 0
X_{149}	Major field of study = Ed	1 or 0
X_{150}	Major field of study = PE	1 or 0
X_{151}	Major field of study = Arts & His	1 or 0
X_{152}	Major field of study = Eng	1 or 0
X_{153}	Major field of study = Bus	1 or 0
X_{154}	Major field of study = Med, Leg	1 or 0
X_{155}	Major field of study = Soc St	1 or 0
X_{156}	Major field of study = Mil Sci	1 or 0
X_{157}	Major field of study = other	1 or 0
X_{158}	Aircrew operations job	1 or 0
X_{159}	Non-aircrew operations job	1 or 0
X_{160}	Scientific and engineering job	1 or 0
X_{161}	Material and comptroller job	1 or 0
X_{162}	Professional job	1 or 0
X_{163}	Administrative and support job	1 or 0
X_{164}	Missile associated job	1 or 0
X_{165}	"Low glamour"job	1 or 0
X_{166}	Length of job description	continuous
X_{167}	Length of job requirement statements	continuous
X_{168}	Total months in DAFSC	continuous
X_{169}	Months in present assignment	continuous
X_{170}	Months in present grade	continuous

APPENDIX C. ILLUSTRATION OF A JOB DESCRIPTION AND RATINGS

This appendix illustrates an actual job description from the 1,687 case sample and the MET ratings obtained on this description. The job (number 990531) was randomly selected. Data concerning application of the policy equation is also provided.

As shown on pages 2 and 3 of the AF Officer Job Survey (Figure C1), the title of the job was "Aircraft Maintenance Supervisor" and it is located in an organizational maintenance squadron. Eight duties with tasks for each duty are listed. Examination of this information reveals specific details concerning job content and responsibilities. Additionally, a section covering unusual job requirements and a brief job summary are provided.

Page 4 of the AF Officer Job Survey provides other assignment information concerning the job, with certain personal data withheld to safeguard confidentiality. With regard to elements in the policy equation, the level of organization was a squadron (level 3), level of job was in some division within the squadron (level 5). Presumably the "division" job level is appropriate considering the job content (pp. 2 and 3), although squadrons typically are divided into flights, sections or detachments. The immediate supervisor's judged appropriate grade for the job was a major (level 4).

Using only the information from pages 2 and 3, seven MET raters provided benchmark factor ratings (9-level scale) and grade ratings (16-point scale). Of the seven raters, five were enlisted and two were officers. The mean factor scores and mean field judges grade ratings, along with other information necessary to apply the grade equation to job #990531 are given in Table C1. This table includes the integer weights for each element of the equation and a cumulative composite score as it may be computed on a desk calculator.

Table C1. **Application of Policy Equation to Job #990531**

Element	Score	(Times)	Weight	=	Cumulative Score
Factor 2 Special Training and Work Experience	3.1		3		9.3
Factor 5 Communication Skills	3.6		4		23.7
Factor 7 Judgment and Decision Making	4.1		2		31.9
Factor 8 Planning	4.3		1		36.2
Factor 9 Management	5.0		12		96.2
Mean Field Judges Grade Ratings	6.1		4		120.6
Level of Job	5		1		125.6
Level of Organization	3		1		128.6
Recoded Supv Judgment of Grade	(4)=1[a]		4		132.6
Grade Evaluation Composite	—		—		132.6*

*Converts to Pay Grade = 7 (junior level major) on 16-pt grade conversion table or grade 4 (major on a 7-pt conversion table (Table 2).

[a]See explanations in text concerning Table 7, and Brokaw and Giorgia (1966 study).

As shown in Table C1, the final grade evaluation composite score was 132.6. Using the equi-percentile conversion scales (Table C2) developed on the 485 MET rated job sample, this value converts to a pay grade of 7 (a junior level of experience major). In comparison, the UDL grade for this position is level 4 (major), the present grade of the officer is level 3 (captain) and the supervisor's judged appropriate grade for the position is level 4 (major).

