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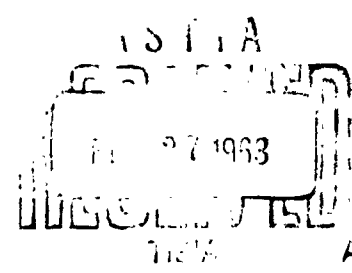
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Abstracts of Personnel Research Reports:

II. 1958-1961

Compiled By
Helen Tomlinson
Jo Ann Elson

Technical Documentary Report PRL-TDR-62-26
December 1962



6570TH PERSONNEL RESEARCH LABORATORY
AEROSPACE MEDICAL DIVISION
AIR FORCE SYSTEMS COMMAND
Lackland Air Force Base, Texas

Projects 7717, 7719, 7734

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PRL-TDR-62-26

ABSTRACTS OF PERSONNEL RESEARCH REPORTS: II. 1958-1961

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**Technical Documentary Report PRL-TDR-62-26
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**6570TH PERSONNEL RESEARCH LABORATORY
AEROSPACE MEDICAL DIVISION
AIR FORCE SYSTEMS COMMAND
Lackland Air Force Base, Texas**

Projects 7717, 7719, 7734

ABSTRACT

Abstracts are assembled of 126 technical documentary reports issued by the Air Force's personnel research laboratory from January 1958 through December 1961. They cover research projects in selection, classification, and utilization of Air Force personnel. The reports are indexed by personal author, corporate author, and project number.

This report has been reviewed and is approved.

**Fred E. Holdrege, Col, USAF
Commander**

**A. Carp
Technical Director**

Hq 6570th Personnel Research Laboratory

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ABSTRACTS OF PERSONNEL RESEARCH REPORTS: II. 1958-1961

INTRODUCTION

Under various names and organizational affiliations, the Air Force unit now called the 6570th Personnel Research Laboratory has had a continuing central mission of developing procedures for the selection, classification, and utilization of Air Force personnel. Its reports have been published among the series of the several organizations to which the laboratory was attached: The Human Resources Research Center, Air Training Command (1949-1953); the Air Force Personnel and Training Research Center, Air Research and Development Command (1954-1957); Wright Air Development Center, Air Research and Development Command (1958-1959); Wright Air Development Division, Air Research and Development Command (1960-1961); and Aeronautical Systems Division, Air Force Systems Command (1962).

Volume I of this series (PRL-TDR-62-25) compiled abstracts of research reports published by the Air Force Personnel and Training Research Center. This second volume covers reports issued during the four years the laboratory was attached to the organization now known as the Aeronautical Systems Division.

The abstracts appear in order of the organizational series number, with section headings giving the name of the publishing organization.

Entries following the author and title heading of the abstract give information further identifying the report and indicating where it is available:

Publication date, month and year.

Series number, e.g., WADC-TN-59-0. The *TN* series are *Technical Notes*; the *TR* series are *Technical Reports*.

ASTIA Document number, indicates availability to government offices and contractors from the Armed Services Technical Information Agency; this number should be used when requesting reports from ASTIA.

Project and Task number: Research areas identified by these numbers are given in the Project-Task index.

Air Force Contract number and name of the contracting organization are entered for contract-produced reports.

OTS appears only if the report has been deposited with the Office of Technical Services, U.S. Department of Commerce, for sale of photocopy or microfilm to the general public.

Three indexes are provided: a personal author index; a corporate author index which identifies reports produced under Air Force contracts monitored by the laboratory; and a project and task index which, although arranged in project number order, provides a rough subject classification. Reports are identified in the indexes by the serial number appearing in the left margin of the abstract entry.

WRIGHT AIR DEVELOPMENT CENTER (WADC) SERIES

January 1958 - December 1959

- 1 Crutchfield, R.S., Woodworth, D.G., & Albrecht, R.E. **Perceptual performance and the effective person.** April 1958. (WADC-TN-58-60, ASTIA Document AD-151 039) (Project 7730; Contract AF 18(600)8, Institute of Personality Assessment and Research, University of California, Berkeley) (OTS). This study presents data collected from 10 perceptual tests included in an extensive psychological assessment of 100 Air Force captains. The purpose of this report is to show the potential contribution of such perceptual behavior to the assessment and understanding of personality. Stress is upon the perceptual performance of the military officer rated effective. Results indicate that the perceptual tests are most strongly related to the areas of intellect and cognitive flexibility. Numerous significant relationships were found with tests in the areas of emotional adjustment, social relations, and leadership. The specific nature and direction of the relationships between perceptual and personality measures are consistent with the assumption that basic personality trends are general in nature and should manifest themselves in analogous ways in perceptual and other forms of behavior.
- 2 Tupes, E.C. & Christal, R.C. **Stability of personality trait rating factors obtained under diverse conditions.** May 1958. (WADC-TN-58-61, ASTIA Document AD-151 041) (Project 7719, Task 17109) (OTS). Peer ratings by officer candidates on specific personality traits have been shown to be predictive of later officer performance. The present study investigated personality trait ratings to determine their factorial structure and the extent to which the factors remained constant in spite of differences in samples, raters, lengths of acquaintanceship, and rating situation. 6 intercorrelation matrices were factored and the resulting factors rotated to orthogonal simple structure. 5 clearly defined personality factors were found in each analysis which remained relatively invariant through all analyses, identified as Surgency, Agreeableness, Dependability, Emotional Stability, and Culture. The factor structure of personality trait ratings is sufficiently invariant that such trait ratings may be regarded as adequate criteria for the study of personality differences and for test development purposes.
- 3 Flyer, E.S. **A follow-up study of Naval Academy graduates who entered the Air Force.** June 1958. (WADC-TN-58-62, ASTIA Document AD-151 042) (Project 7719, Task 17115) (OTS). Air Force Academy selection and proficiency records cannot be validated against measures of officer effectiveness for some years, but an estimate of the relationship of training grades to officer performance can be obtained from comparable records of Naval Academy graduates who have entered the Air Force. In this study, midshipman training grades were related to Air Force retainability and to officer effectiveness measures. The retention rate in the Air Force of Annapolis graduates, 5 to 8 years after graduation, is about 73%. Graduates who resigned their commissions had lower Physical Training grades than those officers remaining on active duty, but differed in no other training proficiency measures. Naval Academy grades predict officer effectiveness reasonably well, with Aptitude-for-Service ratings proving the best single predictor of Air Force officer effectiveness. These results support the use of Aptitude-for-Service ratings and academic grades received at the Air Force Academy as intermediate criteria of officer effectiveness.
- 4 McReynolds, Jane. **Aptitude levels in the enlisted manpower pool of the Air Force.** September 1958. (Part I, WADC-TN-58-63(I), ASTIA Document AD-151 047; Part II, Appendix, WADC-TN-58-63(II), ASTIA Document AD-151 048) (Project 7719, Task 17106) (OTS). Rapid development of weapon systems has increased the need for highly qualified airmen in technical areas and for information concerning their availability. This is the first in a series of reports designed to provide estimates of the aptitude levels of enlisted personnel in the Air Force. From data collected in the May 1957 Sample Survey, distributions of aptitudes were obtained by career fields, by reenlistment plans, by term of enlistment, by skill level, and by grade. Distributions are presented in terms of the total Air Force enlisted population so that estimates can be made not only of the numbers of airmen at each aptitude level in any one group, but of the numbers in any other group who have aptitude levels high enough to permit efficient retraining into shortage areas. For airmen in their first term of enlistment,

- aptitude distributions were typically the normal bell shape with little difference in level between career fields. Airmen in later enlistments were typically higher in aptitude; methods of screening for reenlistment and for promotion build up the quality of career personnel so that the majority of NCOs, and especially those in the highly technical career fields, have high aptitude qualifications and are capable of supporting modern technological advances.
- 5 Woodworth, D.G. & MacKinnon, D.W. The use of trait ratings in an assessment of 100 Air Force captains. September 1958. (WADC-TN-58-64, ASTIA Document AD-202 845) (Project 7730, Task 77353; Contract AF 18(600)8, Institute of Personality Assessment and Research, University of California, Berkeley) (OTS). As part of a project for developing officer assessment techniques, 30 rating dimensions were used by 10 raters to record their psychological evaluations of 100 captains. A cluster analysis of these ratings yielded 3 reliable cluster scores defined as measuring general effective intelligence, personal soundness and assessability, and effective leadership. The cluster scores did not correlate significantly with available Air Force criterion evaluations of the subjects. When the officers were differentiated on the basis of being rated or nonrated, the correlations between cluster scores and 2 of the criteria rose to levels which were significant within the rated group. This suggests that differentiation on the criterion side of the relationship is needed for significant advancement toward an understanding of the Air Force officer personnel evaluation variables, or the relating of psychologically meaningful measures to these criteria.
 - 6 Thompson, C.A. Aptitude differences related to region of enlistment of basic airmen. September 1958. (WADC-TN-58-65, ASTIA Document AD-202 846) (Project 7719, Task 17104) (OTS). Regional differences in mean performance on aptitude variables were found with basic airman samples tested in 1950 and 1953. This study examines trends in overall regional differences for a 1957 sample of 4500 basic airmen. Regional differences on specific variables are examined in terms of AFQT mental category. Geographical regions are Army areas of enlistment and the territories. The variables are the Armed Forces Qualification Test, the 5 Airman Classification Battery Aptitude Indexes (AC-2A), and the individual tests of the Airman Classification Battery. Major regional differences in mean performance were consistent with regional differences reported for 1950 and 1953 samples. Low aptitude airmen made the principal contribution to overall regional differences on specific aptitude variables. High aptitude airmen tended to exhibit only slight differences in mean performance by geographical region. The territorial sample's performance was atypical of the performance of continental samples.
 - 7 Ewart, E.S. A survey of potential morale, motivation, and retention problems at ballistic missile sites. October 1958. (WADC-TN-58-66, ASTIA Document AD-203 399) (Project 7719, Task 17119) (OTS). Potential morale, motivation, and retention problems among personnel at ballistic missile complexes are reviewed, together with pertinent research findings in the military and industrial literature. Although morale and motivation problems do not appear particularly unique, there are important considerations of emphasis. Therefore problem areas and proposed solutions are viewed in the broad context of analogous conditions in other military and industrial situations. This provides a framework for more effective evaluation of personnel actions. It is a major thesis of this report that in the area of improved management and leadership practices lies the greatest potential for enhancing morale and motivation to get things done effectively at ICBM complexes.
 - 8 Thompson, C.A. The relation of selective aptitude index to performance in technical school. November 1958. (WADC-TN-58-67, ASTIA Document AD-205 365) (Project 7719, Task 17104) (OTS). The effectiveness of the Airman Classification Battery (Form AC-2A) in predicting success in airman technical school courses is examined. The population consisted of airmen enlisted during the first 3 months of 1956 and assigned to 10 groups of technical schools after basic training. The relationships of the aptitude index used for selection with final school grades are depicted in 11 charts. The selective aptitude index was predictive of class standing in all courses, the strongest

relationships obtaining for the highly technical courses. During this period a majority of the airmen assigned to the highly technical courses did not meet the selective aptitude index minimums recommended by the Air Force.

- 9 **Tupes, E.C. & DuBois, D.B. The educational achievement of Air Force officers. November 1958. (WADC-TN-58-68, ASTIA Document AD-205 546) (Project 7719, Task 17109) (OTS).** Do years of formal education truly measure an Air Force officer's educational achievement? Do many officers have more knowledge than would be expected from the number of years they spent in school? To answer these questions, 1300 student officers at Air University were given the Area tests and an Advanced test of the Graduate Record Examination. Results indicate that years of education is not very predictive of actual educational achievement and usually underestimates it. As a group, officers were found to have learned more than would be expected from their years of education. Although only 40% of the officers had college degrees, between 50% and 60% scored as high on the Area tests as satisfactory college graduates. On the Advanced tests, which measure intensive knowledge in specialized academic major fields, the officers compared favorably with first-year graduate students. Many officers who lacked the educational requirements for Air Force training courses had as much of the specialized knowledge needed for enrollment in such courses as did officers with the prerequisite educational backgrounds. Were entrance requirements for these courses altered to permit qualification on a test basis, the number of officers eligible for such training would be greatly increased.
- 10 **Valentine, L.D., Jr. Validity of the AFOQT (Form A) for prediction of student-officer success in observer training. (WADC-TN-58-69, ASTIA Document AD-207 334) (Project 7717, Task 87006) (OTS).** The Air Force Officer Qualifying Test, Form A, was administered to AFROTC sophomores. During the latter half of 1957 criterion data matured on those examinees who had entered Observer Training after completion of the AFROTC program. The aptitude composites and subtests of the AFOQT were validated against 3 criteria of success in Observer Training. It was found that the Observer-Technical composite is a valid predictor of success in Observer Training for this population. This Note reports the first Observer validities to become available for an AFROTC population.
- 11 **Carp, Frances M. Relationships between airman interests and career satisfaction. March 1958. (WADC-TR-58-90, ASTIA Document AD-151 038) (Project 7719, Task 17008; Contract AF 41(657)60, Trinity University).** This study is an attempt to validate a 264-item interest inventory for inclusion in the basic airman battery to improve prediction of general competence in the Air Force situation and in particular Air Force jobs. Assuming that satisfaction is related to effectiveness in a work situation, it was taken as the criterion for this study. Responses of 842 airmen were validated against their answers to Sample Survey questions selected as indexes of satisfaction with the general Air Force situation and with particular Air Force duty. Predictive validity was not demonstrated for existing keys with general Air Force personnel or selected job specialty groups; item analysis did not result in new scales.
- 12 **MacKinnon, D.W., Crutchfield, R.S., Barron, F., et al. An assessment study of Air Force officers: Part I. Design of the study and description of the variables. April 1958. (WADC-TR-58-91(I), ASTIA Document AD-151 040) (Project 7730, Task 77353; Contract AF 18(600)8, Institute of Personality Assessment and Research, University of California, Berkeley) (OTS).** This is the first part of 5-part report covering an extensive psychological assessment of a group of Air Force captains selected from the population of captains within Air Training Command who were eligible for promotion. The 343 captains participating in the field-testing phase of the assessment were given 27 paper-and-pencil tests. From the field-testing sample, 100 officers were assigned, in groups of 10, to a 3-day living-in phase of the assessment. During this period they entered into some 50 assessment procedures, and a staff of psychologists rated each officer on a wide variety of personality variables considered relevant for effectiveness in senior command and staff assignments. Effectiveness measures were obtained as criteria from Officer Effectiveness Reports, promotion board ratings, and superiors' ratings. This report presents the overall design of the study and defines each of the 648 variables. Norms are listed in an appendix. The report is considered a reference document for use with the other 4 parts of the Technical Report.

