

**Study
Report
2004-04**

**Replication of Zeidner, Johnson,
and Colleagues' Method for Estimating
Army Aptitude Area (AA) Composites**

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FOREWORD

Assigning tens of thousands of Army recruits per year to job training for which they are best suited and in ways that maximize aggregate Soldier performance represents a major challenge. The U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) has a long history of conducting and supporting research aimed at improving the Army's selection and classification process. In that process potential recruits take the Armed Services Vocational Aptitude Battery (ASVAB), from which nine Aptitude Area (AA) composites are calculated for selection and classification of recruits into entry-level jobs. Until recently, each AA composite was built from four (of the nine) ASVAB subtests. In January 2002, the Army adopted fractional weights based on a defensible performance criterion. This allowed all subtests to contribute to all composites in proportion to their power to "explain" Soldier performance. An ARI contractor research team had developed these composites as part of a larger research program into improving military classification systems.

The purpose of the present study was to independently replicate and document the Zeidner, Johnson, and colleagues' method for estimation of the nine (as well as alternative) composites comprising the proposed classification system, as a prerequisite to their subsequent evaluation (reported separately). The present study successfully reproduced the composites previously reported. These findings support the operational use of the nine composites, as well as the alternative composites, in future research and policy analysis aimed at evaluating the potential benefits of the proposed classification system for improving Army-wide classification and assignment.



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REPLICATION OF ZEIDNER, JOHNSON, AND COLLEAGUES' METHOD FOR ESTIMATING ARMY APTITUDE AREA (AA) COMPOSITES

EXECUTIVE SUMMARY

Research Requirement:

To select and classify recruits to job training, the Army employs nine Aptitude Area (AA) composites. Effective January 2002, the Army adopted a set of nine AA composites based on empirically estimated weights. Developed by Zeidner, Johnson, and colleagues (Zeidner, Johnson, Vladimirsky, & Weldon, 2000, 2001), with support from ARI, these composites were part of a proposed two-tiered classification system designed to substantially enhance the classification potential of the Army's AA composites. The purpose of the present study was to independently replicate and document Zeidner, Johnson, and colleagues' method of deriving the composites, in particular the nine AA composites currently in operational use as well as the alternative 17 and 150 composites comprising the two-tiers of the proposed system. Replication was undertaken as a prerequisite to subsequent evaluation of these composites (reported separately).

Method:

The present study replicated Zeidner, Johnson, and colleagues' method using the same Skills Qualification Test (SQT) database ($N = 257,810$) and affiliated data used by Zeidner et al. (2000, 2001) to generate the AA composites. This procedure involved: (1) correcting ASVAB subtest-SQT validities for criterion unreliability and multivariate range restriction by MOS; (2) aggregating corrected ASVAB subtest-SQT validities by job family; (3) using the aggregated ASVAB subtest-SQT validities, empirically estimating population beta weights for each job

family; (4) converting population beta weights (from Step 3) to unstandardized b-weights and constants; and (5) transforming these unstandardized b-weights and constants to operational weights and constants for computing AA standard scores.

Findings:

Overall, we were able to reproduce both population beta weights and operational weights (and constants) for the 9, 17, and 150 composites previously reported by Zeidner et al. (2000, 2001) with one exception. The single exception was associated with the Clerical Administration 1 (CL1) composite in the 17 job family configuration comprising Zeidner, Johnson, and colleagues' second tier. This difference owes to Zeidner et al.'s (2000, 2001) particular implementation of the recommended procedure for deriving the best set of positive weights.

Use of Findings:

Our results validate the Zeidner, Johnson, and colleagues' method for deriving AA composite weights, including the AA composite weights currently in operational use by the Army. The present study represents an independent verification of their method and previously reported results. These findings support the use of these composites in future research and policy analysis evaluating the proposed two-tiered classification system.

REPLICATION OF ZEIDNER, JOHNSON, AND COLLEAGUES' METHOD FOR ESTIMATING ARMY APTITUDE AREA (AA) COMPOSITES

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INTRODUCTION

Background

To select and classify recruits to job training, the Army employs nine Aptitude Area (AA) composites. Each composite represents a differentially weighted function of aptitudes and skills required for successful performance. Until recently, these nine AA composites utilized unit-weights (i.e., 0, 1). Based on rational linkages to job content, these unit weights were meant to reflect the relative importance of different cognitive aptitudes and abilities (e.g., verbal ability, coding speed, mechanical comprehension), as measured by the Armed Services Vocational Battery (ASVAB), in determining job performance within a family of jobs (e.g., Clerical, Combat, Field Artillery, etc.). These “original”, unit-weighted AA composites and corresponding ASVAB subtests are shown in Table 1.

Table 1: ASVAB Subtests Comprising the Army’s “Original” AA Composites and AFQT

| | ASVAB SUBTESTS | | | | | | | | |
|-------------------------------|----------------|----|----|----|----|----|----|----|----|
| | AR | MK | VE | AS | EI | GS | MC | CS | NO |
| AA COMPOSITES | | | | | | | | | |
| Electronics Repair | X | X | | | X | X | | | |
| General Maintenance | | X | | X | X | X | | | |
| Mechanical Maintenance | | | | X | X | | X | | X |
| Operators / Food | | | X | X | | | X | | X |
| Surveillance / Communications | X | | X | X | | | X | | |
| Combat | X | | | X | | | X | X | |
| Field Artillery | X | X | | | | | X | X | |
| Skilled Technical | | X | X | | | X | X | | |
| Clerical | X | X | X | | | | | | |
| General Technical | X | | X | | | | | | |
| AFQT | X | X | XX | | | | | | |

ASVAB is comprised of following subtests: Arithmetic Reasoning (AR), Math Knowledge (MK), Verbal (VE) = Paragraph Comprehension (PC) + Word Knowledge (WK), Auto & Shop Information (AS), Electronics Information (EI), General Science (GS), Mechanical Comprehension (MC), Coding Speed (CS), Numerical Operations (NO).

Starting in January 2002, the Army adopted a set of nine AA composites based on empirically estimated beta weights, corrected to the Youth population, for a 7 ASVAB test battery (Greenston, Rumsey, Zeidner, & Johnson, 2001).¹ The ASVAB subtest weights that define the AA composites are shown in Table 2. These composites were developed by

Table 2: ASVAB Subtest (Relative) Weights Comprising the AA Composites

| | ASVAB Subtests | | | | | | |
|-------------------------------|----------------|-------|-------|-------|------|------|------|
| | AR | MK | VE | AS | EI | GS | MC |
| AA COMPOSITES | | | | | | | |
| Electronics Repair | .818 | .890 | 1.000 | .754 | .598 | .151 | .469 |
| General Maintenance | .828 | .794 | .417 | 1.000 | .577 | .411 | .503 |
| Mechanical Maintenance | .339 | .289 | .237 | 1.000 | .340 | .060 | .394 |
| Operators / Food | .962 | .600 | .714 | 1.000 | .377 | .251 | .636 |
| Surveillance / Communications | .685 | 1.000 | .915 | .437 | .551 | .019 | .386 |
| Combat | .532 | 1.000 | .529 | .733 | .343 | .313 | .595 |
| Field Artillery | .715 | 1.000 | .586 | .673 | .297 | .249 | .700 |
| Skilled Technical | .727 | .697 | 1.000 | .357 | .230 | .187 | .446 |
| Clerical | 1.000 | .767 | .980 | .110 | .110 | .000 | .148 |

Zeidner, Johnson, and colleagues (Zeidner, Johnson, Vladimirsky, & Weldon, 2000, 2001), with support from the Army Research Institute (ARI), as part of a proposed two-tiered classification system.² Within this system, first tier composites are intended for classifying recruits to one of 150 entry-level job families. The second tier composites, aimed at a smaller set of job families (9 or 17), are meant for recruiting, vocational counseling, and administration purposes. A program of research conducted by Zeidner, Johnson, and colleagues using large-scale simulations demonstrated that the proposed two-tiered classification system and related

¹ DoD initiated a design change to reduce the scope of the ASVAB, from nine to seven subtests, that was implemented in January 2002. Numerical Operations (NO) and Coding Speed (CS) were deleted from the battery, for the purpose of facilitating uniform administration of the test battery, but at a significant reduction in potential classification efficiency.

² In descriptions of the Zeidner, Johnson, and colleagues' method, these weights are frequently referred to as least squares estimates (LSE) or LSE weights, as the weights are empirically estimated using conventional ordinary least-squares (OLS) regression.

composites would produce substantial gains in aggregate Soldier performance over the Army's previous system of unit-weighted composites (Johnson, Zeidner, & Leaman, 1992; Statman, 1993; Zeidner et al., 2000, 2001).

The purpose of the present study is to independently replicate and document the Zeidner, Johnson, and colleagues' method of deriving the composites for their proposed two-tiered classification system, in particular the nine AA composites currently in operational use³, as a prerequisite for subsequent evaluation of the system (reported separately). More specifically, the present study seeks to replicate their method and previously reported results (Zeidner et al., 2000, 2001) for the 9, 17, and 150 composites comprising the two-tiers of this proposed system. For all composites, this includes both the empirically estimated population beta weights and the operational weights (and constants) for computing AA standard scores used by the Army when making personnel and training decisions.⁴ Our replication of the Zeidner, Johnson, and colleagues' method is based on technical reports describing their method (Greenston et al., 2001; Zeidner et al., 2001, 2003a, 2003b), supplemented with information contained in their original programs. All SAS programs, with documentation, used in our replication can be found in Appendix A. The original programs implementing the Zeidner, Johnson, and colleagues' method, also with documentation, can be found in Appendix B.

³ Given the importance of the change from unit-weighted to LSE composites, ARI undertook an independent study to confirm the results of the original research and to provide a well-documented record of the methodology.

⁴ Zeidner, Johnson, and colleagues refer to these operational weights as "u, k values" or "transformation weights", as they reflect linear transformations of the population beta weights to weights that standardize AA scores to have a mean of 100 and a standard deviation (SD) of 20.

METHOD

Data

The present study employs the same Skills Qualification Test (SQT) program database used by Zeidner, Johnson, and colleagues (Zeidner et al., 2000, 2001, 2003a, 2003b). This database contains ASVAB subtest scores and standardized SQT scores for FYs 1987-1989 ($N = 257,810$).⁵ Running from 1983 to 1991, the SQT was a comprehensive program for assessing enlisted Soldiers' job proficiency for purposes of advancement and promotion. Under this program, Soldiers were required to take the SQT annually after completing 11 months or more of service. SQT were work samples or paper-and-pencil job knowledge tests. Each SQT was specific to a military occupational specialty (MOS). These data were originally collected and made available by ARI. Basic descriptives, and the ASVAB variance-covariance matrix, for the full sample are reported in Appendix C.