Table C2. Grade Conversion Table[a]

Weighted Composite Cumulative Score	Converts to Pay Grade (16-pt Scale)	Converts to Pay Grade (7-pt Scale)
See Text and Below[b]	16 General	7 General
289.1 or above	15 Senior Colonel	
261.1 to 289.0	14 Middle Colonel	6 Colonel
238.8 to 261.0	13 Junior Colonel	
217.3 to 238.7	12 Senior Lt Colonel	
200.9 to 217.2	11 Middle Lt Colonel	5 Lt Colonel
183.5 to 200.8	10 Junior Lt Colonel	
162.5 to 183.4	9 Senior Major	
143.9 to 162.4	8 Middle Major	4 Major
→122.1 to 143.8	7 Junior Major	
105.3 to 122.0	6 Senior Captain	
80.3 to 105.2	5 Middle Captain	3 Captain
65.5 to 80.2	4 Junior Captain	
52.3 to 64.5	3 Senior Lieutenant	
52.2 and below[c]	2 Lieutenant	2 Lieutenant

[a]This table was based on data from the 485 case sample described in text of the staff report, and is not recommended for operational use. Additional research is required to produce a more stable.

[b]Although supervisory and MET grade ratings at the general level are allowable, the conversion table does not recognize grade requirements above colonel.

[c]At the present time, the system is not designed to distinguish between middle and junior lieutenant positions (levels 2 and 1).

AIR FORCE OFFICER JOB SURVEY

INSTRUCTIONS

This survey is directed by Hq USAF to identify and describe the work performed by officers in the Air Force. The Air Force needs precise information about the duties, tasks, and requirements of officer jobs in order to maintain the classification structure, to make appropriate grade allocations, to define incumbent qualifications, and to guide other manpower and personnel actions. Participation in this survey gives you an opportunity to provide accurate information about your job in support of improved Air Force management.

You are requested to complete the survey according to the following instructions:

1. ASSIGNMENT INFORMATION (Page 4). Fill in the required data or check the one box in each block that applies to you.
2. JOB DESCRIPTION (Pages 2 and 3). On these pages provide typewritten* information which accurately and comprehensively describes your job.
   a. In the JOB NAME OR TITLE block, record a name or title which is descriptive of your job.
   b. In the JOB CONTEXT block, locate your job within the organizational structure.

      Examples: (1) THIS JOB IS IN THE HEAVY EQUIPMENT BRANCH DIRECTLY UNDER THE BASE MOTOR POOL COMMANDER, WHO REPORTS TO THE M & S GROUP COMMANDER.

      (2) THIS JOB IS IN THE TARGETS SECTION OF THE OPERATIONS PLANNING BRANCH OF WING HQ.

   c. In the blocks under DUTIES AND TASKS, list statements that describe your job. Consider significant work activities such as those involved in commanding, planning, organizing, directing, monitoring, coordinating, reviewing, inspecting, evaluating, supervising, and operating. Use as many blocks as you consider necessary. The statements you provide should clearly define your job.

      Example: Duty A. DIRECTING MATERIEL CONTROL FUNCTIONS

      TASKS (1) ASSIGN PRIORITIES TO REQUISITIONS

      (2) COORDINATE REQUIREMENTS FOR MOBILITY DEPLOYMENT

      (3) MONITOR SUPPLY BUDGET

      (4) PROCESS REQUESTS FOR LOCAL MANUFACTURE OF ITEMS

      (5) REQUISITION TIME CHANGE ITEMS

      First, list all the major duties you perform, then go back and list the appropriate tasks under each duty. Describe your normal job. Omit temporary variations in your work which are not part of your regular assignment. Ignore additional duties unless they constitute a significant part of your job.

   d. In the JOB REQUIREMENTS block, enter additional statements that describe any unusual requirements of your job for the factors below.