- 13 Gough, H. G. & Krauss, I. An assessment study of Air Force officers: Part II. Description of the assessed sample. September 1958. (WADC-TR-58-91(II), ASTIA Document AD-208 700) (Project 7730, Task 77353; Contract AF 18(600)8, Institute of Personality Assessment and Research, University of California, Berkeley) (OTS). This is the second part of a 5-part report covering an extensive psychological assessment of a group of Air Force captains. It presents sociological and psychological descriptions of the sample of 343 captains participating in the field-testing phase of the assessment. The typical member may be characterized as being a reserve officer who entered the service during World War II as an enlisted man and who received his commission through flying school. He is eligible for promotion to the grade of major. He is married and desires an Air Force career. His intelligence score is above the mean for the general adult population, but below the level defined as superior. His personal adjustment and psychiatric stability are judged to be excellent. In social technique he is characterized by factors of leadership and dominance, capacity for status, and achievement motivation. Tests of social acuity and social insight place him in an average rank among groups of equivalent education or occupational status. His vocational interest profile is basically a "military officer" profile similar to the pattern observed in other studies.
- 14 Barron, F., Block, J., MacKinnon, D.W., et al. An assessment study of Air Force officers: Part III. Assessment correlates of criteria of officer effectiveness. December 1958. (WADC-TR-58-91(III), ASTIA Document AD-210 218) (Project 7730, Task 77353; Contract AF 18(600)8, Institute of Personality Assessment and Research, University of California, Berkeley) (OTS). This is the third part of a 5-part report covering an extensive psychological assessment of a group of Air Force captains. Criterion data were gathered from Promotion Board Ratings, Officer Effectiveness Reports, superior officers' ratings, and from structured interviews with the officers. Overlap in criteria was reduced by factor analysis. Separate sections deal with predictability of criteria from 3 different sources. Officers rating high on each criterion are described in terms of assessment variable correlates.
- 15 Gough, H. G. An assessment study of Air Force officers: Part IV. Predictability of a composite criterion of officer effectiveness. December 1958. (WADC-TR-58-91(IV), ASTIA Document AD-210 219) (Project 7730, Task 77353; Contract AF 18(600)8, University of California, Berkeley) (OTS). This is the fourth volume of a 5-part report of a project to develop methods for identifying Air Force officers with high potential for effective military leadership. Its purpose is to reduce the data for 11 criteria to a practical composite criterion and to organize data concerning 631 test and assessment variables for prediction of the composite criterion. Evaluation of the criteria led to selection of 3 for combination in a Criterion Index. From correlations of the predictor variables with this criterion, 41 were identified that maintained significant relationships. By cluster analyses, these were reduced to homogeneous composite predictors that could be defined as psychological dimensions of officer effectiveness. By item analysis, lists of adjectives differentiating high-scoring from low-scoring officers on the Criterion Index were made, and extensive personality questionnaire data were reduced to 2 brief scales keyed to predict the Criterion Index. The results identify both the group-testing instruments and individual assessment devices that hold promise for identification, early in an officer's career, of those capable of becoming outstanding commanders.
- 16 MacKinnon, D.W. An assessment study of Air Force officers: Part V. Summary and applications. December 1958. (WADC-TR-58-91(V), ASTIA Document AD-210 220) (Project 7730, Task 77353; Contract AF 18(600)8, Institute of Personality Assessment and Research, University of California, Berkeley) (OTS). This is the final volume of a 5-part report, summarizing results of a project to develop methods for identifying Air Force officers with high potential for effective military leadership. It surveys significant relationships between predictor and criterion variables. Inferences from these relationships provide a comparative evaluation of the criteria of officer effectiveness and lead to selection from the experimental devices of instruments proposed for inclusion in a program of officer assessment.

- 17 Taylor, C.W., Smith, W.R., Ghiselin, B., et al. Identification of communication abilities in military situations. June 1958. (WADC-TR-58-92, ASTIA Document AD-151 043) (Project 7719, Task 17053; Contract AF 18(600)1211, University of Utah) (OTS). This research was designed to define the dimensions of communication abilities, to provide techniques for measuring performance in communication in military situations, and to determine test predictors of the communication abilities thus defined and measured. A list of communication requirements was abstracted from descriptions of airman jobs. Tests were assembled assumed to be predictive of these abilities. From their administration in 2 large test batteries to samples of airmen, the data were analyzed for selection of predictors, to include with criterion variables, in a validation battery. 18 situations tests provided 27 criteria of communication effectiveness. Significant relationships between predictors and criteria demonstrated the practicability of assembling either a general set of predictors or groups of specific predictors. There is evidence that communication abilities are more complex than the categorization by communication channel (speaking, writing, reading, listening) implies; integrating abilities are predictive of effectiveness in all channels.
- 18 Thompson, C.A. Development of the Airman Qualifying Examination, Forms D and E. (Part I, WADC-TR-58-94(I), ASTIA Document AD-151 045; Part II, Appendix, WADC-TR-58-94(II), ASTIA Document AD-151 046) (Project 7717, Task 87005). Forms D and E of the Airman Qualifying Examination were developed for field use in obtaining a set of aptitude indexes equivalent to indexes of the Airman Classification Battery. They were designed for administration at a single testing session and for hand scoring. 4 aptitude indexes are obtained: Mechanical, Administrative, General, and Electronics. The item types used in the AQE indexes conform generally to those of the Airman Classification Battery, AC-2A. Each AQE index is standardized on the corresponding AC-2A index and uses the same form of converted index, a 20-step percentile scale. The 2 batteries are substantially equivalent except that when AQE is administered before the ACB, AQE scores tend to be lower. The practical importance of this difference will vary with the use of the instruments.
- 19 Glanzer, M. & Glaser, R. A study of non-intellectual correlates of trouble-shooting ability: Rigidity measures. October 1958. (WADC-TR-58-488, ASTIA Document AD-204 511) (Project 7719, Task 17011; Contract AF 41(657)58, American Institute for Research) (OTS). The main objective of this study was to determine the relationship between measures of problem-solving rigidity and performance on both novel and routine troubleshooting tasks concerned with electronics equipment. 13 rigidity tests were constructed in 4 categories; ability to change performance sets; ability to change perceptual sets; preference for highly structured, simple stimuli; and general attitudes. Alternate sets of criterion problems each included 3 routine and 3 novel trouble-shooting problems. The hypothesis to be tested was that scores on the tests of the rigidity battery would be significantly related to performance on the novel problems, but not on the routine problems. Results from administration to airman trainees showed equally low relationships between the rigidity measures and both criterion measures. Combinations of the Electronics Aptitude Index with selected rigidity test scores showed only slightly improved prediction of training school performance, over the aptitude score alone.
- 20 Thorndike, R.L. & Hagen, Elizabeth P. Long-term prediction of some officer-effectiveness measures from aptitude tests. October 1958. (WADC-TR-58-489, ASTIA Document AD-204 531) (Project 7719, Task 17109; Contract AF 41(657)10, Teachers College, Columbia University) (OTS). Aptitude tests administered to applicants for flying training in 1943 were correlated with selected indicators of achievement during the following 12 years for 873 Air Force officers. Criterion components identified were: (1) effectiveness as perceived by superiors; (2) quality and quantity of flying duty; (3) importance of duty assignments; and (4) continuity of service. The first component was predicted, but only to a slight degree, by tests of intellectual and academic ability. Tests of mechanical ability and of motor coordination were slightly predictive of the second and third components. The fourth component was largely unpredicted. Any success in

identifying men who would receive high officer effectiveness ratings came from measures of quantitative and intellectual abilities and not from the tests that predict success in flying training.

- 21 Krumm, R.L. & Newman, P. H. Accuracy of information on line work orders for armament-electronics maintenance. December 1958. (WADC-TR-58-490, ASTIA Document AD-207 335) (Project 7950, Task 17077; Contract AF 41(657)119, American Institute for Research). 10 weeks were spent at 2 Armament-Electronics squadrons observing time spent by mechanics in performing 76 typical steps of a troubleshooting job. Comparison of actual time worked with time reported by the mechanic on Line Work Orders (Form 322) indicated that (a) errors in reporting time worked are largest for shorter jobs and for jobs requiring a time greater than 4 hours per man; (b) depending on the number of men available for assignment, squadrons may differ significantly in the number of man-hours spent on each job even though the jobs are of the same difficulty; and, (c) there is a marked consistency in the amount of time spent on subtasks of a troubleshooting job which are necessary, but which are not "troubleshooting" per se. It was concluded that the Form 322 as presently used does not constitute a usable source of criterion information regarding Armament-Electronics mechanics' troubleshooting proficiency.
- 22 Warrington, W.G. & Saupe, J.L. Spatial abilities and selected elements of Air Force technical jobs. December 1958. (WADC-TR-58-491, ASTIA Document AD-207 336) (Project 7719, Task 17108; Contract AF 41(657)132, Michigan State University) (OTS). This study is an attempt to validate an Air Force spatial survey test and to determine whether this test can contribute additional spatial factors to the Airman Classification Battery. A 3-dimensional performance-type criterion was developed that simulated perceptual elements identified in 20 selected Air Force technical specialties. The criterion measure, the Space Survey Test, a measure of general mental ability, and a measure of mechanical experience and interest were administered to 273 high school junior boys. Analyses of these data indicate that the Space Survey Test has considerable power for predicting the criterion, independent of the measures of mental ability and mechanical experience. The multi-score Space Survey Test is only slightly more effective in predicting the criterion than one of the sub-scores.
- 23 Aronson, E. & Festinger, L. Some attempts to measure tolerance for dissonance. December 1958. (WADC-TR-58-492, ASTIA Document AD-207 337) (Project 7739; Contract AF 41(657)140, Stanford University) (OTS). Individuals differ in their ability to tolerate cognitive dissonance introduced in laboratory experiments. 5 tests were developed, 4 of which were administered to the predetermined criterion groups. None of these discriminated between subjects whose behavior indicated a high tolerance for dissonance low-tolerance subjects. A different approach to a criterion was tried by identifying a group that had demonstrated high tolerance in a real-life situation. These were students who had changed majors in their junior year of college. A personality inventory was constructed and administered to ex-engineering majors and to a control group of engineering majors. Substantial differences in responses appeared in 6 areas. The general effectiveness of the questionnaire as a measure of tolerance for dissonance must be tested by administration to other groups that have recently made an important life decision, such as changing occupation or religion.
- 24 Brokaw, L. D. Some statistical methods for detection of nonstandard test administration. January 1959. (WADC-TN-59-34, ASTIA Document AD-210 475) (Project 7719, Task 17106) (OTS). Fallacious test scores may appear from such sources as cheating, improper procedures of test administration, or errors of scoring. 3 techniques appropriate to detection of abnormalities of score distributions occasioned by the shifting of a group of scores from its proper place within the distribution are the sign test, the Kolmogorov-Smirnov test, and the significance of the difference between standard deviations. These were applied to eight 100-case samples of basic airmen who had been tested and retested on alternate forms of the Armed Forces Qualification Test. A control sample was selected, and the test scores from the other 7 samples were altered to replicate

conditions producing false scores. The sign test proved more efficient than the other techniques, identifying 6 of the 7 samples containing fallacious data. The other two techniques each identified 4 of the 7 samples, but not the same 4 samples.