Procedure

As an overview, the Zeidner, Johnson, and colleagues method consists of the following steps:

- Step 1: Correct ASVAB subtest-SQT validities for criterion unreliability and multivariate range restriction by MOS.
- Step 2: Aggregate ASVAB subtest-SQT validities by job family.
- Step 3: Using the aggregated ASVAB subtest-SQT validities, empirically estimate population beta weights for each job family.

⁵ To ensure comparability across MOS, SQT scores were standardized to have a mean of 0 and an SD of 1.

- Steps 4 and 5: Transform population beta weights (from Step 3) to operational weights (and constants) for computing AA standard scores.

Our goal was to replicate the above steps, and their implementation, so as to reproduce the composite validities and weights previously reported by Zeidner, Johnson, and colleagues (Zeidner et al, 2000, 2001, 2003a). Technical details related to each step, and our replication, are summarized in turn.

Step 1: Correct ASVAB Subtest-SQT Validities for Criterion Unreliability and Multivariate Range Restriction by MOS

Consistent with the current psychometric literature (e.g., Cohen, Cohen, West, & Aiken, 2002; Guion, 1998; Hunter & Schmidt, 1990; Ree, Carretta, Earles, & Albert, 1994; Sackett & Yang, 2000; Schmidt & Hunter, 1996), the goal of this step is to correct observed validities for statistical artifacts (criterion unreliability, range restriction) that downwardly bias validities and related estimates (e.g., beta weights). In keeping with recommendations regarding the order of these corrections (Hunter, Schmidt, & Le, 2002; Stauffer & Mendoza, 2001), criterion reliability was corrected first, followed by range restriction. Using a variation of the standard correction for attenuation formula,⁶

$$\rho_{xy} = \frac{r_{xy}}{\sqrt{r_{yy}}}, \quad (1)$$

observed ASVAB-SQT validities (r_{xy}) were corrected by MOS for criterion unreliability (r_{yy}). Criterion reliabilities used in these corrections reflect internal consistency reliabilities, specifically coefficient alphas (Cronbach, 1951). The reliabilities employed in our corrections were the same as those used by Zeidner et al. (2000, 2001) and are reported in Appendix D.

After correcting for criterion unreliability, ASVAB-SQT validities were corrected for multivariate range restriction by MOS using formulas originally developed by Aitken (1934) and Lawley (1943), and described by Gulliksen (1950), and Birnbaum, Paulson, and Andrews (1950). Large-scale simulations demonstrate that, when applied appropriately, the Aitken-Lawley corrections consistently produce estimates that closely approximate validities for the relevant reference population (Sackett & Yang, 2000). The Aitken-Lawley multivariate range restriction correction formulas are most appropriate for this case because selection to an MOS results from multiple variables (e.g., ASVAB subtests) (Ree et al., 1994; Sackett & Young, 2000).

The multivariate range restriction correction formulas were applied to the validities twice to obtain two separate sets of corrected ASVAB subtest-SQT validities. First, to produce ASVAB subtest-SQT validities corrected to the Army Input population, and the second time, to produce validities corrected to the Youth population. The two sets of corrections were necessary as the relevant reference population, and thereby the factors (or variables) restricting the validities, differs for the two tiers in Zeidner, Johnson, and colleagues' proposed classification system. For purposes of the first tier, the relevant reference population is the Army Input population, so observed ASVAB subtest-SQT validities are restricted by formal classification effects and eligible recruits' self-selection to an MOS. For the second tier, the relevant reference population is the Youth population, so observed validities are doubly restricted by both formal selection (e.g., AFQT) and classification effects, as well as prospective recruits' self-selection into the Army.

⁶ Unless otherwise specified, notation used throughout this report follows that of Cohen et al. (2003).

Corrections were made to obtain the variance-covariance (VCV) matrix (v) for the relevant reference population shown below (using a variation of the conventional Birnbaum, Paulson, & Andrews [1950] notation, cf., Ree et al. [1994]; Sackett & Yang [2000]):

$$v = \begin{bmatrix} v_{xx} & v_{xy} \\ v_{yx} & v_{yy} \end{bmatrix}, \quad (2)$$

where v_{xx} is known and denotes the unrestricted (or population) VCV matrix for all 9 ASVAB subtests; v_{xy} (or its transpose, v_{yx}) is unknown and denotes the estimate of the corrected ASVAB subtest-SQT covariances in the relevant reference population; and v_{yy} is unknown and denotes the estimate of the corrected SQT variance in the relevant reference population. To obtain the corrected ASVAB subtest-SQT validities, we did the following. First, using the known unrestricted (or population) variances for all 9 ASVAB subtests (including NO and CS) and the known ASVAB variances and ASVAB subtest-SQT covariances (corrected for criterion unreliability) from a restricted MOS sample, we estimated the ASVAB-SQT covariances corrected to the relevant reference population (Army Input or Youth).⁷ Second, we derived the SQT variances for each MOS corrected to the relevant reference population. At this point, we had the complete variance-covariance matrix corrected to the relevant reference population for all 155 MOS. Third, and finally, we converted the corrected variance-covariance matrices for each MOS to ASVAB subtest-SQT validities, reflecting the range-restricted corrected validities for the current operational ASVAB battery of 7 subtests (dropping NO and CS).

It should be noted that including information on the full 9 ASVAB subtests in the correction procedure, even though the current battery only contains 7 (minus NO and CS), is necessary to ensure that the range-restriction corrected validities are accurate. This is because

NO and CS are involved in restricting the variance of SQT scores in the MOS samples, which thereby lowers the observed ASVAB subtest-SQT validities. In order to accurately recover the unknown population (Army Input or Youth) variance of SQT prior to the selection and classification effects underlying the MOS samples, NO and CS need to be accounted for, as done in the Zeidner, Johnson, and colleagues' procedure.

After applying the above correction procedures, we had two sets of ASVAB subtest-SQT validities corrected for criterion unreliability and range restriction for 155 MOS; one set reflecting validities corrected to the Army Input population, and the second set reflecting validities corrected to the Youth population. As an interim step, we verified our results against the corrected validities reported by Zeidner, Johnson, and colleagues (2003a).

Step 2: Aggregate ASVAB Subtest-SQT Validities by Job Family

The goal of this step is to aggregate the corrected ASVAB subtest-SQT validities (from Step 1) by job family for empirically estimating the population beta weights derived in Step 3. The procedure for aggregating these corrected validities to form a weighted average for each job family can be summarized in the formula below:

$$\bar{\rho}_{xy} = \frac{\sum(\rho_{xy}n)}{\sum n} \quad (3)$$

where n represents the acquisition number for each MOS; that is, the number of Army recruits to be allocated to an MOS. As evident from the formula, this procedure is directly analogous to conventional meta-analytic procedures in applied psychology for aggregating validities across research samples (e.g., Hunter & Schmidt, 1990). Likewise, the procedure is comparable to the

⁷ In Zeidner, Johnson, and colleagues' description of their method (Zeidner et al., 2001, 2003a, 2003b), this is referred to as the Youth Population criterion variance (YPCV).

traditional method in statistics of pooling averages across multiple samples. A conceptual description of this aggregation procedure follows.

For each MOS, we multiplied the corrected ASVAB subtest-SQT validities (the ρ_s from Step 1) separately by their respective acquisition numbers (n). The resulting products (of the SQT validities and the acquisition numbers) for each ASVAB subtest were then summed across all MOS corresponding to a particular job family, as were the applicable acquisition numbers. To obtain the final aggregated job family-level validities, we then divided the sum of the n -weighted ASVAB-SQT validities for a given job family ($\sum \rho_s n$), by the respective sum of MOS acquisition numbers ($\sum n$).

The acquisition numbers (n) used in our replication are exactly the same as the numbers employed by Zeidner, Johnson, and colleagues. These numbers, which are reported in Appendix E, were based on available assignment and classification data from the Seabrook Reports (1989). Multiplying MOS validities by their respective acquisitions numbers ensures that the contribution of an MOS to the estimation of job family-level beta weights accurately reflects its operational importance to Army assignment and classification policy. The job family configurations used in our replication match the configurations proposed by Zeidner, Johnson, and colleagues, for the new two-tiered classification system, which were previously reported in Zeidner et al. (2001).

Upon completing this step, we had obtained the aggregated corrected ASVAB subtest-SQT validities ($\bar{\rho}_s$) necessary for empirically estimating the population beta weights (β_s) in Step 3. We repeated this procedure three times, to derive three different sets of aggregated ASVAB subtest-SQT validities: (a) one set corresponding to Zeidner, Johnson, and colleagues'

first tier; and (b) two sets corresponding to the second tier (one for 9 job families and a second version for 17 job families).

Step 3: Using the Aggregated ASVAB Subtest-SQT Validities, Empirically Estimate Population Beta Weights for Each Job Family

The primary goal of this step is to empirically estimate population beta weights (β_s) for each job family based on the aggregated ASVAB subtest-SQT validities ($\bar{\rho}_s$) from the preceding step. These weights become the basis for the operational weights (and constants) subsequently derived in Steps 4 and 5, which are used by the Army to compute AA standard scores to assign entry-level recruits to an MOS, or for vocational counseling purposes and re-assignment of currently enlisted Soldiers. The current step was motivated by a series of large-scale simulations conducted by Zeidner, Johnson, and colleagues demonstrating greater classification efficiency and aggregate Soldier performance using AA composites based on empirically estimated beta weights versus the existing unit-weighted composites (Zeidner et al., 2000, 2001). The procedure for estimating the population beta weights slightly differs by tier.

For the first tier, comprised of 150 job families, population beta weights (β_s) were estimated for each job family using: (a) the applicable aggregated ASVAB subtest-SQT validities (from Step 2); and (b) the ASVAB subtest intercorrelation matrix for the relevant reference population, the Army Input population. This procedure is represented in the following formula:

$$\underline{B}_{yx} = R_{xx}^{-1} \underline{R}_{xy}^T \quad (4)$$

For each job family, a 7 x 1 vector of population beta weights (\underline{B}_{yx}) was generated empirically using standard ordinary least squares (OLS) regression applied to a 7 x 7 matrix of ASVAB

intercorrelations (R_{xx}), and a 7×1 vector of ASVAB subtest-SQT validities (R_{xy}). At the end of this estimation process, we had 150 sets of population beta weights (β_s), one set per job family. Conceptually, these weights reflected the relative, unique contribution of different cognitive aptitudes and abilities, as measured by the ASVAB subtests, to job performance for a family of comparable jobs.