      COMMUNICATION SKILLS
      INTERPERSONAL SKILLS
      WORKING CONDITIONS
      FORMAL EDUCATION
      ORIGINALITY, INGENUITY, & CREATIVENESS
      SPECIAL TRAINING & WORK EXPERIENCE
      JUDGMENT & DECISION MAKING
      MANAGEMENT
      PLANNING
      RISK

      Examples: (1) WORKING CONDITIONS: JOB REQUIRES APPROXIMATELY 120 DAYS TDY ANNUALLY.

      (2) SPECIAL TRAINING & WORK EXPERIENCE: JOB REQUIRES A 30-DAY AF COURSE IN SPECIAL WEAPONS DELIVERY.

   e. In the JOB SUMMARY Block, write a three-or four-sentence summary description of your job.
   f. After you have completed pages 2, 3, and 4, sign in the space provided on page 4 and submit this form to your supervisor.

NOTE. Supervisor will review all entries, check a box to indicate his judgment of the most appropriate grade level for this job, and sign the form.

*If typing service is not available, information should be clearly printed by hand.

AFPT FORM 80-000-017 Sep 74

Fig. C1. **Example of completed job description.**

JOB DESCRIPTION

JOB NAME OR TITLE

Aircraft Maintenance Supervisor

JOB CONTEXT

This job is in the Organizational Maintenance Squadron directly under the Chief of Maintenance who reports to the Wing Commander.

DUTIES AND TASKS

DUTY A: Directing the Flightline Maintenance Effort

Tasks

(1) Translates broad management objectives to 4 officers, 4 branch chiefs and one senior NCO.
(2) Assess the progress of maintenance completion on assigned aircraft.
(3) Provides squadron inputs to Chief of Maintenance Staff.
(4) Analyzes delays in schedule takeoff time.
(5) Insure proper number of personnel are available at the right time.

DUTY B: Evaluate Quality of Work Performed by 404 Personnel

Tasks

(1) Review Quality Control MSEP reports.
(2) Spot check maintenance performed by technicians.
(3) Discuss problem areas with Quality Control.
(4) Arrange for required training if necessary.
(5) Demonstrates new ideas or methods.

DUTY C: Coordinate Maintenance Activities With Other Squadrons

Tasks

(1) Discuss maintenance problems with counterparts.
(2) Arranges for specialized support for flying schedule.
(3) Arrange for transfer of equipment.
(4) Organize meetings.

DUTY D Management of 4 Officers and 400 Maintenance Technicians

Tasks

(1) Insure assigned personnel have required clothing, equipment, tools and facilities.
(2) Make spot checks to insure required clothing, equipment and tools are in use.
(3) Discuss and provide solutions to personal problems.
(4) Arrange for TDY of assigned personnel.

Fig. C1 (*Continued*)

DUTY E: Monitor, Review and Supervise the Squadron Financial Budget

Tasks

(1) Review the daily spending.
(2) Determines what supplies are necessary and what supplies can be eliminated
(3) Provide inputs to yearly budget.
(4) Review requests for all money expenditures in squadron.

DUTY F: Assumes Squadron Commander's Responsibilities During His Absence

Tasks

DUTY G: Control and Supervise the Operation and Maintenance of:

Tasks

(1) 68 assigned aircraft and installation equipment worth over $111,000,000.
(2) 52 vehicles worth over $614,000.
(3) 15 trailers worth over $45,000.

DUTY H: Maintain Responsibility for Safeguarding and Condition of:

Tasks

(1) 5 buildings, aircraft parking ramp and surrounding areas.
(2) Tools worth over $15,000.
(3) Aircraft parts worth many thousand dollars.
(4) Office equipment worth over $5,000.

JOB REQUIREMENTS

Working Conditions: Job requires possible TDY on short notice. Amount of TDY is dependent on world political stability. Working hours up to 24 hours per day. On call 24 hours a day. Shift work other than 8-4 shift on occasions. Subject to work outdoors under adverse conditions.

Special Training and Work Experience: Job requires minimum of 6 week course in USAF Aircraft Maintenance. Must be familiar with unit and SAC mission as well as SAC exercises, emergency war orders, and contingencies.

Communicative Skills: Required to brief aircraft status, accidents and incidents, and plans.