- 25 **Flyer, E.S. & Potter, N.R. Characteristics of basic airmen willing to volunteer for a six-year tour in missile squadrons. February 1959. (WADC-TN-59-35, ASTIA Document AD-210 476) (Project 7719, Task 17119) (OTS).** Low retainability of first-term airmen assigned to missile squadrons may affect appreciably the effectiveness of these units. Research was initiated to determine the number and type of basic airmen willing to volunteer for a 6-year tour in missiles—one possible solution to the retention problem. A large group of basic airmen were asked whether or not they would volunteer for a 6-year tour in missiles, and about 42% were willing to extend their tours of duty for this type of assignment. Volunteers and nonvolunteers were then compared for a variety of psychological and background characteristics. Results indicate that self-selection processes operating in a volunteer program would provide missile units with a somewhat superior airman in terms of aptitude and personal adjustment, and a very superior airman in terms of retainability and motivation.
- 26 **Mullins, C.J. Prediction of creativity in a sample of research scientists. February 1959. (WADC-TN-59-36, ASTIA Document AD-211 039) (Project 7719, Task 17109) (OTS).** In an attempt to identify test predictors of scientific creativity, 2 criteria of creativity were used: supervisors' ratings and number of publications. An interest questionnaire, a vocabulary test, and 9 tests of the Guilford Creativity Battery were administered to 131 physical research scientists. Of 42 test scores derived from the battery, 4 were significantly related to the rating criterion and 7 to the publications criterion. The 2 criteria were not significantly related to each other and none of the predictor scores correlated significantly with both criteria. A composite predictor gave promise of increasing effective prediction of the ratings criterion, but not of the publications criterion.
- 27 **Morsh, J.E. & Ratliff, F.R. Occupational classification in some major government agencies. March 1959. (WADC-TN-59-37, ASTIA Document AD-212 540) (Project 7734, Task 97002) (OTS).** From information obtained during personal visits and conferences, current practices in occupational classification in some major military and civilian agencies of the Federal Government are reported. Agencies included are: Department of the Air Force, Bureau of Naval Personnel in the Department of the Navy, the Adjutant General's Office in the Department of the Army, the Bureau of Labor Statistics and the Bureau of Employment Security in the Department of Labor, the Census Bureau in the Department of Commerce, and the U.S. Civil Service Commission. The prime purpose of the survey was to generate hypotheses for the furtherance of occupational classification research in the Air Force. In a concluding section of the report the state-of-the-art of occupational classification is discussed and research implications are suggested.
- 28 **Ward, J.H., Jr. Use of a decision index in assigning Air Force personnel. April 1959. (WADC-TN-59-38, ASTIA Document AD-214 600) (Project 7719, Task 17112).** Those responsible for the distribution of Air Force personnel need to make decisions about the estimated worth of individuals in various jobs and about the assignment of individuals in a manner that will maximize the overall effectiveness of the Air Force. This paper presents techniques to aid in arriving at such decisions. A system is developed that will provide a Decision Index for each individual in each proposed job assignment. Methods are described of computing and arraying the indexes for use in determining personnel assignments.
- 29 **Brokaw, L.D. School and job validation of selection measures for air traffic control training. April 1959. (WADC-TN-59-39, ASTIA Document AD-214 884) (Project 7719, Task 17108) (OTS).** As a joint effort of the Federal Aviation Agency and the Personnel Laboratory, a large battery of experimental tests was administered to trainees entering the CAA Air Traffic Control School in the summer of 1956. Instructor ratings and lecture grades were collected at the end of the course. One year after the men had graduated they were identified on the job to collect supervisory ratings

- of their proficiency and data on recommendations for promotion. A battery of tests suitable for administration as a screening device was selected on the basis of the training validation. These tests displayed satisfactory validity on the job, and produced a composite validity significant beyond the 1% level for on-the-job criteria. Of several experience variables, CAA certification proved the most valid and added appreciably to accuracy of predicting training criteria.
- 30** **Judy, C.J.** An analysis of qualifications data on a group of Air Force mechanics. June 1959. (WADC-TN-59-40, ASTIA Document AD-216 454) (Project 7734, Task 17018). The problem of this investigation was to determine whether selected qualification variables will predict a measure of job proficiency. The subjects were 415 Air Force mechanics specializing in the maintenance of a heavy bomber aircraft. By intercorrelation and multiple regression techniques, 3 groups of variables were identified and evaluated for their power in predicting scores on a written test of job proficiency. The group composed of specific high school courses showed no relationship to the criterion. A second group (education level, time in the Air Force, and Air Force training courses not specific to the equipment maintained) were individually predictive of the criterion, but added nothing to prediction from a composite of the other variables. The third group (Mechanical Aptitude Index, Air Force training courses specific to the equipment maintained, and Air Force maintenance experience) were individually predictive, and, in combination with the other qualification variables, added significantly to the composite prediction.
- 31** **Wiley, L.** Determining job qualifications requirements by rating Air Force task statements. July 1959. (WADC-TN-59-41, ASTIA Document AD-226 280) (Project 7734, Task 17018). The underlying assumption of this study is that personnel qualifications for new Air Force jobs can be evaluated at the task level as distinguished from the whole-job level. If successful, this approach would permit increased freedom in organizational planning and planning for assignment of personnel who possess unusual skills. This report describes a study designed to measure the reliability of ratings made on Air Police tasks. A pilot study using 4 raters indicated considerable agreement on the amount of each of 9 qualification categories needed to perform 80 Air Police tasks. A second study with 10 raters, 7 qualification categories, and 50 of the original 80 tasks produced ratings with reliability coefficients in the .70's for pools of 5 raters. Each rater was scored for his agreement with the others preliminary to development of a task rating scale for use in determining rater bias or rater tendencies.
- 32** **McReynolds, Jane.** Airman performance on the general aptitude test battery and the airman classification battery AC-2A. July 1959. (WADC-TN-59-42, ASTIA Document AD-225 115) (Project 7719, Task 17106) (OTS). Tests of the General Aptitude Test Battery (GATB), which the U.S. Employment Service (USES) uses for job counseling and placement, were administered to large samples of male airmen in 1949 and 1958. This paper reports comparisons of the results with normative data for the general working population (male and female). Airman means for the 7 aptitude scores derived from paper-and-pencil tests of the GATB were distributed about equally above and below the USES norms, with the 1958 sample deviating from the norms less than the 1949 sample. The more significant differences were accounted for by known sex differences in the aptitudes measured. Both airman samples had smaller proportions of very high and very low scores than the USES distribution. This restriction was attributed to Air Force screening on a mental qualifying test and to self-selection. 2 tables give estimates of proportions of airmen qualifying for USES job categories and for airman career fields.
- 33** **Cox, J.A. & Mullins, C. J.** Evaluation of light plane training among AFROTC student officers. July 1959. (WADC-TN-59-43, ASTIA Document AD-219 473) (Project 7719, Task 17109). The AFROTC Flight Instruction Program (FIP) offered 36.5 hours of light plane training in the 1956 school year. 41 detachments took part in this program the first year. Using successful progress and completion confirmed by a series of progress check rides as a criterion of FIP success, small relationships were found between success and scores from the AFOQT. A sample of detachments at which FIP was not given the first year was selected to match 37 of the FIP detachments on selected variables. The

men from the 2 samples (FIP trained and Not-FIP trained) were compared as to proportions entering preflight training, which was considered as a criterion of interest in flying and interest in an Air Force career. No significant differences were found. The same samples were compared as to proportions eliminated from primary pilot training. Significantly more Non-FIP men were eliminated than were FIP men, and this difference was mainly due to flying deficiency elimination.

- 34 Brokaw, L.D. Prediction of Air Force training and proficiency criteria from Armed Forces selection tests. August 1959. (WADC-TN-59-194, ASTIA Document AD-227 635) (Project 7719, Task 17104). Appropriateness of the Armed Forces Qualification Test for use in Air Force pre-enlistment screening is indicated by data showing the positive correlation of AFQT scores with final grades in technical training courses and with scores on Airman Proficiency Tests. There is nothing in the data to suggest that the test could be changed in a manner to improve its across-the-board prediction of success in Air Force specialties.
- 35 Wiley, L., Harber, H. B. & Giorgia, M. Joyce. Rater tendencies in estimating qualifications required by Air Force tasks. September 1959. (WADC-TN-59-195, ASTIA Document AD-227 634) (Project 7734, Task 17018) (OTS). To forecast qualifications requirements of new Air Force jobs by using estimates of judges, the judgments must be accurate and consistent. The purpose of this study is to determine whether personal evaluation habits may influence interrater agreement. A group of ROTC pilot trainees rated tasks drawn from 15 Air Force career fields and the specialties that include them. Judgments were made on 5-point scales to determine how much resourcefulness, general vocabulary, tool and instrument knowledge, number skill, physique and stamina, human contact skill, precision, formal training, and on-the-job training time is needed. Correlation of each rater's overall mean rating in one session with that of the mean for the second session demonstrated consistent tendencies to give high, low, or medium ratings. Similar correlations between mean standard deviations gave evidence of individual tendencies to use or refrain from using the extremes of the rating scale.
- 36 Brokaw, L. D. Prediction of Air Force training and proficiency criteria from airman classification battery AC-2A. October 1959. (WADC-TN-59-196, ASTIA Document AD-228 445) (Project 7717, Task 87006). This Note reports the validity of Airman Classification Battery AC-2A during the first 14 months of its use. Data are presented for 46 specialties for which both technical training and job proficiency criteria were available (Final School Grades and Airman Proficiency Test scores). Technical training validities are given for an additional 20 technical schools. The expectation of some reduction of general validity as a function of maximizing differentiating power was realized. Slightly greater drops in general validity than had been anticipated were found in the mechanical and administrative aptitude clusters, while the remainder of the battery showed validity comparing favorably with the preceding Battery AC-1B. Battery AC-2A demonstrated itself to be an effective instrument for differential classification; interpretation of its validities are made in this frame of reference. Current Air Force policies require a different kind of instrument for most effective recruitment and placement of new airmen.
- 37 Lecznar, W. B. Preparation of the Airman Classification Test-1960. October 1959. (WADC-TN-59-197, ASTIA Document AD-228 453) (Project 7717, Task 87002). The Airman Classification Battery was used for classification of basic airmen from 1948 to 1959. Introduction by the Air Force of selective enlistment required the development of a new instrument for use by the Recruiting Service in pre-enlistment aptitude testing. A preliminary form, for use in 1960, was developed by abbreviating and simplifying administration of Airman Classification Battery AC-2A. The reduced battery requires only 4 hours for administration. It retains elements that provide aptitude indexes equivalent to 4 of the 5 indexes of Battery AC-2A. A table gives the content of each subtest, the time limits, and the composition of the 4 aptitude indexes.

- 38 Tupes, E. C. Personality traits related to effectiveness of junior and senior Air Force officers. November 1959. (WADC-TN-59-198, ASTIA Document AD-231 256) (Project 7719, Task 17110) (OTS). A previous study showed that officer candidates in training can produce reliable personality ratings of their peers that are predictive of effectiveness ratings as Air Force junior officers. This study repeats the investigation with field-grade officers. It was found that the factor structure underlying peer ratings of personality traits of senior officers closely resembled that of the junior officers. There was agreement with one exception between junior and senior officers on the relative importance for officer effectiveness of 30 personality traits. The 2 groups showed even greater similarity in the relationships of the personality trait ratings to Officer Effectiveness Reports. Hence any officer selection program which screens on personality variables essential to junior-officer success will also select for traits characteristic of effective field-grade officers.
- 39 Gough, H.G. Fakability of the Air Force Preference Inventory. November 1959. (WADC-TN-59-199, ASTIA Document AD-231 379) (Project 7730, Task 77353; Contract AF 18(600)8, University of California, Berkeley) (OTS). This study concerns (a) recognition of the possibility of faking responses to the Air Force Preference Inventory in order to present a better impression, (b) consideration of a possible index for detecting faking, and (c) an analysis of the psychological correlates of this index. Effect of faking was revealed by comparison of 3 Inventory scores made by an experimental sample of 30 college students tested under normal administration and then requested to fake. From items showing marked differences in the second testing, a dissimulation scoring key was constructed and applied to the college student sample and 2 Air Force officer samples. Significant differences were found between dissimulation scores of normal vs faked testing of the college student group and there was a negative correlation between the 2 sets of scores. Testing of additional samples would be needed to establish precise cutting points for distinguishing between authentic and faked test protocols.
- 40 Judy, C. J. Relationships between available qualifications data and initial assignment. December 1959. (WADC-TN-59-200, ASTIA Document AD-230 967) (Project 7734, Task 17018). Initial assignments in the Air Force are made on the basis of those qualifications identifiable at the time of enlistment which presumably are related to success in the various position types which make up Air Force specialties. The problem of this investigation was to determine how accurately initial assignment can be predicted from a knowledge of aptitudes, education, physical condition, and other supposedly relevant data routinely assembled on entering airmen. Multiple-regression analysis, using data on two 1000-man groups, was the principal statistical procedure. Under conditions prevailing at the time, it was found that variables of the kind examined, altogether, can be used to explain from 30 to 47% of the variance in job family assignment, depending upon the particular job family considered. Aptitudes and counselor recommendations played major roles in the prediction, but physical-profile data were of little value. Education variables, taken by themselves, were found to predict assignment, but they did not add significantly to prediction from other available information.
- 41 Flyer, E.S. Factors relating to discharge for unsuitability among 1956 airman accessions to the Air Force. December 1959. (WADC-TN-59-201, ASTIA Document AD-230 758) (Project 7719, Task 17155). This report gives major findings from a large-scale research investigation in which suitable and unsuitable airmen were compared for a number of personal attributes. Educational level was the best single predictor of unsuitability discharge, although aptitude and age considered in conjunction with educational level increased significantly the accuracy of prediction. The implications of the findings for current selection procedures are discussed.
- 42 Brokaw, L.D. Prediction of criteria for medical and dental specialties from Airman Classification Battery AC-2A. December 1959. (WADC-TN-59-202, ASTIA Document AD-231 257) (Project 7717, Task 87006) (OTS). Validation of Battery AC-2A for training grades in 5 medical and one dental specialty, and for Airman Proficiency Test scores in 2 medical career fields (Pharmacy Specialist, Medical Administrative Specialist) reveals a satisfactory predictive efficiency for the

General Aptitude Index. Although the Electronics Aptitude Index seems of equal validity, there is no basis for recommending a change in the selective aptitude index.