For the second tier, comprised of either 9 or 17 job families, population beta weights were estimated for each job family using: (a) the applicable aggregated ASVAB subtest-SQT validities (from Step 2); and (b) the ASVAB subtest intercorrelation matrix for the relevant reference population, in this case the Youth population. Consistent with Zeidner, Johnson, and colleagues, ASVAB subtest intercorrelations were based on normative information for the 1980 Youth population. In contrast to the estimation process for the first tier, population beta weights were constrained to be positive. This was done for operational purposes, so that poor performance on a test, particularly due to low motivation or deliberate distortion, would not significantly contribute to and, thereby, bias assignment and classification decisions. Otherwise, consistent with the first tier, population beta weights were estimated using standard OLS regression.

To derive the "best" set of positive beta weights, where "best" is defined as the subset of positive beta weights yielding the highest multiple R, we did the following. Starting with all 7 ASVAB subtests, then iterating through successively smaller composites consisting of $(m-1)$ tests, we estimated betas for all possible subsets. That is, we estimated betas for all possible subsets of 7, then 6, then 5, then 4, etc., ASVAB subtests. The stopping rule was reached when we had identified the "best" set of positive beta weights. Specifically, these are the beta weights of the non-negatively weighted composite with the largest possible number of tests, say m^* ,

whose multiple R is highest among *all non-negatively* weighted composites with m^* tests and, at the same time, higher than the Rs of *all possible* composites with (m^*-1) tests. Once identified, this set of betas was outputted, with all excluded tests being assigned beta weights of 0.

We carried out this estimation process twice, once for the 9 job families and once for the 17 job families comprising Zeidner, Johnson, and colleagues, second tier. At the end of this estimation process, we had two full sets of population beta weights.

All population beta weights for the 9, 17, and 150 job families estimated from our replication are reported in Appendix F.

Steps 4 and 5: Transform Population Beta Weights (From Step 3) to Operational Weights (and Constants) for Computing AA Standard Scores

The goal for the final two steps is to transform population beta weights (from Step 3) to operational weights (and constants) for purposes of computing AA standard scores for use by Army personnel managers when making classification and counseling decisions.⁸ For the first tier, the operational weights are simply unstandardized population b-weights and constants. Consistent with their intended use, the operational weights for the second tier are linearly transformed b-weights and constants, constructed so as to produce AA standard scores with a mean of 100 and a standard deviation (SD) of 20, which reflect the desired population-level characteristics of the relevant reference population, the Youth population. The Zeidner, Johnson, and colleagues' transformation process, which we replicated, generally involves two steps.

⁸ Readers are reminded that Zeidner, Johnson, and colleagues refer to these operational weights (and constants) as "u, k values" or "transformation weights".

In the first step, population beta weights (the β s from Step 3) are converted to unstandardized b-weights and constants. For each job family, the population beta weights were converted to unstandardized population b-weights (B_{yx}^*) using the following formula:

$$B_{yx}^* = \beta_{yx} \left(\frac{\sigma_y}{\sigma_x} \right) \quad (5)$$

As can be seen from the formula, this conversion was carried out by multiplying each population beta weight (β_{yx}) by the ratio of the SQT standard deviation over the respective ASVAB subtest standard deviation $\left(\frac{\sigma_y}{\sigma_x} \right)$. For the first tier, the constants (B_{0y}^*) were then derived using the formula:

$$B_{0y}^* = \sum (B_{yx}^* \mu_x) \quad (6)$$

where the set of unstandardized b-weights (B_{yx}^*) for a given job family were individually multiplied by their respective ASVAB subtest population means (μ_x , Army Input), and the summation is across the 7 ASVAB subtests. This step effectively converts the population beta weights back to their original metric (or scale). For the first tier, no additional conversion was necessary, as the unstandardized b-weights and constants produced at this step constitute the operational weights. For the second tier, the conversion to unstandardized b-weights permits the subsequent linear transformation of these same weights (and constants) to an alternative standard scale with the aforementioned properties (mean of 100, SD of 20).

In the second step, applicable only to the second tier, the unstandardized b-weights for each job family were transformed to their final operational form using the formulas:

$$CM = \frac{20}{(10 \sqrt{B_{yx}^* R_{xx} B_{yx}^{*T}})} \quad (7)$$

$$b_{yx} = CM (B_{yx}^*) \quad (8)$$

$$b_{0y} = 100 - \sum (b_{yx} * 50) \quad (9)$$

The first formula (Eq. 7) generates a composite multiplier (CM), which standardizes b-weighted AA scores to have a SD of 20. This standardization is accomplished through formula (Eq. 8), which linearly transforms the unstandardized b-weights to operational weights using *CM*. The third and final formula (Eq. 9) derives constants that center operational AA scores to have the desired mean of 100. At the end of this second step, we had the operational weights and intercepts (by job family) for both the 9 and 17 composites comprising Zeidner, Johnson, and colleagues' proposed second tier.

Our replicated operational weights and intercepts for 9, 17, and 150 composites are reported in Appendix F.

RESULTS

Following the Zeidner, Johnson, and colleagues' method, we were able to successfully reproduce both population beta weights and operational weights and intercepts for the 9, 17, and 150 composites previously reported by Zeidner et al. (2000, 2001) with one exception (see Appendix F for our results). The exception can be found in the 17 job family variation of Zeidner, Johnson, and colleagues' second tier, specifically with the Clerical Administration 1 (CL1) composite (see Tables 4 and 5, Appendix F).

Population beta weights reported for CL1 (Zeidner et al., 2000, 2001) were not consistent with the weights generated by our replication. The most notable discrepancies between the Zeidner et al. estimates (2001) and those produced from our replication are associated with the Arithmetic Reasoning (AR) and Mathematical Knowledge (MK) subtests. Specifically, our estimated population beta weights for AR and MK were .24818270 and .22718282, respectively; whereas Zeidner et al. (2000, 2001) reported betas of .00000 (AR) and .36801 (MK). Because

there were differences with the population beta weights, the operational weights previously reported for CL1 were likewise not in agreement with the weights derived from our replication.

An examination of the regression of all possible subsets of ASVAB subtests indicates that the set originally derived by Zeidner et al. (2000, 2001) yielded a multiple R of .5085 based on 4 subtests, compared to our set of best positive weights, which yielded a higher multiple R of .5241 based on 3 subtests.⁹ This finding suggests that for this particular composite, the previously reported results are not entirely consistent with the stated goal of the Zeidner, Johnson, and colleagues' (2000, 2001) method for deriving the "best" set of positive weights. The Zeidner et al. results could be viewed as advantageous in that the set of weights generated are based on a larger number of ASVAB subtests, although our weights are consistent with the goal of estimating the "best" set of positive weights and produced a higher multiple R. Additionally, there is a meaningful relationship between our weights for CL1 and the weights estimated for CL (Clerical Administration) at the 9-composite level, such that averaging the weights associated with CL1 and CL2 recover the weights estimated for the CL composite.

Other than the CL1 composite, all other replicated beta weights and operational weights (and constants) comprising the first and second tier of Zeidner, Johnson, and colleagues' proposed classification system matched exactly with previously reported estimates.

DISCUSSION

Starting in January 2002, the Army adopted a set of nine AA composites based on empirically estimated beta weights, corrected to the Youth population, for a 7 ASVAB test battery. Zeidner, Johnson, and colleagues (Zeidner et al., 2000, 2001) developed these

⁹ More specifically, Zeidner et al. derived the best *positive* weights based on four subtests, whereas our replication of their method produced the best weights *among all possible subsets* based on 3 subtests.

“interim” composites as part of a proposed two-tiered classification system. The purpose of the present study was to independently replicate the Zeidner, Johnson, and colleagues’ method, and implementation of their method, in deriving the 9, 17, and 150 composites comprising their proposed classification system.

Overall, we successfully reproduced both population beta weights and operational weights and constants for the 9, 17, and 150 composites previously reported by Zeidner et al. (2000, 2001) with one exception. The single exception is associated with the Clerical Administration 1 (CL1) composite in the 17 job family configuration of Zeidner, Johnson, and colleagues’ second tier. Otherwise, we fully replicated population beta weights and operational weights (and constants) for all other composites comprising both the first and second tier of Zeidner, Johnson, and colleagues’ proposed classification system, including the “interim” set of nine AA composites currently in operational use by the Army. These findings support the use of these composites in future research and policy analysis aimed at evaluating the potential benefits of the proposed two-tiered classification system for improving Army-wide classification and assignment.

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**APPENDIX A: PROGRAMS FOR REPLICATING ZEIDNER, JOHNSON, AND
COLLEAGUES' (2000) METHOD**

Step 1: Correction for Criterion Unreliability and Range Restriction

Correction for Criterion Unreliability

```
*****
Correcting ASVAB-SQT validity coefficients and covariances
for criterion unreliability
*****/

libname DirPath "D:\NewAA\";

/*****
OUTPUT DATASETS - rename right-hand-side as needed
*****/
%let Ryx_CorrectRelib_MOS=DirPath.CorXY;
%let Cyx_CorrectRelib_MOS=DirPath.CorCV;

/*****
INPUT DATASETS
*****/
%let Descriptive_MOS=DirPath.Descrip;
%let R_Samp_MOS=DirPath.Corr;

/* variable names for ASVAB subtests */
%let TESTNAMES=GS AR NO CS AS MK MC EI VE;

proc iml;

    TestNames = {&TESTNAMES};

    /* Read ASVAB-SQT correlations and numeric ID into XYcorr and MOSNumID */
    use &R_Samp_MOS;
    read all var(TestNames) where(NAMES="SQT") into XYcorr;
    read all var{MOSNUMID} where(NAMES="SQT") into MOSNumID;
    close &R_Samp_MOS;

    /* Read SQT reliabilities into vector YYscal*/
    use DirPath.Relib;
    read all var{YY} into YYscal;
    close DirPath.Relib;

    NumMOS = nrow(MosNumID); /* =nrow(CorMat) */
    NumTest = ncol(TestNames);

    /* correcting validity coefficients for attenuation using standard formula */
    correctedRxy = XYcorr#(1/SQRT(YYscal));

    /* initialize corrected covariance matrix */
    correctedCVxy = repeat(0,NumMOS,NumTest);

    /* computing corrected covariances -- one ASVAB subtest column at a time */
    use &Descriptives_MOS;
    read all var{SD} where(names="SQT") into sdY;
    do iTest = 1 to NumTest;
        xName = TestNames[iTest];
        read all var{SD} where(NAMES=xName) into sdX;
        correctedCVxy[,iTest] = correctedRxy[,iTest]#sdY#sdX;
    end;
endrun;
```

```
end;
close &Descriptives_MOS;

/* creating dataset of MOS corrected SQT-ASVAB correlations */
create &Ryx_CorrectRelib_MOS var{MOSNUMID &TESTNAMES};
correctedRxy = MosNumID || correctedRxy;
append from correctedRxy;
close &Ryx_CorrectRelib_MOS;

/* creating dataset of MOS corrected SQT-ASVAB covariances */
create &Cyx_CorrectRelib_MOS var{MOSNUMID &TESTNAMES};
correctedCVxy = MosNumID || correctedCVxy;
append from correctedCVxy;
close &Cyx_CorrectRelib_MOS;

quit;
run;
```