JOB SUMMARY

This job entails managing assigned personnel equipment, and facilities to accomplish the maintenance workload in a safe and timely manner. This is accomplished by translating the broad management objectives of the chief of maintenance into specific responsibilities of the branch chiefs.

Fig. C1 (*Continued*)

ASSIGNMENT INFORMATION

LAST NAME: WITHHELD | FIRST NAME | M.I.

ORGANIZATION (5-40): 509th OMS

BASE OR INSTALLATION (41-80): Pease AFB[

SOCIAL SECURITY ACCOUNT NUMBER: WITHHELD (Number 2-5-13) (Suffix 14-15)

YOUR PRIMARY AFSC: (Prefix 16) 4024 (Number 17-20) (Suffix 21)

YOUR OUTY AFSC: (Prefix 25) 4024 (Number 26-29) (Suffix 30)

TOTAL MONTHS IN YOUR OUTY AFSC: 122 (31-33)

TOTAL MONTHS ACTIVE FEDERAL MILITARY SERVICE: 125 (34-36)

SEX (check one): [X] M 1 [ ] F 2 (37)

MAJOR AIR COMMAND (38)

AAC		A	
USAFA		B	
ADC		C	
USAFE		D	
AFAFC		E	
AFLC		F	
AFSC		H	
ARPC		I	
ATC		J	
AU		K	
USAFSO		L	
AFRES		M	
Hq USAF		N	
AFDAA		O	
Hq Comd		P	
MAC		Q	
PACAF		R	
SAC	[X]	S	
TAC		T	
USAFSS		U	
AFCS		Y	
Other		Z	

Specify

UMO AUTHORIZED GRADE FOR YOUR POSITION (22)

Overage		A
W/O		B
Lt		2
Capt		3
Maj	[X]	4
L/C		5
Col		6

YOUR PRESENT GRADE (23)

W/O		8
2/Lt		1
1/Lt		2
Capt	[X]	3
Maj		4
L/C		5
Col		6

GRADE OF YOUR IMMEDIATE SUPERVISOR (24)

Civ		B
2/Lt		1
1/Lt		2
Capt		3
Maj		4
L/C	[X]	5
Col		6
Gen		7

LEVEL OF YOUR ORGANIZATION (39)

DOD, Hq USAF		9
Hq Maj Air Comd		8
Numbered AF (or Equiv)		7
Air Division (or Equiv)		6
Wing (or Equiv)		5
Group (or Equiv)		4
Squadron (or Equiv)	[X]	3
Detachment (or Equiv)		2
Other (Specify)		1

LEVEL OF YOUR JOB WITHIN YOUR ORGANIZATION (40)

Command Element		7
Directorate, Dept, Office (or Equiv)		6
Division (or Equiv)	[X]	5
Branch (or Equiv)		4
Section (or Equiv)		3
Unit (or Equiv)		2
Other (Specify)		1

HIGHEST LEVEL OF YOUR EDUCATION (41)

Non High School Grad		1
High School Grad		2
1 Year College		3
2 Years College		4
3 Years College		5
Bachelor's Degree		6
Some Post-Grad Work	[X]	7
Master's Degree		8
Doctoral Degree		9

YOUR MAJOR FIELD OF STUDY (42)

Education		1
Physical Science		2
Arts, Humanities		3
Engineering	[X]	4
Business, Management		5
Medical, Legal		6
Social Science		7
Military Science		8
Other (Specify)		9

SUPERVISOR'S JUDGMENT OF MOST APPROPRIATE GRADE FOR THIS JOB (43)

Lt		2
Capt		3
Maj	[X]	4
L/C		5
Col		6
Gen		7

COMPLETED BY: WITHHELD (Signature) WITHHELD (Duty Phone) (Date)

REVIEWED BY: SUPERVISOR CHECK ONE → WITHHELD (Signature of Immediate Supervisor) WITHHELD (DAFSC) (Date)

Fig. C1 (*Continued*)

AFSC—Andrews AFB Md 1975