- 43 Mullins, C.J. & Cox, J.A. Construction and validation of the Instructor Aptitude Test. December 1959. (WADC-TN-59-203, ASTIA Document AD-230 968) (Project 7719, Task 17104). A test was constructed for predicting success in Technical Instructor Schools, using items previously proved valid for General Instructor School success and for Pilot Instructor School success. It consists of 4 parts: verbal, arithmetic reasoning, social insight, and interest. The test was normed for instructors now performing on the job. Validation coefficients were obtained between test scores and course grades in schools at 6 Air Force bases. Validities ranged from .06 to .63, with 5 of the 6 highly significant. These compare favorably with validities of the General Aptitude Index of the Airman Classification Battery for the final school grade criterion. Test scores identified eliminees from Technical Instructor Schools with considerable accuracy.
- 44 Vanasek, F. J. & Cox, J. A. , Jr. Development of a position description system for Project Square Peg. January 1959. (WADC-TR-59-35, ASTIA Document AD-208 859) (Project 7727). Project 7727 was initiated to provide operational support for ARDC Headquarters Project Square Peg. Research and development job-man matching was the primary problem which in turn required investigation into position description, personnel description, and matching methods. This report presents the plan for carrying out the 3 tasks and outlines progress in developing position descriptions. Materials used to gather information about position requirements are reproduced in an appendix.
- 45 Schweiker, R. F. Stability of interest measures and their validation for selection and classification. May 1959. (WADC-TR-59-36, ASTIA Document AD-215 482) (Project 7719, Task 17104; Contract AF 18(600)1358, Educational Research Corporation) (OTS). To determine the suitability of interest measures for Air Force personnel selection, 2 multiple-scale interest measures, Activity Preference Report and Opinion Inventory, were given to 16,665 recruits, to 1,465 of the initially-tested airmen near completion of basic training, and to 1,043 of the initially-tested airmen when completing technical school for one of 5 selected career fields. Career Preference Items and a Reenlistment Intent Item were given in the first 2 testings and measures of satisfaction with the career field and the Air Force were given in the third testing. Technical school grades and aptitude indexes were obtained for the airmen in the third testing. The interest measures and the Reenlistment Intent Item indicated differences among groups at the 3 basic training bases and among groups later assigned to 5 career fields. They also indicated that some changes occur during basic training and technical school training. In a multiple regression analysis, the interest measures did not provide useful prediction of school success, reenlistment intent, or other indications of career satisfaction, although they are accurately measuring something of importance.
- 46 Fiske, D.W., Cox, J.A., Jr., & van der Veen, F. Consistency and variability in peer ratings. May 1959. (Part I, WADC-TR-59-37(I), ASTIA Document AD-215 483; Part II, Appendix, WADC-TR-59-37(II), ASTIA Document AD-215 484) (Project 7719, Task 17109; Contract AF 41(657)157, University of Chicago). This study tests the assumptions that peer and observer ratings are consistent over tasks, over groups, across types of traits, and over time. An additional goal was to examine the reliability and nature of "variability" scores taken from rating data. Men were assigned to 6-man groups which worked on problems in 2-hour shifts, after which they were rated on 7 traits by peers (work-group members) and observers. The groups were reorganized and the procedure was repeated. The primary finding is that the group making the ratings (either peer or observer) has a marked effect on the ratings. There is little effect on ratings due to type of work, rater role (peer or observer), or time. Generalized or global traits are rated more consistently from session to session than traits specific to behavior in the situation. The research shows that reliable variability scores can be obtained from rating data, but there is little evidence concerning what these scores mean. There is a hint that they are inversely related to measures of sociability and initiative.

- 47 Merck, J.W. & Ford, F.B. Feasibility of a method for estimating short-term and long-term effects of policy decisions on the airman personnel system. June 1959. (WADC-TR-59-38, ASTIA Document AD-217 079) (Project 7719, Task 17114) (OTS). This report describes and indicates the utility of a model which simulates the flow of airmen through the Air Force personnel system under a given set of policies. This model makes it possible to estimate, with as much accuracy as is available in the input information, the effects of that set of policies at future points in time. These effects may be gauged in terms of the future distribution of grade levels, career fields, or other pertinent information which may be built into the model.
- 48 Schweiker, R. F. & Curran, R. J. Variables contributing to regular officer procurement panel scores. July 1959. (WADC-TR-59-39, ASTIA Document AD-220 791) (Project 7719, Task 17110; Contract AF 41(657)238, Educational Research Corporation). The purpose was to determine what information from personnel folders, in addition to the Overall Evaluation on Officer Effectiveness Reports, can be objectified to replicate operational panel evaluations. A random sample of 500 cases was drawn for both the rated and nonrated regular officer applicants in the 2-year, 8-year, and 14-year groups. Data were collected for 28 items of information which appear in the personnel records and could be objectified. Correlation with Panel Scores and beta weights for 18 variables were computed. Multiple correlation coefficients for a set of 5 cumulative predictors showed that the Panel Scores can be predicted fairly well from combinations of a few easily obtained measures. By far the most important predictor is the Mean Overall Evaluation rating on Officer Effectiveness Reports.
- 49 Votaw, D.F., Jr. Functional tests of solutions of personnel assignment problems. August 1959. (WADC-TR-58-358, ASTIA Document AD-229 881) (Project 7719, Task 17112; Contract AF 41(657)4, Yale University). The purpose was to carry out functional testing of computerized methods of solving quota problems associated with Air Force personnel procurement. The functional tests proved that, with an electronic computer, an organization such as the Air Force could quickly carry out assignments of large numbers of persons (e.g., 10,000) in an effective fashion; and could rapidly determine, for a given group of persons, whether the quotas and minimum qualifying scores are compatible. 6 appendixes give technical details of the development of procedures and programs and the results of successive tryouts.
- 50 Kossack, C.F. & Beckwith, R. E. The mathematics of personnel utilization models. November 1959. (WADC-TR-59-359, ASTIA Document AD-233 775) (Project 7719, Task 17112; Contract AF 41(657)160, Purdue University) (OTS). This report deals with the development of a personnel utilization model, with special attention to the problem of estimating cost to the Air Force resulting from varied policies governing selection, classification, and training of personnel. An actual model is constructed, including definitions, flow diagrams, and an illustration showing application of the model to the problem of personnel distribution for airmen during their first 4 years of service. A further development presents a specialization of the general model, using the mathematics of Markovian processes. The Air Force could benefit from evolving a model of its personnel program not only by thus solving heretofore unresolved model problems, but also by the examination of Air Force operations essential to development of the model and the identification of areas in which personnel research is likely to be most productive.
- 51 Wherry, R. J., Stander, N. E., & Hopkins, J.J. Behavior trait ratings by peers and references. December 1959. (WADC-TR-59-360, ASTIA Document AD-239 098) (Project 7719, Task 17109; Contract AF 41(657)222, The Ohio State University Research Foundation) (OTS). Experience has shown that reliable trait ratings by peers can be secured during officer training that have appreciable validity for later ratings of officer effectiveness. This investigation tests the hypothesis that equally reliable and valid ratings can be secured from individuals listed as references by applicants for officer training. 4 rating forms were developed, each using the same descriptive adjectives selected by factorial analysis of a preliminary check-list form. From the results of tryouts with college students, a check-list form and a modified forced-choice form were selected for mailing to references listed by the criterion sample of male undergraduate college students. Results from a

71% return of reference ratings showed that: (a) reliability, assuming an equal number of raters, was consistently lower than for peer ratings; (b) correlation with the criterion of peer nominations was markedly lower than for peer ratings, but was reasonably high for one class of raters (educators); (c) the check-list rating form brought a higher proportion of returns and yielded a higher validity than the modified forced-choice form.

- 52 Taylor, E.K. & Parker, J.W. Spatial tests as predictors of success in Air Force training. December 1959. (WADC-TR-59-361, ASTIA Document AD-239 270) (Project 7719, Task 17104; Contract AF 41(657)125, Personnel Research and Development Corporation, Cleveland, Ohio) (OTS). The Airman Classification Battery includes 2 measures of spatial ability. In a search for possible improvement of coverage, 20 spatial tests were investigated to determine their validity for predicting success in Air Force training courses in 5 career fields representing the 5 aptitude indexes used in airman classification and assignment. Factor analysis indicated that a heterogeneous test was a better measure of spatial ability than were tests composed of homogeneous items. Of the final school grade criteria, those for Aircraft Mechanic were most predictable both from Airman Classification Battery tests and from the spatial tests. Those for Organizational Supply Specialist were least predictable. Of the spatial battery tests, the most promising for a place in a differential classification battery is the heterogeneous subtest, Space Survey I. This had high validity for mechanical training but generally lower validity for other training.
- 53 Elliott, Lois L. Effects of item construction and respondent aptitude on response acquiescence. December 1959. (WADC-TR-59-362, ASTIA Document AD-238 787) (Project 7719, Task 17124). Measures of personality, attitude, and opinion are affected by individual differences in response bias. The tendency of basic airmen to agree or disagree with presented statements was investigated to determine its relationships with the form and content of the item and with the aptitude level of the examinee. Airmen at 3 aptitude levels were given 4 kinds of test content in 3 different item formats. Responses were scored for agreement with the item statement. Analysis of variance showed that extent of acquiescence varied with the form of the items, the content of the items, and the aptitude of the airmen. Further investigation of the complex relationships is needed to determine how questionnaires may be constructed and scored to control effects of the tendency to acquiesce.

WRIGHT AIR DEVELOPMENT DIVISION (WADD) SERIES

January 1960-March 1961

- 54 Miller, R.E. Predicting achievement of cadets in their first two years at the Air Force Academy. January 1960. (WADD-TN-60-37, ASTIA Document AD-238 791) (Project 7719, Task 17109). As cadets progress through the Air Force Academy it becomes possible to secure new criteria against which selection and experimental tests may be validated. The present study reports the predictive validities of an operational selection battery and an experimental battery administered to the class of 1959. Academic and leadership criteria maturing at the end of both the first and second years at the Academy are used. Validities of the selection battery hold up well against criteria maturing in the second year, and the experimental battery contains predictors which may be worth further development. Attention is called to the highly selected character of the cadet sample and to possible effects of homogeneous ability groupings in certain academy classes.
- 55 Brokaw, L.D. & Tomlinson, Helen. Impact of a negatively weighted variable on the validity of an aptitude index. January 1960. (WADD-TN-60-38, ASTIA Document AD-237 209) (Project 7717, Task 87006) (OTS). Effect of a negatively weighted variable as part of a composite score is determined by comparison between the characteristics of such composites and the characteristics of the composites with that variable removed. The validity of the aptitude indexes was increased, but not significantly, by eliminating the negatively weighted element. The aptitude indexes containing the negatively weighted elements were not appreciably correlated with each other; but the composites

without the negatively weighted elements were positively intercorrelated. The results support the use of negatively weighted elements in the aptitude indexes of differential classification batteries; they indicate that other purposes are best served by batteries involving only positively weighted elements. This conclusion is pertinent only to aptitude composites whose components all have positive validity.