Correction for Restriction in Range

```

/*****
  Correcting ASVAB-SQT validity coefficients and covariances for
  range restriction.
*****/

libname DirPath "D:\NewAA\";

/*****
  OUTPUT DATASETS - rename right-hand-side as needed
*****/

/* uncomment line below if correcting to Army input population */
%let Ryx_CorrectRelibRange_MOS=DirPath.ArmyValid;

/* uncomment line below if correcting to Youth population */
* %let Ryx_CorrectRelibRange_MOS=DirPath.YouthValid_range;

/*****
  INPUT DATASETS
*****/

/* uncomment line below if correcting to Army input population */
%let RefPopStats=DirPath.SummaryStats_Army;

/* uncomment line below if correcting to Youth population */
*%let RefPopStats=DirPath.PopCovYouth;

/* all data sets below common to both reference populations */
%let Descriptive_MOS=DirPath.Descrip;
%let R_Samp_MOS=DirPath.Corr;
%let C_Samp_MOS=DirPath.Covar;
%let Ryx_CorrectRelib_MOS=DirPath.CorXY;
%let Cyx_CorrectRelib_MOS=DirPath.CorCV;

/* variable names for ASVAB subtests */
%let TESTNAMES=GS AR NO CS AS MK MC EI VE;

proc iml;

  TestNames = {&TESTNAMES};

  /* read REFERENCE POPULATION ASVAB subtests covariance */
  use &RefPopStats;
  read all var{&TESTNAMES} where(_TYPE_='COV' & names?TestNames) into PopCxx;
  close &RefPopStats;
  SDx = sqrt(vecdiag(PopCxx));

  /* open MOS SQT-ASVAB covariance corrected for unreliability */
  use &Cyx_CorrectRelib_MOS;
  read all var{MOSNUMID} into MosNumID;
  NumMOS = nrow(MosNumID);

  /* open MOS SQT-ASVAB sample variance-covariance -- no correction */
  use &C_Samp_MOS;

  /* create output data for range-restriction corrected validities */
  create &Ryx_CorrectRelibRange_MOS var{MOSNUMID &TESTNAMES};

```

```

/*looping through MOSs listed under MOSTextID*/
do idxMOS=1 to NumMOS;

  /* read reliability corrected ASVAB-SQT covariance, uncorrected ASVAB
     variance-covariance, and uncorrected SQT variance from iTH MOS */
  setin &Cyx_CorrectRelib_MOS;
  read all var{&TESTNAMES} where(MOSNUMID=idxMOS) into Cxc; *correctedCVxy;
  setin &C_Samp_MOS;
  read all var{&TESTNAMES} where(names?TestNames & MOSNUMID=idxMOS) into Cxx;
  read all var{SQT} where(names='SQT' & MOSNUMID=idxMOS) into Cyy;

  /* compute range-restriction corrected ASVAB-SQT covariances for iTH MOS */
  PopCxc = PopCxx*inv(Cxx)*Cxc`;
  PopCcc = Cyy+Cxc*inv(Cxx)*(PopCxc-Cxc`);

  /* compute range-restriction corrected ASVAB-SQT correlations for iTH MOS*/
  PopRxc = (1/SDx/*Sxvec*/)#(PopCxc)#(1/sqrt(PopCcc));

  /* append iTH MOS SQT-ASVAT correlations to output data */
  TmpOutput = idxMOS || PopRxc`;
  setout &Ryx_CorrectRelibRange_MOS;
  append from TmpOutput;

end;

close &Cyx_CorrectRelib_MOS;
close &C_Samp_MOS;
close &Ryx_CorrectRelibRange_MOS;

quit;
run;

```

Step 2: Aggregation of ASVAB Subtests-SQT Validities by Job Family

```

/*****
Aggregating corrected ASVAB-SQT validity coefficients by job family.
*****/

%macro JFValid(JF_VALIDITY_DATA,MOS_VALIDITY_DATA,JF_SOLUTION,JF_CONFIG_DATA);

/* variable names for ASVAB subtests */
%let TESTNAMES=GS AR NO CS AS MK MC EI VE;

proc iml;

/* open data containing Job Family MOS configuration */
use &JF_CONFIG_DATA;
read all var{&JF_SOLUTION} into JFSolVec;

/* Total number of JF in JFSolVec vector */
NumJF = max(JFSolVec);

/* open data containing reference population MOS validities */
use &MOS_VALIDITY_DATA;

/* create output data set for aggregated JF validities */
create &JF_VALIDITY_DATA var{&JF_SOLUTION &TESTNAMES};
setout &JF_VALIDITY_DATA;

do idxJF = 1 to NumJF;

/* locate MOS in iTH job family and read acquisition weights */
setin &JF_CONFIG_DATA;
MOSJFIDX = loc(JFSolVec=idxJF);
read point(MOSJFIDX) var{AcqN} into N_Wgt;

/* read corrected validities of MOSs in iTH job family */
setin &MOS_VALIDITY_DATA;
read point(MOSJFIDX) var{&TESTNAMES} into XYvec;

/* aggregate validity coefficients across MOS weighted by N */
/* - note job family index is concatenated to output validity vector */
JFCorr = idxJF || (diag(N_Wgt)*XYvec)[+,]/sum(N_Wgt);

append from JFCorr;

end;

close &JF_CONFIG_DATA;
close &MOS_VALIDITY_DATA;
close &JF_VALIDITY_DATA;

quit;
run;

%mend;
```

```
option mprint=1;
```

```
libname DirPath "D:\NewAA\";
```

```
/* 9 JF validities corrected to youth population */
```

```
%JFValid(DirPath.JF9YouthValid,DirPath.Youthvalid,JF9,DirPath.EntryMOS155);
```

```
/* 17 JF validities corrected to youth population */
```

```
%JFValid(DirPath.JF17YouthValid,DirPath.Youthvalid,JF17,DirPath.EntryMOS155);
```

```
/* 150 JF validities corrected to Army input population */
```

```
%JFValid(DirPath.JF150ArmyValid,DirPath.Armyvalid,JF150,DirPath.EntryMOS155);
```

Step 3: Calculation of Population Beta Weights by Job Family

```

/*****
Computing Beta Weights by job family.
* Use macro argument CONSTRAINT to obtain different solutions:
  NONE = no constraint on subtest weights
  POSITIVE1 = Postive weights using Zeidner-Johnson-Vladimirsky stopping rule
  POSITIVE2 = Postive weights -- ignoring solutions with negative weights
*****/

/* variable names for ASVAB subtests, excluding NO and CS */
%let TESTNAMES=GS AR AS MK MC EI VE;

%macro BetaWeights(BETADATA,COVDATA,VALIDITYDATA,JFSOLUTION,CONSTRAINT);

%let CORRDATA=TMPCORRDATA;

proc iml;
  TestNames = (&TESTNAMES SQT);
  NTests = ncol(TestNames);
  _TYPE_={"MEAN", "STD", "N"}//j(NTests,1,"CORR");
  _NAME_=j(3,1,"")//t(TestNames);

  call symput('MNTESTS',char(NTests));

  /* Used later for CONSTRAINT=POSITIVE */
  call symput('MNTESTS_ASVAB',char(NTests-1));

  do i=1 to NTests;
    if(i<10) then
      MTESTNAME = concat('MTESTNAME',char(i,1,0));
    else
      MTESTNAME = concat('MTESTNAME',char(i,2,0));
    call symput(MTESTNAME,TestNames[i]);
  end;

  use &COVDATA;
  read all var(&TESTNAMES) where((Names?TestNames) & (Names^?"SQT")) into RXX;
  close &COVDATA;

  SXX_INV = sqrt(diag(1/RXX));
  RXX = SXX_INV*RXX*SXX_INV;

  XMEAN = j(1,NTests,0);
  XSTD = j(1,NTests,1);

  /* NOT actual sample sizes, but does not matter for estimation */
  XN = j(1,NTests,10000);

  /* Read Validity Data Matrix -- Note that MOS/JF<->Row */
  use &VALIDITYDATA;
  read all var(&TESTNAMES) into RXY_ALL;
  read all var(&JFSOLUTION) into JFNO_ALL;
  close &VALIDITYDATA;

  /* For each job family, read validities and create correlation matrix */
  create &CORRDATA(Type=corr) var ({ &JFSOLUTION _TYPE_ _NAME_ }||TestNames);
  do iJF = 1 to nrow(JFNO_ALL);

    IdxJF = JFNO_ALL[iJF];

```

```

&JFSOLUTION = j(nrow(_TYPE_),1,IdxJF);

RXY = RXY_ALL[iJF,];
XCORR = (RXX//RXY)|| (t(RXY)//1);
XDATA = XMEAN//XSTD//XN//XCORR;

%do i=1 %to &&MNTESTS;
  &&MTESTNAME&i = XDATA[,&i];
%end;

append;

end; /* END OF: do iJF = 1 to nrow(JFNO_ALL) */

close &CORRDATA;

quit;
run;

%if &CONSTRAINT=NONE %then
  %let MODELOPTIOIN=NOINT;
%else
  %let MODELOPTIOIN=NOINT SELECTION=RSQUARE B;

proc reg data=&CORRDATA
  outest=&BETADATA (keep=&JFSOLUTION &TESTNAMES _RSQ_ _P_)
  NOPRINT;
  model SQT = &TESTNAMES / &MODELOPTIOIN;
  by &JFSOLUTION;
  quit;
run;

/*****
Zeidner-Johnson-Vladimirsky Non-negative Beta Weights Approach
*****/
%if &CONSTRAINT=POSITIVE1 %then %do;
  proc sort data=&BETADATA;
    by &JFSOLUTION descending _P_ descending _RSQ_;
  run;

  /* Organize all possible solutions using two data sets: */
  /* TmpBetaPositive: solutions with non-negative weights */
  /* TmpBetaMax: solutions with maximum R for each JF & no. subtests pair */
  data TmpBetaPositive
    TmpBetaMax
    (keep=&JFSOLUTION _RSQ_ _P_);
  array Beta {&MNTESTS_ASVAB} &TESTNAMES;
  set &BETADATA;
  by &JFSOLUTION descending _P_ descending _RSQ_;
  NegativeWgtFlag = 0;
  do i=1 to &MNTESTS_ASVAB;
    if (Beta{i}=.) then Beta{i} = 0;
    NegativeWgtFlag = NegativeWgtFlag or (Beta{i}<0);
  end;
  /* output all solutions without negative weights */
  if (^NegativeWgtFlag) then
    output TmpBetaPositive;
  /* output subset with maximum R overall for given number of subtests */
  if (First._P_ and ^First.&JFSOLUTION) then do;
    _P_ = _P_+1;
    output TmpBetaMax;
  end;
run;

```

```

/* output positive weighted solutions with R2 >= max R2 in the next level */
data TmpCompare;
  keep &JFSOLUTION &TESTNAMES _RSQ_;
  merge TmpBetaPositive TmpBetaMax (rename=(_RSQ_=Rmax));
  by &JFSOLUTION descending _P_;
  if(_RSQ_ >= Rmax) then output;
run;

/* output only weights with maximum number of subsets for job family */
data &BETADATA;
  set TmpCompare;
  by &JFSOLUTION descending _RSQ_;
  if First.&JFSOLUTION then output;
run;
%end;

/*****
HumRRO Simple Non-negative Beta Weights Approach:
- Entirely ignore solutions with negative weights.
*****/
%if &CONSTRAINT=POSITIVE2 %then %do;
  /* keep only solutions with all positive weights */
  data TmpBetaPositive;
    array Beta (&MNTESTS_ASVAB) &TESTNAMES;
    set &BETADATA;
    do i=1 to &MNTESTS_ASVAB;
      if (Beta{i}=.) then Beta{i} = 0;
      else if (Beta{i}<0) then delete;
    end;
  run;

  proc sort data=TmpBetaPositive;
    by &JFSOLUTION descending _RSQ_;
  run;

  /* output all positive weights solution with maximum R2 */
  data &BETADATA;
    keep &JFSOLUTION &TESTNAMES _RSQ_;
    set TmpBetaPositive;
    by &JFSOLUTION descending _RSQ_;
    if First.&JFSOLUTION then output;
  run;
%end;

%mend;

option mprint=1;

libname DirPath "D:\NewAA\";

%BetaWeights (Modlib.JF9Beta, Modlib.PopCovYouth, Modlib.Jf9youthvalid, JF9, POSITIVE1);
%BetaWeights (Modlib.JF17Beta, Modlib.PopCovYouth, Modlib.Jf17youthvalid, JF17, POSITIVE1);
%BetaWeights (Modlib.JF150Beta, Modlib.PopCovArmy, Modlib.Jf150ArmyValid, JF150, NONE);

```

Step 4-5: Calculation of Operational ASVAB Subtest Weights and Constant

```
*****
Computing Beta Weights by job family.
*****/

/* variable names for ASVAB subtests, excluding NO and CS */
%let TESTNAMES=GS AR AS MK MC EI VE;

%macro UKWeights(UKDATA, COVDATA, POPDATA, BETADATA, JFNUM, TYPE);
proc iml;

  Subtest = {&TESTNAMES};

  /* predictor correlation matrix for Army Input Population*/
  use &COVDATA;
  read all var{&TESTNAMES} where(names?Subtest) into CovMat;
  close &COVDATA;

  use &POPDATA;
  read all var{SD} where(test?Subtest) into SDvec;
  %if &TYPE=TIER1 %then %do;
    read all var{MEAN} where(test?Subtest) into Means;
  %end;
  close &POPDATA;

  SDProd = 1/(SDvec#SDvec);
  R = CovMat#SDProd`;

  /*reading in all JFs into JFNO_ALL*/
  use &BETADATA;
  read all var{&JFNUM} into JFNO_ALL;
  NumJF = nrow(JFNO_ALL);

  /*creating SAS dataset containing u weights and k values for all JFs */
  create &UKDATA var{JFNO &TESTNAMES k};

  do idxJF=1 to NumJF;

    /*converting beta weights to b-weights for MOS-level*/

    setin &BETADATA;
    read all var{&TESTNAMES} where(&JFNUM=idxJF) into ObsBeta;

    bweights = ObsBeta#(1/SDvec`);

    /*transform b-weights to u and k values for Tier2 */
    %if &TYPE=TIER2 %then %do;
      /* composite multiplier*/
      CM = 20/(10*(SQRT(bweights*R*bweights`)));
      /* calculate U and K values */
      Uvec = diag(CM)*bweights;
      K = (SUM(Uvec)*50)-100;
    %end;

    /*transform b-weights to u and k values for Tier1 */
    %else %if &TYPE=TIER1 %then %do;
      /* calculate U and K values */
      Uvec = bweights;
    %end;
  end;
end;

```

```

        /* sum ASVAB means weighted by their respective b-weight*/
        K = SUM(Uvec#Means`);
    %end;

    /*merging u values with k value and adding a column for JFNO*/
    UKvec = J(nrow(K),1,idxJF) || Uvec || K;

    append from UKvec;

end;

close &UKDATA;
close &BETADATA;

quit;
run;

%mend;

option mprint=1;

libname DirPath "D:\NewAA\";

/* 9 JF operational weights corrected to youth population */
%UKWeights(DirPath.JFby9uk,DirPath.PopCovYouth,DirPath.PopDescripYouth,
DirPath.JF9Beta,JF9,TIER2)

/* 17 JF operational weights corrected to youth population */
%UKWeights(DirPath.JFby17uk,DirPath.PopCovYouth,DirPath.PopDescripYouth,
DirPath.JF17Beta,JF17,TIER2)

/* 9 JF operational weights corrected to Army input population */
%UKWeights(DirPath.JFby150uk,DirPath.PopCovArmy,DirPath.PopDescripArmy,
DirPath.JF150Beta,JF150,TIER1)

```

**APPENDIX B: ORIGINAL PROGRAMS IMPLEMENTING ZEIDNER, JOHNSON,
AND COLLEAGUES (2000) METHOD**

Part A: Step 1

```

/*****
      Compute basic descriptives for 155 MOS and Army Input population;
      Correct ASVAB-SQT validities for criterion unreliability and range restriction.
*****/

new;

NAME = {      /* List of 155 MOS names */
"11B" ,
"11C" ,
*...(con.)...,*
"98G" ,
"98H" ,
"98Z"
} ;

/* Load vector of SQT reliabilities */
LOAD rlblt[] = A\data\reliabty;

/* Determine number of MOS in vector of SQT reliabilities */
JOBS = ROWS( RLBLT );

/* Set ASVAB subtest names for output */
test = { "GS      " "AR      " "NO      " "CS      " "AS      " "MK      "
         "MC      " "EI      " "VE      " "SQT     " };

/* Initialize a corrected population matrix */
Rt = zeros( 10, 10 );

/* Index vector for the explicit variables - 9 ASVAB subtests */
indx = { 1 2 3 4 5 6 7 8 9 };

/* Index for the implicit variables - SQT */
indy = { 10 };

/* Combined vector for explicit and implicit variables */
indt = indx ~ indy;

/* Remove existing Army data file in order to avoid appending the same data */
DOS DEL ARMY\ARMY.DAT;

/*****
Create Army Input population data file and compute basic descriptives and ASVAB
intercorrelation matrix
*****/

I = 1;
DO WHILE I <= JOBS; /* Beginning of loop */

/* Create DOS command to append MOS file */
CMD = "TYPE JOBS\\" $+ NAME[ I ] $+ " >> ARMY\ARMY.DAT";
DOS ^CMD; /* Execute the above command */

I = I + 1;

ENDDO; /* End of loop. File ARMY.DAT contains data from all MOS */

```

```

f1 = "ARMY\\ARMY.DAT";

load X[ ] = ^f1;          /* Load the Army Input population data file */
nrws = rows( X ) / 10;   /* Compute N for Army Input population */
X = reshape( X, nrws, 10 ); /* Reshape the matrix */
SD_a = stdc( X );       /* Compute SDs for Army Input population */
MEAN_a = meanc( X );    /* Compute means for Army Input population */

format/rd 21,16;

/* Output SDs */
output file = "army\\SD" reset;
print SD_a;

/* Output means */
output file = "ARMY\\MEAN" reset;
print MEAN_a;
output off;

/* Compute variance-covariance matrix for 9 ASVAB subtests */
VCxx = vcx( X[ ., indx ] );

/* Output ASVAB variance-covariance matrix */
screen off;
format/rd 20,16;
OUTPUT FILE = ARMY\\VAR_COV.ASC RESET;
PRINT VCxx;

/* Compute ASVAB intercorrelation matrix from variance-covariance matrix */
Gxx = corrv( VCxx );

/* Output intercorrelation matrix */
output file = "ARMY\\CORR_ARM.ASC" reset;
print Gxx;

CLEAR X; /* Remove matrix of Army Input data from memory to free space */

NUMS=ZEROS( JOBS,1); /* Initialize vector of observed MOS sample sizes (N) */

/*****
/** Process all 155 MOS. Compute corrected ASVAB-SQT validities for all MOS *****/
*****/

N = 0;
l = 1;
do while l <= jobs;

format/rd 20,16;

f1 = "JOBS\\" $+ name[ l ];
load X[ ] = ^f1;          /* Load matrix of ASVAB-SQT data for current MOS */
nrws = rows( X ) / 10;   /* Find number of rows in the data matrix */
NUMS[ L ] = NRWS;       /* Update vector of MOS sample sizes */
X = reshape( X, nrws, 10 ); /* Reshape the data matrix */
MEAN = MEANC( X );      /* Compute means for current MOS */
SD = stdc( X );        /* Compute SDs for current MOS */

/* Compute ASVAB-SQT variance-covariance matrix (VCV) for current MOS */
VC_l = vcx( X );
/* Compute correlation matrix from VCV matrix for MOS */
RV_l = corrv( VC_l );
/* Extract 9 x 9 submatrix corresponding to ASVAB subtests from VCV matrix */