- 56 Cobb, B.B. Conversion of aptitude indexes between forms AC-1B and AC-2A of the Airman Classification Battery. February 1960. (WADD-TN- 60-39, ASTIA Document AD-237 210) (Project 7719, Task 17106). The study represents an empirical approach by which scales have been developed to facilitate conversion of aptitude indexes derived from the Airman Classification Battery AC-1B to equivalents of corresponding aptitude indexes for the Airman Classification Battery AC-2A. The Armed Forces Qualification Test score was used as a reference variable to select and equate an AC-1B sample with an AC-2A sample. Frequency distributions were obtained for each of 4 sets of corresponding indexes and conversion tables were derived by the equipercentile technique. These tables are appropriate for use when comparing qualifications of individuals tested by different forms of the Airman Classification Battery.
- 57 Valentine, L.D., Jr. A factor-analytic study of the USAF Officer Activity Inventory. March 1960. (WADD-TN-60-40, ASTIA Document AD-238 087) (Project 7719, Task 17108) (OTS). This analysis was designed to determine the actual number of distinct fields of interest that can be identified by an interest inventory scaled for 16 officer career fields. 2 factor-analytic techniques were applied to the 16 job-interest scores for a sample of new officers. The analyses each yielded 5 significant factors (Combat and Operations Interest, Administrative Interest, Technical Interest, Quantitative Interest, and Administrative (Personnel) Interest) with corresponding factors defined by almost identical clusters of interest scales. In each analysis, one of the factors, Administrative (Personnel), was a subset of scales included in the broader Administrative factor. Thus 4 distinct interest areas were defined whose definition established their equivalence to the 4 interest measures included in the Air Force Officer Qualifying Test, and confirmed the judgment that 4 interest scales were adequate in the officer test battery. The factor analyses, presented in detail in the appendixes, show how an incomplete hierarchical structure can be handled by the Schmid-Leiman hierarchical factor model.
- 58 Miller, R.E. Predicting achievement of cadets in their first year at the Air Force Academy, class of 1960. March 1960. (WADD-TN-60- 41, ASTIA Document AD-238 088) (Project 7719, Task 17109). Each entering class is administered batteries of selection and experimental tests. To a large extent this study replicates previous investigations of test validities at the Air Force Academy. Many of the formerly high validities continue to be relatively high, but a general decline is seen when comparison is made with validities against early criteria for the class of 1959. The decline probably is the effect of more rigorous selection standards applied to the class of 1960. The highly selected nature of the sample is indicated, and the possible effect of homogeneous ability groupings in certain Academy classes is pointed out. Attention is called to the value of unique tests in the batteries, even though their predictive validities may be low.
- 59 Creager, J.A. & Miller, R.E. Predicting achievement of cadets in their first year at the Air Force Academy, class of 1961. March 1960. (WADD-TN-60-42, ASTIA Document AD-238 088) (Project 7719, Task 17109). Each class at the Air Force Academy is administered batteries of selection and experimental tests prior to training. The present study reports the validities of these batteries for the class of 1961. The criteria are those which matured after one or two semesters of work at the Academy. Predictive validities of each test in the batteries are presented. Variables which could be compared with the results of previous studies were found to have a fairly persistent pattern of validities, with a tendency toward somewhat lower coefficients than in previous classes. The selection standards applied to the class of 1961 contributed to the loss. It is possible that other factors, such as changes in course content, may be involved. No adequate explanation has been found, however, for the near-zero validities obtained for certain verbal tests against English course criteria. Promising experimental tests will be cross-validated in future studies.

- 60 **Flyer, E.S. Unreliable airmen in high-risk jobs: Unsuitability in the munitions and weapons maintenance career field. March 1960. (WADD-TN-60-43, ASTIA Document AD-151 042) (Project 7719, Task 17155).** Lack of adaptability screening in procuring personnel for high-risk positions has resulted in some unreliable personnel being assigned to nuclear weapons duties. In addition, some airmen are maintained in nuclear positions after numerous incidents showing instability or irresponsibility. Techniques are available to screen airmen prior to and during assignment to high-risk positions. While unauthorized nuclear detonation will not be precluded by the most intensive personnel screening, many unreliable airmen can be identified and removed from assignments to high-risk career fields.
- 61 **Mullins, C.J. & Cox, J.A. Evaluation of the AFROTC Flight Instruction Program. April 1960. (WADD-TN-60-44, ASTIA Document AD-237 211) (Project 7717, Task 87006).** The AFROTC Flight Instruction Program (FIP) initiated in 1956 is evaluated by comparison of 1957 AFROTC graduates who were given the training and a similar group who were not. Exposure to FIP training produced no significant increase in the proportion of AFROTC graduates electing to enter Air Force pilot training; but FIP graduates exhibited a marked advantage over non-FIP trainees in their lower elimination rates from both primary and basic pilot training. An estimate shows an appreciable saving in cost of flying training attributable to the AFROTC light plane training.
- 62 **Meyer, J.K. & Miller, R.E. Validity of photo interpreter predictors for test and training criteria. April 1960. (WADD-TN-60-45, ASTIA Document AD-238 793) (Project 7719, Task 17108).** To identify predictors of performance in Photo Interpretation School, scores on a battery of 39 aptitude and biographical tests were obtained for 200 photo interpreter trainees. 9 criteria were developed, with 7 of these derived from a photo interpreter proficiency test and 2 from training grades. The best predictors were among the aptitude tests of spatial ability and the aptitude indexes of the Airman Classification Battery (AC-1B). Both test and training criteria proved to be predictable, but the highest validities were against a composite of 7 phase grades.
- 63 **Trites, D.K. & Czymoure, R.N. Characteristics of officers graduating in 1954 from Air Force Institute of Technology programs. April 1960. (WADD-TN-60-46, ASTIA Document AD-237 212) (Project 7719, Task 17155) (OTS).** This note reports the results of a survey of 360 officers who remained in the Air Force and of 151 officers who left the Air Force after graduation from training programs sponsored by the Air Force Institute of Technology. Background information was collected and questionnaires were mailed to each group of officers. It was found that officers remaining on active duty are generally older, have more rank, have spent more time in service, and more frequently are rated than were officers leaving service. Possible methods of improving retainability are identified and discussed.
- 64 **Brokaw, L.D. & Holdrege, F.E. Qualifying aptitude minimums as a function of recruiting and training objectives. May 1960. (WADD-TN-60-134, ASTIA Document AD-238 089) (Project 7717, Task 87006).** This paper discusses the interrelationships among desired performance of technical training graduates, the length, content, and training standards of the course, and the aptitude qualification of the entrants into the training. The impact of shifting the cutting score upon the characteristics of the other factors in the production of airmen trained to the requisite level is examined. The relationships between scores on selection or classification instruments and measures of proficiency, such as a final school grade, are described.
- 65 **Leczmar, W.B. & Davydiuk, B.F. Airman classification test batteries: A summary. May 1960. (WADD-TN-60-135, ASTIA Document AD-240 831) (Project 7717, Task 87002).** Assignment to training and jobs has been effectively accomplished by the Air Force through the use of test batteries. 2 basic testing instruments have been used: the Airman Classification Battery and the Airman Qualifying Examination. These 2 tests have been revised periodically to counteract item obsolescence incurred by technology changes, to protect test security, and to use new test theory. Validation studies have prompted some of the revisions in test content, format, and administration. This

report compiles a review of each form of these tests, together with development information, and citation of published reports.

- 66 Whitlock, G.H. The status of morale measurement, 1959. May 1960. (WADD-TN-60-136, ASTIA Document AD-243 825) (Project 7719, Task 17130; Contract AF 41(657)247, University of Tennessee) (OTS). This review and critical analysis of attempts at morale measurement presents the first phase of an investigation aimed at developing an effective means for measuring morale among Air Force personnel. The uses of morale measures as predictors and as criteria are noted, and the implications of each usage for measurement are discussed. The problem of scale dimensionality is analyzed, and studies are cited demonstrating the confusion resulting from erroneous assumptions of unidimensionality. An analysis of low intercorrelations among diverse morale measures emphasizes notions of dimensional relevance and concept relevance. A review of definitions of morale points out such problems as the equating of job satisfaction and morale, individual and group references, and definitions for which no measurement operations presently exist. The collection of methodologies and conceptualizations which, in effect, constitute the body of morale theory, is reviewed with particular attention to conclusions drawn from factor analysis.
- 67 Cureton, E.E. Dimensions of airman morale. June 1960. (WADD-TN-60-137, ASTIA Document AD-245 845) (Project 7719, Task 17130; Contract AF 41(657)247, University of Tennessee) (OTS). In an attempt to determine and measure aspects of airman morale, 167 questionnaire items were assembled and administered to 1000 airmen. By cluster and factor-analytic techniques, 8 scales were derived, one of them defined as a measure of General Morale. 3 of the scales are fairly independent of each other, but closely related to the General Morale Scale: satisfaction with the Immediate Supervisor, with the Air Force as a Military Organization, with the Job, and with the Civilian Community. The Supervision scale is the only one clearly defined as measuring a uniquely identified facet of morale. For the other scales, a different approach in the analysis could yield another equally defensible set.
- 68 Cureton, E.E. & Sargent, B.B. Factor-analytic reanalysis of studies of job satisfaction and morale. July 1960. (WADD-TN-60-138, ASTIA Document AD-248 076) (Project 7719, Task 17130; Contract AF 41(657)247, University of Tennessee). This is one of 4 papers reporting development of scales for measuring morale among Air Force personnel. Data from published reports of 6 previously developed scales were reanalyzed and the results compared with those for the scales developed in this project. Factor analyses show nearly all the scales with high loadings on the first centroid factor, indicating a large general factor, termed "morale" or "general attitude toward the organization." The one consistent separate factor was "Supervision." Variation in other factors from study to study is attributed in part to differences in attitude structuring among the various samples of workers, but in larger part to differences in the content and organization of the particular scales used. The report includes a discussion of special problems in factoring small matrices.
- 69 Judy, C.J. A regression analysis of one set of Airman Proficiency Test scores. June 1960. (WADD-TN-60-139, ASTIA Document AD-240 361) (Project 7734, Task 17018) (OTS). One criterion for airman skill upgrading in the Air Force is met by attaining a qualifying score on an applicable Airman Proficiency Test (APT). This note reports an analysis which shows the proportion of variance one such test has in common with selected measures of training, experience, education, aptitude, supervisory opinion, and airman attitudes for 384 aircraft mechanics tested in 1956 and 1957. Each of these categories of information, except airman attitudes, could be used to predict the APT Criterion at some level of effectiveness; but only the training variables and the aptitude variables added significantly to the prediction attainable by using all other available information. Results show the utility of APT scores in defining one important aspect of airman proficiency.
- 70 Ewart, E.S. Factorial structure of airman peer nominations. June 1960. (WADD-TN-60-140, ASTIA Document AD-241 425) (Project 7719, Task 17155) (OTS). A factor analysis of the intercorrelations of 25 peer nomination traits administered to 11 flights of airmen in basic training yielded 4 interpretable factors. These were thought to represent dimensions of a "general" rating factor, "good naturedness," "sociability," and "motivation for military life."

- 71 Elliott, Lois L. Factorial structure of airman self-ratings and their relationship to peer nominations. July 1960. (WADD-TN-60-141, ASTIA Document AD-242 388) (Project 7719, Task 17155). Over 600 airmen rated themselves on the same traits for which they later made peer nominations. Self-ratings showed a highly differentiated factor structure, with 8 factors defined as compared with 4 for peer nominations. There was no direct correspondence between the 2 sets of factors. In combination with AFQT category and amount of education, the self-ratings were moderately predictive of peer ratings of a number of traits.
- 72 McCormick, E.J. Effect of amount of job information required on reliability of incumbents' check-list reports. July 1960. (WADD-TN-60-142, ASTIA Document AD-246 439) (Project 7734, Task 17013; Contract AF 41(657)237, Purdue Research Foundation) (OTS). The purpose was to measure what effect the number of questions asked about each task had upon the consistency and amount of information provided by Air Force personnel when completing task inventories. Aircraft Control and Warning Operators (AFSC 27350) were asked to report, by means of a task check list, various combinations of the following information: (a) the occurrence of tasks; (b) the frequency with which the task was performed; (c) the time required; (d) the judged mental difficulty of the tasks. 56 airmen were randomly assigned to one of 4 experimental groups. Each group was asked for one of 4 combinations of the 4 types of information. Analysis of variance showed no systematic differences in the number of tasks reported by incumbents who were asked to report 1, 2, 3, or 4 types of information. Incumbents who were required to report more (as opposed to fewer) types of information about their tasks provided more reliable information. There was considerable stability from group to group in the proportion who reported that they performed a particular task.
- 73 Harding, F.D. & Madden, J.M. Analysis of some aspects of the Air Force position evaluation system. July 1960. (WADD-TN-60-143, ASTIA Document AD-242 696) (Project 7734, Task 17015). The job evaluation system used by the Air Force was applied to a sample of positions. Judged by pay-grade conversions, evaluation scores obtained were somewhat inflated, but the evaluations discriminated between higher and lower skilled jobs. A simple average of individual ratings closely approximates the consensus ratings arrived at during 2-man conferences held by the judges. This finding eliminates the reason for limiting the number of judges to the small number who can attend such meetings. By regression analysis, it was found that factors dealing with Knowledge, Adaptability and Resourcefulness, and Attention formed one group of related factors while the factors measuring Responsibility for Safety of Others, Physical Effort, and Job Conditions were related to each other. Although there was overlap within the 2 groups, each factor had a considerable amount of unique variance.
- 74 Gordon, Mary Agnes. Arithmetic reasoning items with formula responses. July 1960. (WADD-TN-60-210, ASTIA Document AD-243 203) (Project 7717, Task 87002) (OTS). This is a study of the effect of practice on item statistics. Some specific practice effects were found. These were not large enough to be troublesome in selecting items for a new test from a pool of experimental items. If experimental items are protected by initial practice items and final time-filling items, most of the practice effects can be controlled. Arithmetic reasoning items with formula responses as used in this study were found to be suitable for moderate to difficult tests of airman aptitude.
- 75 Lecznar, W.B. Equivalence of scores from three airman classification devices. July 1960. (WADD-TN-60-211, ASTIA Document AD-245 431) (Project 7717, Task 87006). Airman Classification Battery, AC-2A, and Airman Qualifying Examination, Forms D and E, were administered in various combinations to groups of examinees. Aptitude composite scores from the several samples were compared for normative purposes and to verify certain differences found in the data obtained during the development of Airman Qualifying Examination, Form E. The results indicate a general comparability of scores from one test to the others, but some isolated variations appeared and some of the deviations found during the Form E development were not replicated. The data did not suggest that AQE-E norms should be revised.