```

```

    Gxx_1 = VC_1[ indx, indx ];
/* Extract 9 x 1 submatrix corresponding to ASVAB-SQT validities from VCV matrix */
    Gxy = VC_1[ indx, indy ];
/* Correct ASVAB-SQT validities for criterion unreliability */
    Gxy = Gxy / sqrt( rlblt[ 1 ] );

/* Correction for restriction in range to Army Input Population */
    Gyy = VC_1[ indy, indy ]; /* Extract variance for SQT */
/* Put together VCV matrix and compute correlation matrix */
    RV = corrvc( ( ( VCxx~Gxy ) | ( Gxy'~Gyy ) ) );

/* Use correction method described in literature */
    Gxy_a = VCxx * inv( Gxx_1 ) * Gxy;
    Gyy_a = Gyy + Gxy' * inv( Gxx_1 ) * ( Gxy_a - Gxy );
    G_a = ( VCxx - Gxy_a ) | ( Gxy_a' - Gyy_a ); /* G_a is corrected VCV matrix */
/* Compute correlation matrix from range restricted corrected VCV matrix */
    RV_a = corrvc(G_a);

/*Output ASVAB-SQT validities corrected to Army Input population */
screen off;
FORMAT/RD 20,16;
fl = "ARMY\\" $+ name[ 1 ] $+ ".VLD";
output file = ^fl reset;
print RV_a[ indy, indx ];
OUTPUT OFF;

/* Correction for restriction in range to 1980 Youth population */
/* Load ASVAB intercorrelation matrix for 1980 Youth from the literature */
load VC_y[ 9, 9 ] = \YEFIM\ARI\corr.dat;
/* Multiply correlations by variance of the Youth population, which is equal 100 */
VC_y = VC_y * 100.;

/* Use correction method from literature */
Gxy_y = VC_y * inv( Gxx_1 ) * Gxy;
Gyy_y = Gyy_a + Gxy_a' * inv( VCxx ) * ( Gxy_y - Gxy_a );
G_y = ( VC_y - Gxy_y ) | ( Gxy_y' - Gyy_y ); /* G_y is corrected VCV matrix */
/* Compute correlation matrix from range restricted corrected VCV matrix */
RV_y = corrvc( G_y );

/* Output ASVAB-SQT validities corrected to 1980 Youth Population */
screen off;
FORMAT/RD 20,16;
fl = "YOUTH\\" $+ name[ 1 ] $+ ".VLD";
output file = ^fl reset;
print RV_y[ indy, indx ];
OUTPUT OFF;

/* Output of ASVAB-SQT validities for validation check */
fl = "JOBS\\" $+ name[ 1 ] $+ ".CHK";
SCREEN OFF;
output file = ^fl reset;
FORMAT 3,0;
print;
PRINT $name[ 1 ] ;
print " Uncrr  Atten  Army  Youth  STD  MEAN";
print;
FORMAT/RD 7,4;
K = 1;
DO WHILE K <= 10;
print RV_1[K,10]~RV[K,10]~RV_a[K,10]~RV_y[K,10]~SD[K]~MEAN[K] $TEST[K];
K = K + 1;
ENDO;

```

```
/* Check for non-positivity, i.e., correlation matrices must be non-singular. */
d = det( RV_a );
if d > 0;
;
else;
screen on;
print $name[ 1 ];
print "Determinant " d;
screen off;
endif;

l = l + 1;
```

```
endo;
```

```
/****** End of processing of all MOS *****/
```

```
output off;
screen on;
end;
```



```

QUOTA = ZEROS( FMLS, 1 );

/* Aggregate ASVAB-SQT validities to JF-level using cluster solution */
L = 1;
DO WHILE L <= FMLS;

V_f = zeros( 9,1 );

N = 0;
K = 1;
DO WHILE K <= JOBS;

  IF CLUST[ K ] == L;
    /* If Youth is used to create visible system */
    fl = "YOUTH\\" $+ mos[ K, 1 ] $+ ".VLD";
    /* If Army is used to create invisible system */
    /* fl = "ARMY\\" $+ mos[ K, 1 ] $+ ".VLD";
    */
    load RV_p[ ] = ^fl;

    V_f = V_f + RV_p * NUM[ K ];

    N = N + NUM[ K ];

  ENDIF;

  K = K + 1;

endo;

/* Output aggregated ASVAB-SQT validities */
SCREEN OFF;
if N > 0;
  print V_f/N;
else;
  print V_f/5000;
endif;

QUOTA[ L ] = N; /* Update job family quota */

L = L + 1;

ENDO;

/***** End of aggregating MOS into families *****/

/* End of Step 2 */

output off;

/*****
Computation of Composites
*****/

/* Start of Step 3 */

test = { " GS " " AR " " NO " " CS " " AS "
         " MK " " MC " " EI " " VE " };

test = test[ TESTS];

nmb = { " 1 " " 2 " " 3 " " 4 " " 5 "
        " 6 " " 7 " " 8 " " 9 " " };

```

```

y = date;
format/ldn 1,0;
output file = "OUT.CRT" reset;
SCREEN ON;
PRINT "
                                "
                                y[3] "/" y[2] "/" y[1];
print
"          TEST COMPOSIT FOR SQT . ( SAMPLE A+B+C ).";

format/rdn 8,3;
PRINT;
print "          " $test;

test_id = { 2 3 4 5 6 7 8 9 };

load V[ ] = "FMLS\\SQT";
FMLS = ROWS( V ) / 9;
V = reshape( V, FMLS, 9 );

/* This file is used for invisible tier */
/*load RV_FULL[ 9, 9 ] = "ARMY\\CORR_ARM.ASC";*/
/* This file is used for visible tier */
load RV_FULL[ 9, 9 ] = "\\YEFIM\\ARI\\CORR.DAT";

/* Extract ASVAB intercorrelation matrix from full 9 x 9 matrix */
RV = RV_full[ TESTS, TESTS];
/* Initialize matrix of weights (us) */
W = zeros( N_tests, FMLS );
/* Initialize matrix of Us */
U = W;
/* Initialize matrix of Ks */
KU = ZEROS( 1, FMLS );

load MEAN[ 9, 1 ] = "ARMY\\MEAN"; /* Load vector of means for all 9 ASVAB subtests */
MEAN = MEAN[ TESTS, .]; /* Extract means for specified ASVAB battery */

load SD[ 9, 1 ] = "ARMY\\SD"; /* Same as for the means */
SD = SD[ TESTS, .]; /* Same as for the means */

/* Compute diagonal matrix of reciprocal to SDs */
SD = DIAGRV( zeros( N_tests, N_tests ), 1/SD );

S = DIAGRV( ZEROS( FMLS, FMLS ), 1/SQRT( DIAG(V[..,tests]*INV(RV)*V[..,tests]') ));

/* Estimate composite weights for all families */
l = 1;
do while l <= FMLS; /* Start of loop */

    V_l = V[ L, tests ]; /* Extract SQT validities for given set of ASVAB subtests */
    W_CT = inv( RV ) * V_l'; /* Estimate Beta weights for given set of ASVAB subtests */

    PV_CTP = sqrt( V_L * W_CT ) ;
    MV = PV_CTP; /* Compute multiple R */

/* Find composite without negative weights */
if negative == 0;
    ko = 1;
    do while ko <= N_tests;
        if W_CT[ ko ] < 0;
            RV_0 = zeros( 9, 9 );
            RV_0[ TESTS, TESTS ] = RV;
            { W_CT, MV } = select_8( RV_0, V[ L, . ] );
        end if;
        ko = ko + 1;
    end do;
end if;

```

```

        W_CT = W_CT[ TESTS ];
        break;
    endif;
    ko = ko + 1;
endo;
endif;

W[ ., 1 ] = W_CT;          /* Update matrix of weights */

/* Determine order of weights in composite */
format/rd 6,3;
PV_CT = ones( 1, N_tests ) *10;
k = 1;
do while k <= N_tests;
    order = 1;
    kk = 1;
    do while kk <= N_tests;
        if W[ k, 1 ] < W[ kk, 1 ];
            order = order + 1;
        endif;
        kk = kk + 1;
    endo;

    PV_CT[ k ] = order;

    IF W[ K, L ] == 0. ;
        PV_CT[ K ] = 10;
    ENDIF;
    k = k + 1;
endo;

/* End of Step 3 */

/* Start of Steps 4 & 5 */

/* Transform Beta weights to Us and Ks for computing AA composites scores, with mean 0
and SD 1, for invisible tier */
U[ ., L ] = SD * W[ ., L ];
KU[ L ] = MEAN' * U[ ., L ];

output file = "OUT.CRT" on;

SCREEN ON;

FORMAT/RDN 5,0;
print l ;
FORMAT/RDN 8,5;
PRINT " " MV;
PRINT " " $NMB[ PV_CT ];
print " " W[ ., 1 ]';
l = l + 1;
OUTPUT OFF;
endo;

/* Transform Beta weights to Us and Ks for computing AA standard scores, with mean 100
and SD 20, for visible tier */
U = W * S * 2.;
KU = 50 * ONES( 1, N_tests ) * U - 100.;

OUTPUT FILE = "U.OUT" RESET;
PRINT U';
OUTPUT OFF;
OUTPUT FILE = "K.OUT" RESET;

```

```

print KU';
OUTPUT OFF;

closeall;
screen off;

/* Step 3 (con.) */

/* Below are the procedures used to eliminate negative weights from visible tier
composites */

proc ( 2 ) = select_6( RV, V );

local W_CTP, W_CT, PV_CTP, PV_CT, id, flag, n,m,i,j,k,b,c,num, e,test_id;

test_id = { 2 3 4 5 6 7 };
num = 1;

PV_CTP = zeros( 130, 9 );
PV_CT = zeros( 1, 9 );
W_CTP = zeros( 9, 1 );
id = zeros( 1, 6 );

c = 1;
do while c <= 4;
n = c + 1;
do while n <= 5;
m = n + 1;
do while m <= 6;
i = m + 1;
do while i <= 7;
j = i + 1;
do while j <= 8;
k = j + 1;
do while k <= 9;

id[ 1 ] = c;
id[ 2 ] = n;
id[ 3 ] = m;
id[ 4 ] = i;
id[ 5 ] = j;
id[ 6 ] = k;

if det( RV[ id, id ] ) == 0;
k = k + 1;
continue;
endif;

W_CT = inv( RV[ id, id ] ) * V[ 1, id ]';

PV_CTP[ num, 1 ] = sqrt( V[ 1, id ] * W_CT ) ;

PV_CTP[ num, test_id ] = id;

if num == 1;
num = num + 1;
continue;
endif;

if PV_CT[ 1 ] < PV_CTP[ num, 1 ];

```

```

        flag = 1;
        e = 1;
        do while e <= 6;
            if W_CT[ e ] < 0;
                flag = -1;
                break;
            endif;
            e = e + 1;
        endo;
        if flag == 1;
            PV_CT = PV_CTP[ num, . ];
            W_CTP = zeros( 9, 1 );
            W_CTP[ PV_CT[ test_id ] ] = W_CT;
        endif;

    endif;

        num = num + 1;

        k = k + 1;
        endo;
        j = j + 1;
        endo;
        i = i + 1;
        endo;
        m = m + 1;
        endo;
        n = n + 1;
        endo;
        c = c + 1;
        endo;

if W_CTP*W_CTP' == 0;
    { W_CTP, PV_CT[ 1 ] } = select_5( RV, V );
endif;

retp( W_CTP, PV_CT[ 1 ] );

endp;

proc ( 2 ) = select_5( RV, V );

local W_CTP, W_CT, PV_CTP, PV_CT, id, flag, n,m,i,j,k,b,c,num, e,test_id;

test_id = { 2 3 4 5 6 };
num = 1;

PV_CTP = zeros( 130, 9 );
PV_CT = zeros( 1, 9 );
W_CTP = zeros( 9, 1 );
id = zeros( 1, 5 );

n = 1;
do while n <= 5;
    m = n + 1;
    do while m <= 6;
        i = m + 1;
        do while i <= 7;
            j = i + 1;
            do while j <= 8;
                k = j + 1;
                do while k <= 9;

```

```

id[ 1 ] = n;
id[ 2 ] = m;
id[ 3 ] = i;
id[ 4 ] = j;
id[ 5 ] = k;

if det( RV[ id, id ] ) == 0;
    k = k + 1;
    continue;
endif;

W_CT = inv( RV[ id, id ] ) * V[ 1, id ]';

PV_CTP[ num, 1 ] = sqrt( V[ 1, id ] * W_CT ) ;

PV_CTP[ num, test_id ] = id;

if num == 1;
    num = num + 1;
    continue;
endif;

if PV_CT[ 1 ] < PV_CTP[ num, 1 ];

    flag = 1;
    e = 1;
    do while e <= 5;
        if W_CT[ e ] < 0;
            flag = -1;
            break;
        endif;
        e = e + 1;
    endo;
    if flag == 1;
        PV_CT = PV_CTP[ num, . ];
        W_CTP = zeros( 9, 1 );
        W_CTP[ PV_CT[ test_id ] ] = W_CT;
    endif;

endif;

    num = num + 1;

    k = k + 1;
    endo;
    j = j + 1;
    endo;
    i = i + 1;
    endo;
    m = m + 1;
    endo;
    n = n + 1;
    endo;

if W_CTP*W_CTP' == 0;
    { W_CTP, PV_CT[ 1 ] } = select_4( RV, V );
endif;

retp( W_CTP, PV_CT[ 1 ] );

endp;

```

```

proc ( 2 ) = select_4( RV, V );

local W_CTP, W_CT, PV_CTP, PV_CT, id, flag, n,m,i,j,k,b,c,num, e,test_id;

test_id = { 2 3 4 5 };
num = 1;

PV_CTP = zeros( 130, 9 );
PV_CT = zeros( 1, 9 );
W_CTP = zeros( 9, 1 );
id = zeros( 1, 4 );

m = 1;
do while m <= 6;
  i = m + 1;
  do while i <= 7;
    j = i + 1;
    do while j <= 8;
      k = j + 1;
      do while k <= 9;

        id[ 1 ] = m;
        id[ 2 ] = i;
        id[ 3 ] = j;
        id[ 4 ] = k;

        if det( RV[ id, id ] ) == 0;
          k = k + 1;
          continue;
        endif;

        W_CT = inv( RV[ id, id ] ) * V[ 1, id ]';

        PV_CTP[ num, 1 ] = sqrt( V[ 1, id ] * W_CT ) ;

        PV_CTP[ num, test_id ] = id;

        if num == 1;
          num = num + 1;
          continue;
        endif;

        if PV_CT[ 1 ] < PV_CTP[ num, 1 ];

          flag = 1;
          e = 1;
          do while e <= 4;
            if W_CT[ e ] < 0;
              flag = -1;
              break;
            endif;
            e = e + 1;
          endo;
          if flag == 1;
            PV_CT = PV_CTP[ num, . ];
            W_CTP = zeros( 9, 1 );
            W_CTP[ PV_CT[ test_id ] ] = W_CT;
          endif;

        endif;

        num = num + 1;
      enddo;
    enddo;
  enddo;
enddo;

```

```

        k = k + 1;
        endo;
        j = j + 1;
        endo;
        i = i + 1;
        endo;
        m = m + 1;
        endo;

if W_CTP*W_CTP' == 0;
    { W_CTP, PV_CT[ 1 ] } = select_3( RV, V );
endif;

retp( W_CTP, PV_CT[ 1 ] );

endp;

proc ( 2 ) = select_3( RV, V );

local W_CTP, W_CT, PV_CTP, PV_CT, id, flag, n,m,i,j,k,b,c,num, e,test_id;

test_id = { 2 3 4 };
num = 1;

PV_CTP = zeros( 130, 9 );
PV_CT = zeros( 1, 9 );
W_CTP = zeros( 9, 1 );
id = zeros( 1, 3 );

i = 1;
do while i <= 7;
    j = i + 1;
    do while j <= 8;
        k = j + 1;
        do while k <= 9;

            id[ 1 ] = i;
            id[ 2 ] = j;
            id[ 3 ] = k;

            if det( RV[ id, id ] ) == 0;
                k = k + 1;
                continue;
            endif;

            W_CT = inv( RV[ id, id ] ) * V[ 1, id ]';

            PV_CTP[ num, 1 ] = sqrt( V[ 1, id ] * W_CT ) ;

            PV_CTP[ num, test_id ] = id;

            if num == 1;
                num = num + 1;
                continue;
            endif;

            if PV_CT[ 1 ] < PV_CTP[ num, 1 ];

                flag = 1;
                e = 1;
                do while e <= 3;
                    if W_CT[ e ] < 0;

```

```

        flag = -1;
        break;
    endif;
    e = e + 1;
enddo;
if flag == 1;
    PV_CT = PV_CTP[ num, . ];
    W_CTP = zeros( 9, 1 );
    W_CTP[ PV_CT[ test_id ] ] = W_CT;
endif;

endif;

    num = num + 1;

    k = k + 1;
    enddo;
    j = j + 1;
    enddo;
    i = i + 1;
enddo;

if W_CTP*W_CTP' == 0;
    { W_CTP, PV_CT[ 1 ] } = select_3( RV, V );
endif;

retp( W_CTP, PV_CT[ 1 ] );

endp;

proc ( 2 ) = select_2( RV, V );

local W_CTP, W_CT, PV_CTP, PV_CT, id, flag, n,m,i,j,k,b,c,num, e,test_id;

test_id = { 2 3 };
num = 1;

PV_CTP = zeros( 130, 9 );
PV_CT = zeros( 1, 9 );
W_CTP = zeros( 9, 1 );
id = zeros( 1, 2 );

    j = 1;
    do while j <= 8;
        k = j + 1;
        do while k <= 9;

            id[ 1 ] = j;
            id[ 2 ] = k;

            if det( RV[ id, id ] ) == 0;
                k = k + 1;
                continue;
            endif;

            W_CT = inv( RV[ id, id ] ) * V[ 1, id ]';

            PV_CTP[ num, 1 ] = sqrt( V[ 1, id ] * W_CT ) ;

            PV_CTP[ num, test_id ] = id;

            if num == 1;

```

```

    num = num + 1;
    continue;
endif;

if PV_CT[ 1 ] < PV_CTP[ num, 1 ];

    flag = 1;
    e = 1;
    do while e <= 2;
        if W_CT[ e ] < 0;
            flag = -1;
            break;
        endif;
        e = e + 1;
    endo;
    if flag == 1;
        PV_CT = PV_CTP[ num, . ];
        W_CTP = zeros( 9, 1 );
        W_CTP[ PV_CT[ test_id ] ] = W_CT;
    endif;

endif;

    num = num + 1;

    k = k + 1;
    endo;
j = j + 1;
endo;

retp( W_CTP, PV_CT[ 1 ] );

endp;

/* End of Step 3 */

```

**APPENDIX C: BASIC DESCRIPTIVES AND ASVAB SUBTEST VARIANCE-
COVARIANCE (VCV) MATRICES FOR ARMY INPUT AND YOUTH POPULATIONS**

Table 1
Basic Descriptives for ASVAB Subtests and SQT for Army Input Population (N = 257,810)

| Variable | M (μ) | SD (σ) | VAR (σ^2) |
|----------|-------------|-----------------|--------------------|
| GS | 52.13830340 | 7.55278124 | 57.04450447 |
| AR | 52.41040689 | 7.07276512 | 50.02400645 |
| NO | 54.06027307 | 6.47601979 | 41.93883230 |
| CS | 52.97999690 | 6.94181519 | 48.18879808 |
| AS | 53.22434351 | 8.83256904 | 78.01427576 |
| MK | 51.56189830 | 7.76769675 | 60.33711285 |
| MC | 53.75594042 | 8.43933343 | 71.22234882 |
| EI | 52.20712540 | 8.30057262 | 68.89950588 |
| VE | 52.87955471 | 5.58611374 | 31.20466676 |
| SQT | 0.00007664 | 1.00017246 | 1.00034494 |

Note. For Youth Population, all ASVAB subtests have mean (μ) of 50 and SD (σ) of 10; SQT mean (μ) and SD (σ) same as Army Input Population.

GS = General Science; AR = Arithmetic Reasoning; NO = Numerical Operations; CS = Coding Speed; AS = Auto & Shop Information; MK = Mathematical Knowledge; EI = Electronics Information; VE = Verbal

Table 2
ASVAB Subtest Variance-Covariance (VCV) Matrix for Army Input Population (N = 257,810)

| | GS | AR | NO | CS | AS | MK | MC | EI | VE |
|----|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| GS | 57.04450447 | 24.03543527 | -1.99574141 | 0.55323992 | 30.08100496 | 27.48286504 | 35.46816127 | 37.89577453 | 29.83954632 |
| AR | 24.03543527 | 50.02400645 | 10.10300140 | 8.85037942 | 19.06172355 | 36.48989068 | 30.82144616 | 23.35250004 | 17.25495601 |
| NO | -1.99574141 | 10.10300140 | 41.93883230 | 24.00625978 | -9.45136157 | 14.31275736 | -2.16063659 | -5.03994244 | -0.53673611 |
| CS | 0.55323992 | 8.85037942 | 24.00625978 | 48.18879808 | -6.03941701 | 11.36504819 | 1.51034830 | -1.39594372 | 3.59526961 |
| AS | 30.08100496 | 19.06172355 | -9.45136157 | -6.03941701 | 78.01427576 | 9.97406579 | 44.36535155 | 44.80651289 | 17.90743269 |
| MK | 27.48286504 | 36.48989068 | 14.31275736 | 11.36504819 | 9.97406579 | 60.33711285 | 28.51679811 | 22.49318756 | 18.22467046 |
| MC | 35.46816127 | 30.82144616 | -2.16063659 | 1.51034830 | 44.36535155 | 28.51679811 | 71.22234882 | 41.75330783 | 22.60526383 |
| EI | 37.89577453 | 23.35250004 | -5.03994244 | -1.39594372 | 44.80651289 | 22.49318756 | 41.75330783 | 68.89950588 | 23.56569266 |
| VE | 29.83954632 | 17.25495601 | -0.53673611 | 3.59526961 | 17.90743269 | 18.22467046 | 22.60526383 | 23.56569266 | 31.20466676 |