- 76 **Madden, J.M.** A review of some literature on judgment with implications for job evaluation. August 1960. (WADD-TN-60-212, ASTIA Document AD-245 432) (Project 7734, Task 17013) (OTS). Job evaluation has been described as a psychological process closely resembling those which have been subjected to experimentation both in the laboratory and in practical situations. It is based on the psychophysical method of single stimuli. Predictions from previous research indicate that the evaluation a job receives is most reliable when it is judged in a group with other jobs, and that the composition of this group influences the evaluation it receives. If the presence of these context effects in job evaluation is verified, the next step is to design an adequate procedure for their control. Determination of the optimal method of representing the job to the rater and an examination of the effects of residual factors, such as familiarity of the rater with the job being rated, may also suggest changes in current job evaluation procedures. All of these phenomena should be considered in their relationship to Air Force job-evaluation procedures.
- 77 **Cowan, G.E.** Development of specialty outlines for collecting job information in the Radio-Radar Systems career field. August 1960. (WADD-TN-60-213, ASTIA Document AD-243 826) (Project 7734, Task 17016) (OTS). This study investigates the feasibility of using an instrument with standard functional work categories to collect occupational information across different specialties of a maintenance career field and at 2 skill levels. Specialty Outlines were developed for the 5- and 7-skill level for 6 AFSCs in the Radio-Radar Systems career field and administered to teams of proficient NCO incumbents. The 7-level outlines were administered twice with a 5-week interval and the 5-level outlines were administered once. Analysis of variance techniques were applied to estimates of the percentage of time spent on each of 13 standard functional work categories. Each team of specialists was interviewed to discuss the content and format of the outline for their AFSC. Results of the analyses and interviews indicate that Specialty Outlines using standard functional work categories are (a) reliable instruments, (b) adequate for use across different AFSCs of a maintenance career field at both the 5- and 7-level, and (c) differentiate between the work activities of 5- and 7-level airman.
- 78 **Brokaw, L.D.** Suggested composition of airman classification instruments. August 1960. (WADD-TN-60-214, ASTIA Document AD-252 252) (Project 7717, Task 87002) (OTS). Each test of Airman Classification Battery AC-2A was evaluated for its contribution to Air Force classification procedures. Criteria were success in Air Force technical training and scores achieved on job proficiency tests. By a multiple regression technique, standard beta weights and a squared multiple correlation coefficient were derived for 16 predictors against both criteria for 36 criterion groups. Components for 4 aptitude indexes were selected by reviewing the frequency with which tests appeared among the best 4 predictors within each of 4 job clusters.
- 79 **Miller, R.E.** Prediction of technical training criteria from AFOQT composites. September 1960. (WADD-TN-60-215, ASTIA Document AD-246 658) (Project 7717, Task 87003). The Air Force Officer Qualifying Test (AFOQT) is used in various officer procurement and selection programs. Scores on this test are of significance in selecting officers for attendance at basic technical courses. A study of 975 reserve officers in 7 different technical courses provided data on the predictive validities of AFOQT composite scores for final technical course grades. Satisfactory validity coefficients were obtained for the AFOQT aptitude composites against the course criteria. Most of the composites were valid for each separate criterion, and coefficients as high as .58 were obtained. These validities persist in different samples of officers enrolled in the same course at different times. Validities of the AFOQT interest composites were markedly lower and frequently negative. The highest in terms of absolute value was .32.
- 80 **Elliott, Lois L.** Prediction of success in WAF basic training by two background inventories. September 1960. (WADD-TN-60-216, ASTIA Document AD-249 952) (Project 7719, Task 17155) (OTS). As part of a longitudinal study of WAF careers, the Biographical Inventory of the Airman Classification Battery and the WAF Self Report Inventory were administered to a 6- months' input

- of WAF basic trainees. On the basis of item counts for half the sample, keys were developed to predict success in basic training. When cross validated against the remaining part of the sample, moderate validity was obtained for one group and negligible validity for the other.
- 81 Elliott, Lois L. Factor analysis of WAF peer nominations. September 1960. (WADD-TN-60-217, ASTIA Document AD-246 940) (Project 7719, Task 17155) (OTS). A factor analysis of the intercorrelations of 30 peer nomination variables, aptitude, age, and success or failure for WAF in basic training yielded 7 factors. The 3 major factors represented dimensions of leadership, heterosexual adjustment, and agreeableness. The remaining dimensions were motivation, emotional maturity, neatness, and feminine interests.
- 82 Elliott, Lois L. WAF performance on the California Psychological Inventory. September 1960. (WADD-TN-60-218, ASTIA Document AD-246 941) (Project 7719, Task 17155). The California Psychological Inventory was administered to a 6-months' input of WAF basic trainees. Mean scores for the total WAF group exceeded norms for high-school women on all scales except social presence, socialization, flexibility, and femininity. Mean scores of successful WAF exceeded those for the failure groups on all but 3 scales. It was concluded that test performance by the incoming WAF population compared favorably with results from a similar female population.
- 83 Tupes, E.C., Brokaw, L.D. & Kaplan, Margorie N. An application of the hierarchical factor model to the criterion grouping problem. September 1960. (WADD-TN-60-219, ASTIA Document AD-253 013) (Project 7717, Task 87002) (OTS). A hierarchical factor analysis was applied to intercorrelations of the validity coefficients of 14 aptitude tests for 66 technical school criteria. 7 factors emerged: a general, 2 second-order, and 4 first-order factors. From these results it was concluded that the present 5 aptitude indexes could probably be reduced to 4 with little loss in prediction; however, if the number of aptitude indexes were reduced below 4, appreciable loss in prediction would occur. The present aptitude indexes could be reduced to 4 by combining the General and Electronics Aptitude Indexes. Some shifting in courses from one aptitude index to another is suggested.
- 84 Madden, J.M. Context effects in job evaluation. October 1960. (WADD-TN-60-220, ASTIA Document AD-249 950) (Project 7734, Task 17015) (OTS). Judgments may be distorted by a variety of influences. One potent influence is the context in which the object judged is placed. When a list of jobs is being evaluated in a job-evaluation program, each job is presented to the rater in the context of all the remaining jobs on the list. When a list was composed of all high-value jobs, the obtained evaluation scores were lower than the "true" ones. When a list was composed of all low-value jobs, the evaluation scores were higher. On lists containing a majority of high-value jobs, the low-value jobs were judged even lower; and the reverse was true when the list contained a majority of low-value jobs. Suggestions were made for the control of context effects in the Air Force job-evaluation program.
- 85 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. October 1960. (WADD-TN-60-257, ASTIA Document AD-251 837) (Project 7734, Task 17015) (OTS). Reliabilities of single ratings and pooled ratings of Air Force job evaluation factors were estimated from ratings on 50 Air Force specialties by student officers attending the USAF Command and Staff School. The Spearman-Brown prophecy formula was found to produce reliability estimates which were practically identical to those obtained by randomly drawing samples and computing the reliability for each one. The interrater and rater reliability of the Air Force job evaluation system was found to be adequate when the composites were based upon an average of the ratings made by 10 to 15 officers at the Command and Staff School. The reliability of such mean ratings did not rise appreciably as the number of raters was increased beyond 20. When the basis of rating was a full-length job description, the raters tended to assign higher values than when they based their ratings on a brief Specialty Summary, but the rank ordering of the specialties remained essentially unchanged. Reliability of the ratings was the same whether long or short job descriptions were used.

- 86 Madden, J. M. A note on the rating of multidimensional factors. October 1960. (WADD-TN-60-258, ASTIA Document AD-249 951) (Project 7734, Task 17015) (OTS). To determine how the reliability of ratings is affected by fractionating a multidimensional rating factor, the complex job-evaluation factor, Knowledge, was split into 4 simpler factors: Formal Education, Special Education, On-the-Job Training, and Work Experience. Aviation cadets' ratings of 42 Air Force specialties on these 4 factors were somewhat more reliable than ratings on the original multidimensional Knowledge factor. Maximum reliability of rater judgments is suggested as one criterion for the most desirable level of fractionation of a complex factor.
- 87 Miller, R.E. & Creager, J.A. Predicting achievement of cadets in their first year at the Air Force Academy, class of 1962. October 1960. (WADD-TN-60-259, ASTIA Document AD-250 117) (Project 7717, Task 87003). A battery of experimental tests was administered to the Air Force Academy class of 1962 on entry. Results of these tests and previously administered selection tests were correlated with final academic grades and Cadet Effectiveness Ratings earned in the fourth class year. The predictive validities of the tests tended to show some loss when compared with those from previous classes. Shifts in validity patterns for the same tests against the same or similar criteria were also noted. Nevertheless, all criteria proved to be predictable. Prediction of mathematics and science course grades was best accomplished by the Quantitative composite of the AFOQT, while the English achievement test of the College Entrance Examination Board was the most adequate for the prediction of English grades. These findings are consistent with those from other Academy classes. 13 predictors had significant validity coefficients for the prediction of Cadet Effectiveness Ratings, with the best single predictor the experimental Peer Status scale of the Life Experience Inventory.
- 88 Fisher, W.E., Ward, J.H., Jr., Holdrege, F.E., et al. Prediction of unsuitability discharges. October 1960. (WADD-TN-60-260, ASTIA Document AD-248 077) (Project 7719, Task 17155) (OTS). An equation was devised to provide recruiters with a convenient device for estimating the quality of a prospective recruit from 3 predictors: age, education, and aptitude score. This report describes the development of the equation and illustrates its effectiveness in predicting unsuitability discharges. It provides a convenient dial computer for estimating probability of unsuitability discharge.
- 89 Madden, J.M. Familiarity effects in evaluative judgments. November 1960. (WADD-TN-60-261, ASTIA Document AD-248 384) (Project 7734, Task 17015) (OTS). This report is one of a series dealing with rater bias in job evaluation. It was found that the more familiar the rater is with the job being evaluated, the higher his rating is likely to be. This effect was observed for 5 of the 14 rating factors used: Adaptability, Decision-Making, Managerial and Supervisory, Mental Work, and Working Conditions. Methods are suggested for controlling the familiarity effect in the Air Force job evaluation system.
- 90 Madden, J.M. A comparison of three methods of rating-scale construction. November 1960. (WADD-TN-60-262, ASTIA Document AD-252 251) (Project 7734, Task 17015) (OTS). 4 job evaluation factors were used as the basis of rating 10 Air Force specialties. For each factor, 3 different methods were used in constructing the scale: (I) each scale division was defined and illustrated; (II) neither scale division definitions nor examples were used; and (III) definitions were used but examples were omitted. Ratings by samples of aviation cadets were analyzed for effects of method on mean ratings. For 3 of the 4 factors, the mean ratings obtained were not different as a function of the method of scale construction. Methods I and III were about equally reliable, both yielding more reliable means than method II. Method III is suggested as being the most effective because the task of the rater is somewhat simpler than for method I and the reliability is higher than for method II.
- 91 Christal, R.E. & Madden, J.M. Effect of degree of familiarity in job evaluation. November 1960. (WADD-TN-60-263, ASTIA Document AD-250 118) (Project 7734, Task 17013) (OTS). A significant association between the familiarity of the rater with a job and the ratings he assigns

to the job was found for 17 of 50 Air Force specialties. Assuming that the most valid ratings are those given by highly familiar raters, it appears that highly technical jobs tend to be under-evaluated by raters who are unfamiliar with the work performed. On the other hand, some jobs tend to be over-evaluated by raters who are unfamiliar with the work performed. These findings point to the necessity for controlling the level of familiarity when job evaluation is conducted.

- 92 **Judy, C.J. Appraisal of educational requirements for airman specialties. December 1960. (WADD-TN-60-264, ASTIA Document AD-252 253) (Project 7734, Task 17018) (OTS). Educational requirements for airman specialties are given in Air Force Manual 35-1. This study examines the role of some of these gross indicators of academic achievement in predicting technical school grades. Attention was restricted to the educational information shown on testing and assignment record cards completed for a sample of airmen in 13 Air Force specialties. By linear regression techniques it was found that the joint contribution of this limited amount of information permits the prediction of a large part of the variance in technical school grades. High school graduation was the best single predictor. Completion or noncompletion of particular high-school-level courses, although individually predictive of the criterion measures, did not reach a level of practical significance for any specialty when the effects of other information were controlled.**
- 93 **Humphreys, L.G. Equipercetile conversions as a function of training in a technical curriculum. December 1960. (WADD-TN-60-265, ASTIA Document AD-257 428) (Project 7717, Task 87002; Contract AF 41(657)279, University of Illinois) (OTS). This study examines the effect of training differences on scaling new forms of personnel tests for equivalence to previous forms. 3 classes of a technical high school were given the test against which Air Force classification tests have been scaled, the General Classification Test. In addition, they took a recent form of the Airman Classification Battery. The ability range of these students corresponded closely to that of the airman population, showing that findings from these samples can be generalized to the Air Force input. Differences between sophomores and seniors in equipercetile conversion tables for the aptitude indexes reflected the emphasis in this high school on mechanical training. This was interpreted as a joint effect of the nature of the tests and the nature of this particular high school curriculum.**
- 94 **Bottenberg, R.A. The exploitation of personnel data by means of a multiple linear regression model. December 1960. (WADD-TN-60-266, ASTIA Document AD-257 499) (Project 7719, Task 17112). One broad class of personnel problems involves predicting a criterion (training success, job performance, job knowledge, reenlistment decision) from available predictor information. Effectiveness of personnel utilization depends to a large extent upon effective prediction systems for such criteria. This report describes an iterative procedure for determining weights in a multiple regression problem, programmed for an electronic computer. Large-scale regression problems can be economically computed while avoiding altogether the question of singularity. The procedure permits precise tests of hypotheses, enabling the investigator to express his hunches in full detail in formulating the regression model.**
- 95 **Whitlock, G.H. & Cureton, E. E. Validation of morale and attitude scales. June 1960. (WADD-TR-60-76, ASTIA Document AD-242 359) (Project 7719, Task 17130; Contract AF 41(657)247, University of Tennessee) (OTS). This paper completes reporting of the development of scales for measuring morale among Air Force personnel. A previously developed questionnaire keyed for 8 scales was given to an independent sample. When these scores were compared with criteria derived from interviews, ratings, and Air Force records, validities were uniformly low. Although none of the validities are high enough for useful prediction, the scales do measure expressed attitudes with considerable reliability.**
- 96 **McCormick, E.J. & Ammerman, H. L. Development of worker activity check lists for use in occupational analysis. July 1960. (WADD-TR-60-77, ASTIA Document AD-248 385) (Project 7734, Task 17013; Contract AF 41(657)237, Purdue Research Foundation) (OTS). To determine the consistency with which job incumbents respond to a list of task activities, several forms of check lists were completed by job incumbents in 3 Air Force position types. An identical form was**

readministered one week later. Consistency in reporting frequency of task performance and length of task time was fairly satisfactory with mean reliabilities around .70. Those for relative proportion of total time per task and for general task difficulty were considerably lower (.53 and .52). From analyses of variance, it was determined that: (a) consistency in reporting task occurrence is not generally related to consistency in reporting other types of task information; (b) a recall period of 6 months elicits more reliable task occurrence information than a one-month period, but the one-month recall yields greater consistency of time and difficulty judgments than the 6-month period; and (c) interactions among experimental factors (scales, recall periods, position and equipment types, methods of response) were generally negligible. The degree of reliability shown and the absence of important interactions are evidence that the check list may prove a useful procedure for gathering information over a large variety of conditions and jobs.

- 97 **Vanasek, F.J.** Development of a data bank for officer effectiveness ratings. July 1960. (WADD-TR-60-78, ASTIA Document AD-244 643) (Project 7717, Task 17110; Contract AF 41(657)244, Data Processing Center). Data from over 700,000 Officer Effectiveness Reports have been accumulated for the years 1954-1958 and recorded on IBM 650 tape. This report describes the procedure whereby the basic data, annual analyses, and a 5-year summary analysis were derived. These records make available information of value to the Air Force in formulating officer personnel policies and for use as criterion data in personnel research. An appendix itemizes the categories of information recorded.
- 98 **McCormick, E.J. & Tombrink, K.B.** A comparison of three types of work activity statements in terms of the consistency of job information reported by incumbents. August 1960. (WADD-TR-60-80, ASTIA Document AD-248 386) (Project 7734, Task 17013; Contract AF 41(657)240, Purdue Research Foundation) (OTS). 3 types of work activity statement (tasks, elements, and work actions) were compared for consistency of job information collected through their use in check lists. Check lists of activities of 2 maintenance position types were administered to incumbents and supervisors. These provided for reporting job information on 7 scales: 1. frequency of performance of activities; 2. time required for performance; 3. mental difficulty; 4. physical difficulty; 5. type of training received; 6. type of training desired; and 7. type of assistance obtained. 3 indexes of rater consistency were used: (a) test-retest reliability of scale responses; (b) test-retest reliability of reports about the occurrence of activities; and (c) inter-rater consistency of scale responses. For the quantitative scales (1-4), tasks and elements yielded more consistent information than work actions. With the qualitative scales (5-7), work actions were more consistent than tasks, with elements falling between and not differing significantly from either of them. Patterns of differences were found between the 2 jobs, but there were no systematic differences between incumbents and supervisors in reporting information about incumbents' jobs. Frequency and time information were reported more consistently than mental and physical difficulty; and information about assistance obtained was reported more consistently than training received and training desired.
- 99 **Morsh, J.E., Madden, J.M., & Christal, R.E.** Job analysis in the United States Air Force. February 1961. (WADD-TR-61-113, ASTIA Document AD-259 389) (Project 7734, Task 17013) (OTS). The Air Force has recently revised the Occupational Analysis Manual which prescribes procedures for job analysis and evaluation. The revised method of job analysis, including the research and development which has led to its present form, is described in this paper. The method centers around the use of the task inventory, while at the same time it includes many of the more desirable features of traditional methods. The uses of job analysis data, statistical treatment, and special problems for future research are discussed. Evidence shows that the method will produce reliable information and will permit economical sampling of many job incumbents. It facilitates quantitative analysis and the organization of information into a form useful to a maximum number of using agencies.
- 100 **Ward, J.H., Jr.** Hierarchical grouping to maximize payoff. March 1961. (WADD-TN-61-29, ASTIA Document AD-261 750) (Project 7734, Task 17016). This report describes mathematically a general procedure for forming hierarchical groups of mutually exclusive sets in a manner which

yields an optimum value for the functional relation, or objective function, that reflects the criterion chosen by the investigator. The number of groups to be formed need not be specified in advance. Given k sets, this technique permits their reduction to $k - 1$ mutually exclusive sets by considering the union of all possible pairs that can be formed and the selection of that union which has the highest payoff value with respect to the criterion chosen. This procedure can be repeated until only one set remains. Hence decisions on the number of groups to be used can be based on a knowledge of the "costs" of grouping at each stage. A computer flowchart and a numerical example of the grouping procedure are provided. An appendix shows how to determine the number of possible ways of forming groups and the number of distinguishable unions possible.

- 101 Bottenberg, R.A. & Christal, R.E. An iterative technique for clustering criteria which retains optimum predictive efficiency. March 1961. (WADD-TN-61-30, ASTIA Document AD-261 615) (Project 7734, Task 17016). In a personnel classification program, maximum predictive efficiency results from applying least-squares weights to a set of predictor tests to produce a separate composite score for each criterion. With a large, complex organization such as the Air Force, it is not feasible to compute composite scores to predict the success of every individual in every criterion situation. This paper describes an iterative technique, programmed for an electronic computer, that at each step reduces the number of criterion clusters and provides optimal weights for the tests. A cost table can be used to determine the appropriate balance between predictive efficiency and number of criterion clusters. Solution of a sample problem illustrates each step of the technique.

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- 102 Creager, J.A. & Miller, R.E. Summary of regression analyses in the prediction of leadership criteria, Air Force Academy classes of 1961 through 1963. April 1961. (ASD-TN-61-41, ASTIA Document AD-263 979) (Project 7717, Task 87003) (OTS). A battery of experimental tests is administered each year to entering cadets at the Air Force Academy. Validities against academic and leadership criteria are routinely determined. Multiple linear regression methods have been applied to the problem of predicting the Cadet Effectiveness Rating as a leadership criterion. This report summarizes the results of such regression studies on 3 Academy classes. Considerations governing the design of each experimental battery are pointed out. Battery validities and regressions are examined within classes, and across classes. Multiple correlations with the criterion ran as high as .49. Interaction variables made no contribution to prediction beyond that of the primary variables. Findings are of use in developing a valid leadership predictor for screening Academy applicants.
- 103 Lecznar, W.B. Development of the Airman Classification Test-1961. April 1961. (ASD-TN-61-42, ASTIA Document AD-261 502) (Project 7717, Task 87002). Airman Classification Test-1961 was developed for use in Air Force personnel classification programs other than selective enlistment. It is a 4-hour test composed of 10 subtests from which 4 aptitude scores can be derived. The battery is adapted for either hand or machine scoring.
- 104 Norman, W.T. Problems of response contamination in personality assessment. May 1961. (ASD-TN-61-43, ASTIA Document AD-262 433) (Project 7717, Task 87003; Contract AF 41(657)269, University of Michigan) (OTS). This survey reports the first phase of a project to develop tests to measure 5 personality variables. Various techniques are defined and these are appraised on the basis of logical implications and empirical findings. Conclusions favored questionnaires composed of forced-choice self-report items as best suited to the purpose of the project. A program is outlined for construction of such tests to produce instruments valid for the selected criterion variable and free from appreciable biasing effects.

- 105 Norman, W.T. Development of self-report tests to measure personality factors identified from peer nominations. May 1961. (ASD-TN-61-44, ASTIA Document AD-267 779) (Project 7717, Task 87003; Contract AF 41(657)269, University of Michigan) (OTS). An experimental battery of personality tests were constructed as part of a project to develop personality tests appropriate for use in selection of applicants for Air Force officer training. Criteria were peer-nomination ratings previously shown to define personality factors that were predictive of Officer Effectiveness Ratings. Rational selection of testing techniques and item forms was supplemented by information from a series of tryouts with small samples. The battery will be administered to a large sample composed of groups from which reliable peer-rating criteria can be obtained for full cross validation.
- 106 Miller, R.E. Predicting achievement of cadets in their first year at the Air Force Academy, class of 1963. May 1961. (ASD-TN-61-45, ASTIA Document AD-263 980) (Project 7717, Task 87003). Applicants for each class at the Air Force Academy take a battery of selection tests during the winter preceding admission of the class and a battery of experimental tests on entry. Results from both batteries are used as predictors of academic and leadership performance at the Academy. Predictive validities were computed in the class of 1963 for tests in these batteries, using the academic average for the fourth class year and the Cadet Effectiveness Rating for the fall semester of that year as criteria. Both criteria were predictable. Validities for the academic criterion attained a value of .51, while for the leadership criterion the highest validity was .30. The Physical Aptitude Examination, frequently the best predictor of the Cadet Effectiveness Rating, was equaled or exceeded by 6 other more economical predictors. Several different sets of predictors were about equally effective in predicting this criterion. An increase in validities of the High School Activities Index was noted as compared with recent classes. The trend toward lower validities observed in the past several classes did not hold for the class of 1963.
- 107 Christal, R.E. & Madden, J.M. Air Force research on job evaluation procedures. June 1961. (ASD-TN-61-46, ASTIA Document AD-267 346) (Project 7734, Task 17015). This paper reviews present procedures in Air Force job evaluation and outlines a program for improving methods of job evaluation. A short-term program, its results, and current applications are described in terms of (a) desirable rater characteristics, (b) desirable rating situations, and (c) desirable characteristics of rating factors and scales. The long-term program has the objective of making possible an accurate evaluation for every job-type in the Air Force. A method is proposed for determining job-types. Problems of determining grade levels, of selecting factors to be rated, and of scaling and weighting judgments are considered.
- 108 Madden, J.M. A further note on the familiarity effect in job evaluation. June 1961. (ASD-TN-61-47, ASTIA Document AD-263 981) (Project 7734, Task 17015) (OTS). Job evaluations were found to vary as a function of the extent to which raters were familiar with them. In addition, there was an interaction between the job rated and the familiarity level of the rater. It is suggested that an adequate control of the familiarity effect could be maintained by maximizing the familiarity level of the raters. This should be done by using job descriptions and other materials rather than obtaining raters with a high degree of familiarity gained through personal work experience. A personal relationship with the job rated may reduce the validity of the ratings if affective factors are operating.
- 109 Tupes, E.C. & Kaplan, Margorie N. Similarity of factors underlying peer ratings of socially acceptable, socially unacceptable, and bipolar personality traits. June 1961. (ASD-TN-61-48, ASTIA Document AD-266 861) (Project 7717, Task 17110) (OTS). 5 well-defined factors have been found to underly ratings of personality traits when the traits were expressed in bipolar form (e.g., Cooperative vs Obstructive). The present study investigated the factor structure underlying ratings when the traits were presented with socially acceptable definitions alone (e.g., Cooperative vs Not So); with socially Unacceptable definitions alone (e.g., Obstructive vs Not So); as well as in the bipolar form. Members of the Air Force Command and Staff School Class of 1959 rated each other (in rating groups of 12 to 14 officers) using one or another of 3 forms designed to obtain bipolar and unipolar

ratings. When the 3 intercorrelation matrices were factor analyzed, 5 factors emerged from each, same 5 factors found in previous analyses. The factor structure underlying ratings of personality traits appears unaffected by differences in the polarity of the rating definitions.

- 110 Vitola, B.M. & Cantrell, G.K. An experimental investigation of multiple-choice item structure. July 1961. (ASD-TN-61-49, ASTIA Document AD-264 913) (Project 7717, Task 17131). This study was designed to measure the effect on item difficulty level of the presence or absence of central problems and generic terms in the stems of multiple-choice items. Each of 60 elements of information, appropriate for the average high school student, was reflected in 3 types of 4-choice multiple-choice items. Type 1 questions included both a central problem and generic term; Type 2 questions included a central problem but no generic term; and Type 3 questions included neither a central problem nor a generic term. 3 forms of a 60-item test were assembled to include 20 of each type of question. 3 groups of basic airmen, equated on the basis of AFQT centiles, each completed a different test form. No significant difference was found between any 2 of the mean total scores. Type 1 questions were significantly easier than Types 2 and 3, and Type 2 was significantly easier than Type 3. For basic airmen, use of a central problem alone reduces item difficulty significantly, but the use of a generic term in conjunction with the central problem reduces the item difficulty even more.
- 111 Holdrege, F.E. Factorial structure of basic training performance variables. July 1961. (ASD-TN-61-50, ASTIA Document AD-265 824) (Project 7719, Task 17155) (OTS). Peer nominations of basic airmen on 25 traits had been previously factor analyzed into 6 factors, only 4 of which were interpretable. A new analysis was made with 6 added variables based on tactical instructor ratings and objective measures of aptitude, education, and age. The new analysis duplicates the first 4 factors of the previous analysis (General Rating Factor, Agreeableness, Surgency, Motivation for Military Life). By the addition of age and the aptitude measure to the analysis, the remaining 2 factors of the new analysis can be interpreted as Maturity and Intelligence.
- 112 Humphreys, L.G. Validation of Air Force classification tests against academic grades in an aviation high school. August 1961. (ASD-TN-61-51, ASTIA Document AD-267 799) (Project 7717, Task 17154; Contract AF 41(657)279, University of Illinois) (OTS). This is the first of a series of reports detailing the long-range validity of Air Force selection tests for technical academic criteria. The Aviation High School provides a unique opportunity for collection of predictor and criterion information for the same individuals over an extended period of time. Course grades showed low to moderate levels of reliability, with those in the terminal aviation-mechanic curriculum somewhat less than grades in the pre-engineering technical curriculum. Most of the multiple correlations of classification test scores with course grades were at a usefully high level. Highest correlations with Air Force aptitude indexes were somewhat lower, and correlations with AGCT still lower. For selection purposes the Air Force classification tests do a better job than the AGCT general intelligence test. The Air Force tests that have the highest utility for selection are Arithmetic Reasoning, Physics, and Pattern Comprehension. Additional mechanical and numerical content, as well as the use of keyed biographical data items, may improve prediction in this school situation.
- 113 Valentine, L.D., Jr. Air Force Academy selection variables as predictors of success in pilot training. September 1961. (ASD-TN-61-52, ASTIA Document AD-263 982) (Project 7717, Task 87003) (OTS). Of the first class graduating from the Air Force Academy, 172 entered Flying Training. Scores from the Academy selection tests, given 5 years earlier, were correlated with pass/fail criteria in Primary and Basic Flying Training, and with final grades in Basic Training. None of the College Entrance Examination Board scores were predictive of success in Flying Training. The Pilot composite of the Air Force Officer Qualifying Test had moderately high validity for passing both Primary and Basic Training. Neither of the sets of selection tests showed much discrimination for final grades of the successful students.

- 114 Tupes, E.C. & Kaplan, Margorie N. Relationships between personality traits, physical proficiency, and cadet effectiveness reports of Air Force Academy cadets. September 1961. (ASD-TN-61-53, ASTIA Document AD-264 916) (Project 7717, Task 17110) (OTS). Cadets in 3 Air Force Academy classes rated each other on 20 personality traits as well as on physical ability and officer potential. For 2 of the classes objective measures of physical proficiency were also available. Intercorrelation matrices within each class were analyzed to determine relationships between personality trait ratings and Cadet Effectiveness Ratings (CERs), and to determine the factor structure underlying the ratings. Traits such as responsibility, perseverance, good adjustment, poise, social polish, and social intelligence were most highly related to CERs, while traits of surgency or extroversion such as talkativeness, frankness, adventurousness, and sociability bore little or no relationships to CERs. When compared with OCS candidates and majors attending Command and Staff School, the Academy cadets differed little from these groups in the pattern of the personality trait vs CER relationships. 5 personality trait ratings were identified which correspond closely to the 5 (Surgency, Agreeableness, Conscientiousness, Emotional Stability, and Culture) found in other analyses. A sixth factor was identified as physical ability.
- 115 McReynolds, Jane. Development of screening and selection tests for women. September 1961. (ASD-TN-61-54, ASTIA Document AD-266 865) (Project 7717, Task 87000) (OTS). This report details the development and standardization of replacement forms of the Armed Forces Women's Selection Test and the Women's Enlistment Screening Test. Classification Test R-5, with extended time limits and a revised conversion table, was used as the reference test for standardization of both tests. In the standardization testing, a form of WEST was always administered first, but counterbalanced order of administration of AFWST and the reference test was used to stabilize practice effect. Intercorrelations indicate close relationships between these forms and earlier forms of AFWST and WEST effective prediction of scores used by the Army and Air Force in classifying enlisted personnel.
- 116 Ward, J.H., Jr. & Hook, Marion E. A hierarchical grouping procedure applied to a problem of grouping profiles. October 1961. (ASD-TN-61-55, ASTIA Document AD-269 536) (Project 7734, Task 773403). This report describes an application of a hierarchical grouping procedure to a problem of grouping test profiles so as to maximize the homogeneity of profiles within clusters. The data are 25 test profiles from a published report of a different grouping technique. The results of the two grouping techniques are compared and desirable characteristics of the hierarchical grouping technique are demonstrated. It shows not only the order in which profiles must be grouped so as to yield the optimal value of the objective function when the number of profiles is systematically reduced, but also the costs of the grouping at each stage of the hierarchy.
- 117 Holdrege, F.E. & Born, G. Graphic determination of coefficients of part and multiple correlation in three-variable problems. October 1961. (ASD-TN-61-144, ASTIA Document AD-269 526) (Project 7719, Task 771902) (OTS). On many occasions it is convenient to solve equations graphically rather than algebraically. This report provides a convenient means for graphically determining the values of coefficients of part correlation, coefficients of multiple correlation, and beta weights for 3-variable problems.
- 118 Valentine, L.D., Jr. & Creager, J.A. Officer selection and classification tests: Their development and use. October 1961. (ASD-TN-61-145, ASTIA Document AD-269 827) (Project 7717, Task 771706). The Air Force's use of selection and classification test instruments for officer personnel started early in World War II with the development and use of the Aviation Cadet Qualifying Test and the Aircrew Classification Batteries. Current officer testing programs developed from research on the aircrew batteries and from a second line of research with the Aviation-Cadet Officer-Candidate Qualifying Test which began in 1949. This report gives a resume of the officer selection and classification programs from 1941 to 1961, and describes the various test instruments in terms of their content and use.

- 119 **Valentine, L.D., Jr. Development of the Air Force Precommission Screening Test-62. October 1961. (ASD-TN-61-146, ASTIA Document AD-269 527) (Project 7717, Task 771706) (OTS).** The 1962 revision of the Air Force Precommission Screening Test replaces an earlier form for screening of applicants for navigator training and selection of airmen for the Air Force Academy Preparatory School. Sections of the test were constructed as short equivalent forms of 5 parts of the Air Force Officer Qualifying Test: verbal, quantitative, general science, mechanical, and scale reading. Results of a tryout with a high-aptitude sample of basic airmen demonstrated a suitable distribution of scores and high correlations between corresponding parts of the new test and AFOQT.
- 120 **Harding, F.D. & Bottenberg, R.A. Contribution of status factors to relationships between airmen's attitudes and job performance. November 1961. (ASD-TN-61-147, ASTIA Document AD-272 050) (Project 7719, Task 771902).** Previous investigation has shown little relationship between self-report measures of an airman's attitudes (morale) and his rated job proficiency. The data of one such study were reanalyzed by a multiple regression technique to determine whether military status variables (military rank, length of service, kind of duty) affect correlation of attitude measures with proficiency ratings. The addition of such variables to the attitude variables contributed significantly to prediction of supervisors' ratings of proficiency; but the attitude variables did not significantly increase prediction from the status variables alone. The findings show the importance of considering personal and situational factors when evaluating effects of attitude and morale.
- 121 **Holdrege, F.E., Lawrence, H.G., Kagihara, R.H., et al. Iterative item analysis. December 1961. (ASD-TN-61-148, ASTIA Document AD-279 555) (Project 7719, Task 771902) (OTS).** A method of weighting individual items which uses part correlation coefficients to obtain maximum test-criterion correlation has been proposed. A simple method for graphical solution of the formula for a part correlation coefficient is presented to make the proposed system of iterative item analysis feasible without the use of an electronic computer. By continuing the iterative procedure, this technique produces a result comparable to that obtained from standard iterative multiple regression techniques. The technique was applied to a practical item selection problem and demonstrated improved prediction over a single empirical key. Further studies could determine applicability to other item types and the limits of effective iteration.
- 122 **Taylor, C.W., Smith, W.R., Ghiselin, B., et al. Explorations in the measurement and prediction of contributions of one sample of scientists. April 1961. (ASD-TR-61-96, ASTIA Document AD-267 832) (Project 7717, Task 17110; Contract AF 41(657)158, University of Utah) (OTS).** Physical scientists at 2 Air Force research centers were intensively interviewed concerning the nature of scientific productivity and the characteristics of effective scientists. Based on these interview suggestions, data were collected on 52 criteria. These were reduced analytically to 14 factor scores. Several tests and questionnaires were developed for tryout as predictors. Scores from these and previously developed instruments that showed promise were correlated with the factor scores and 3 of the original criteria. The most predictable criteria (in terms of number of significant correlations) were ratings of likableness as a member of a research team, membership in professional societies, organizational status, rated work output, supervisory ratings on overall performance, and peer rankings on overall productivity. The instruments that had scores correlating with the greatest number of criteria were a biographical data questionnaire, self-ratings, and a questionnaire designed to measure minimum level of aspiration. The outcomes of this investigation were identification of a wide variety of measurable criteria and a number of self-report instruments suitable for longitudinal followup and validation as a means of identifying kinds of scientific talent needed by the Air Force.
- 123 **Tupes, E.C. & Christal, R.E. Recurrent personality factors based on trait ratings. May 1961. (ASD-TR-61-97, ASTIA Document AD-267 778) (Project 7717, Task 17110) (OTS).** Intercorrelations among ratings on 35 personality traits, selected as representative of the personality domain, were obtained for 8 samples. These samples differed in length of acquaintanceship from 3 days to more

than a year; in kind of acquaintanceship from assessment programs in a military training course to a fraternity house situation; in type of subject from airmen with only a high school education to male and female undergraduate students to first-year graduate students; and in type of rater from very naive persons to clinical psychologists and psychiatrists with years of experience in the evaluation of personality. Centroid or multiple-group factors were extracted and rotated orthogonally to simple structure. For one study, an independent solution was obtained in which analytic rotations were accomplished on an IBM 650 computer using Kaiser's normal varimax criterion. 5 fairly strong and recurrent factors emerged from each analysis, labeled as (1) Surgency, (2) Agreeableness, (3) Dependability, (4) Emotional Stability, and (5) Culture.

- 124 Wherry, R.J., Stander, N., Leight, Janet, et al. General on-the-job criteria of airman effectiveness applied to three career fields. June 1961. (ASD-TR-61-98, ASTIA Document AD-269 670) (Project 7717, Task 17154; Contract AF 41(657)270, The Ohio State University Research Foundation) (OTS). This report describes the development and analysis of experimental criteria for evaluating job performance. 3 criterion measures were constructed and administered to airmen selected from 3 areas which correspond to 3 aptitude groups defined by Air Force classification tests. Each of the instruments was subjected to a factor analysis; the resulting factor scores, in combination with test scores and performance ratings, were also factor analyzed. 6 factors were identified, with each factor defined by at least 2 of the major variables. Short forms of 2 of the criterion instruments were prepared for further use. The results suggest suitability of these scales across the 3 job areas.
- 125 Davis, F.B. Measurement of mental skills employed in arithmetic reasoning tests. August 1961. (ASD-TR-61-99, ASTIA Document AD-266 864) (Project 7717, Task 87002; Contract AF 41(657)232, Test Research Service) (OTS). Arithmetic reasoning items are widely used in Air Force personnel selection tests because of their high reliability and validity for a wide range of performance criteria. With the objective of finding test items that measure the same abilities, but require less testing time, 9 types of replacement items were tried out in combination with a set of arithmetic reasoning items. The best combination of new items did measure the same abilities, but with no saving in testing time. Statistical analysis of data for the new tests and Arithmetic Reasoning provides information about the mental skills employed in solving arithmetic reasoning problems.
- 126 Madden, J.M. The methods and foundations of job evaluation in the United States Air Force. (With appendix, Annotated bibliography of job evaluation, by M. Joyce Georgia & J.M. Madden) October 1961. (ASD-TR-61-100, ASTIA Document AD-271 372) (Project 7734, Task 773402) (OTS). This report summarizes the history of job evaluation and gives a critical review of the technical literature as a background for the Air Force job evaluation plan. The Air Force plan is described with the rationale for each phase. A discussion of unsolved problems includes an outline of research needed to discover solutions of these problems. An Appendix lists a 200-item bibliography with abstracts.

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