Table 3
ASVAB Subtest Variance-Covariance (VCV) Matrix for 1980 Youth Population

| Variable | GS | AR | NO | CS | AS | MK | MC | EI | VE |
|----------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| GS | 100.00 | 72.00 | 52.00 | 45.00 | 64.00 | 69.00 | 70.00 | 76.00 | 80.00 |
| AR | 72.00 | 100.00 | 63.00 | 51.00 | 53.00 | 83.00 | 69.00 | 66.00 | 73.00 |
| NO | 52.00 | 63.00 | 100.00 | 70.00 | 30.00 | 62.00 | 40.00 | 41.00 | 62.00 |
| CS | 45.00 | 51.00 | 70.00 | 100.00 | 22.00 | 52.00 | 34.00 | 34.00 | 57.00 |
| AS | 64.00 | 53.00 | 30.00 | 22.00 | 100.00 | 41.00 | 74.00 | 75.00 | 52.00 |
| MK | 69.00 | 83.00 | 62.00 | 52.00 | 41.00 | 100.00 | 60.00 | 59.00 | 70.00 |
| MC | 70.00 | 69.00 | 40.00 | 34.00 | 74.00 | 60.00 | 100.00 | 74.00 | 60.00 |
| EI | 76.00 | 66.00 | 41.00 | 34.00 | 75.00 | 59.00 | 74.00 | 100.00 | 67.00 |
| VE | 80.00 | 73.00 | 62.00 | 57.00 | 52.00 | 70.00 | 60.00 | 67.00 | 100.00 |

APPENDIX D: CRITERION RELIABILITIES BY MOS

Criterion Reliabilities (r_{yy}) by MOS

| MOS | r_{yy} | MOS | r_{yy} | MOS | r_{yy} | MOS | r_{yy} |
|-----|----------|-----|----------|-----|----------|-----|----------|
| 11B | 0.860 | 31V | 0.800 | 63S | 0.840 | 88H | 0.750 |
| 11C | 0.880 | 35E | 0.830 | 63T | 0.850 | 88M | 0.870 |
| 11H | 0.780 | 35H | 0.830 | 63W | 0.840 | 88N | 0.840 |
| 11M | 0.850 | 35J | 0.830 | 63Y | 0.840 | 91A | 0.810 |
| 12B | 0.850 | 35N | 0.830 | 67N | 0.840 | 91D | 0.805 |
| 12C | 0.820 | 36M | 0.830 | 67R | 0.840 | 91E | 0.805 |
| 12F | 0.850 | 41C | 0.830 | 67T | 0.840 | 91F | 0.805 |
| 13B | 0.830 | 44B | 0.860 | 67U | 0.840 | 91G | 0.805 |
| 13C | 0.845 | 44E | 0.850 | 67V | 0.910 | 91K | 0.805 |
| 13E | 0.845 | 45B | 0.830 | 67Y | 0.840 | 91M | 0.805 |
| 13F | 0.860 | 45D | 0.830 | 68B | 0.850 | 91P | 0.805 |
| 13M | 0.900 | 45E | 0.840 | 68D | 0.840 | 91Q | 0.805 |
| 13N | 0.770 | 45K | 0.850 | 68F | 0.840 | 91R | 0.805 |
| 13R | 0.850 | 45L | 0.830 | 68G | 0.830 | 91S | 0.805 |
| 14D | 0.770 | 45N | 0.840 | 68J | 0.880 | 91T | 0.805 |
| 15E | 0.805 | 45T | 0.830 | 68M | 0.830 | 91Z | 0.805 |
| 16E | 0.805 | 46Z | 0.850 | 68N | 0.800 | 92A | 0.810 |
| 16J | 0.805 | 51B | 0.850 | 68Z | 0.830 | 92G | 0.820 |
| 16P | 0.770 | 51K | 0.830 | 71D | 0.870 | 92M | 0.830 |
| 16R | 0.770 | 51M | 0.830 | 71G | 0.840 | 92R | 0.830 |
| 16S | 0.770 | 51R | 0.830 | 71L | 0.850 | 92Y | 0.890 |
| 19D | 0.850 | 51T | 0.805 | 71M | 0.870 | 93C | 0.805 |
| 19E | 0.870 | 52C | 0.830 | 72E | 0.860 | 93F | 0.830 |
| 19K | 0.870 | 52D | 0.850 | 72G | 0.850 | 93P | 0.805 |
| 24Z | 0.830 | 54B | 0.790 | 73C | 0.800 | 95B | 0.800 |
| 25M | 0.720 | 55B | 0.880 | 73D | 0.840 | 95C | 0.805 |
| 25S | 0.820 | 55D | 0.830 | 74B | 0.770 | 96B | 0.805 |
| 25Z | 0.805 | 55G | 0.830 | 75B | 0.800 | 96D | 0.805 |
| 27E | 0.830 | 57E | 0.830 | 75C | 0.840 | 96R | 0.805 |
| 27Z | 0.830 | 62B | 0.900 | 75D | 0.780 | 97B | 0.830 |
| 29V | 0.850 | 62E | 0.790 | 75E | 0.840 | 97E | 0.805 |
| 29Z | 0.830 | 62F | 0.830 | 75F | 0.840 | 98C | 0.805 |
| 31C | 0.850 | 62J | 0.790 | 76J | 0.840 | 98G | 0.805 |
| 31K | 0.790 | 63B | 0.830 | 76P | 0.840 | 98H | 0.805 |
| 31L | 0.880 | 63D | 0.840 | 76V | 0.840 | 98Z | 0.805 |
| 31N | 0.830 | 63E | 0.740 | 76X | 0.840 | | |
| 31P | 0.830 | 63G | 0.850 | 77F | 0.850 | | |
| 31Q | 0.830 | 63H | 0.840 | 77W | 0.830 | | |
| 31R | 0.830 | 63J | 0.840 | 81L | 0.805 | | |
| 31S | 0.830 | 63N | 0.840 | 82C | 0.805 | | |

APPENDIX E: ACQUISITION AND OBSERVED *ns* BY MOS

Acquisition and Observed *ns* by MOS

| MOS | Acquisition <i>n</i> | Observed <i>n</i> | MOS | Acquisition <i>n</i> | Observed <i>n</i> |
|-----|-------------------------|----------------------|-----|-------------------------|----------------------|
| 11B | 13310 | 5000 | 45D | 123 | 565 |
| 11C | 1993 | 5000 | 45E | 225 | 546 |
| 11H | 2118 | 5000 | 45K | 199 | 817 |
| 11M | 338 | 4593 | 45L | 105 | 448 |
| 12B | 3560 | 5000 | 45N | 45 | 563 |
| 12C | 436 | 1950 | 45T | 249 | 509 |
| 12F | 234 | 603 | 46Z | 135 | 498 |
| 13B | 4442 | 5000 | 51B | 297 | 2037 |
| 13C | 141 | 720 | 51K | 61 | 532 |
| 13E | 632 | 1919 | 51M | 28 | 327 |
| 13F | 1274 | 4101 | 51R | 77 | 723 |
| 13M | 657 | 776 | 51T | 26 | 344 |
| 13N | 328 | 2724 | 52C | 322 | 529 |
| 13R | 166 | 592 | 52D | 1233 | 5000 |
| 14D | 30 | 683 | 54B | 1152 | 1380 |
| 15E | 408 | 224 | 55B | 629 | 2457 |
| 16E | 356 | 703 | 55D | 81 | 415 |
| 16J | 118 | 171 | 55G | 110 | 215 |
| 16P | 906 | 1104 | 57E | 122 | 791 |
| 16R | 1157 | 1996 | 62B | 460 | 3054 |
| 16S | 1880 | 2406 | 62E | 504 | 1522 |
| 19D | 5536 | 5000 | 62F | 200 | 527 |
| 19E | 232 | 4764 | 62J | 406 | 887 |
| 19K | 31 | 5000 | 63B | 3250 | 5000 |
| 24Z | 192 | 752 | 63D | 359 | 1234 |
| 25M | 23 | 451 | 63E | 562 | 1376 |
| 25S | 16 | 358 | 63G | 96 | 785 |
| 25Z | 61 | 372 | 63H | 547 | 2396 |
| 27E | 282 | 898 | 63J | 383 | 1302 |
| 27Z | 266 | 548 | 63N | 116 | 750 |
| 29V | 47 | 852 | 63S | 1056 | 2506 |
| 29Z | 222 | 433 | 63T | 868 | 3378 |
| 31C | 1723 | 5000 | 63W | 1105 | 3062 |
| 31K | 1744 | 5000 | 63Y | 364 | 987 |
| 31L | 914 | 2778 | 67N | 374 | 1359 |
| 31N | 267 | 709 | 67R | 286 | 236 |
| 31P | 173 | 563 | 67T | 415 | 1564 |
| 31Q | 423 | 1394 | 67U | 268 | 1632 |
| 31R | 1810 | 5000 | 67V | 178 | 1751 |
| 31S | 160 | 498 | 67Y | 303 | 1168 |
| 31V | 1001 | 4278 | 68B | 65 | 640 |
| 35E | 192 | 1021 | 68D | 84 | 740 |
| 35H | 75 | 307 | 68F | 81 | 712 |
| 35J | 161 | 1034 | 68G | 148 | 904 |
| 35N | 218 | 737 | 68J | 258 | 1128 |
| 36M | 223 | 1201 | 68M | 90 | 388 |
| 41C | 48 | 323 | 68N | 46 | 475 |
| 44B | 305 | 1045 | 68Z | 18 | 749 |
| 44E | 73 | 592 | 71D | 240 | 1431 |
| 45B | 93 | 612 | 71G | 181 | 1145 |

Acquisition and Observed *n*s by MOS (con).

| MOS | Acquisition <i>n</i> | Observed <i>n</i> | MOS | Acquisition <i>n</i> | Observed <i>n</i> |
|------------|---------------------------------|------------------------------|------------|---------------------------------|------------------------------|
| 71L | 1325 | 5000 | 91K | 209 | 1478 |
| 71M | 214 | 972 | 91M | 93 | 513 |
| 72E | 799 | 1651 | 91P | 76 | 695 |
| 72G | 572 | 1738 | 91Q | 83 | 682 |
| 73C | 275 | 2246 | 91R | 113 | 558 |
| 73D | 94 | 500 | 91S | 119 | 514 |
| 74B | 105 | 1184 | 91T | 76 | 345 |
| 75B | 796 | 4113 | 91Z | 169 | 641 |
| 75C | 148 | 2505 | 92A | 2336 | 5000 |
| 75D | 115 | 2714 | 92G | 3002 | 5000 |
| 75E | 211 | 1379 | 92M | 33 | 298 |
| 75F | 163 | 624 | 92R | 296 | 1009 |
| 76J | 71 | 997 | 92Y | 2031 | 5000 |
| 76P | 671 | 2897 | 93C | 278 | 626 |
| 76V | 1267 | 5000 | 93F | 90 | 303 |
| 76X | 228 | 541 | 93P | 220 | 1327 |
| 77F | 1326 | 5000 | 95B | 4187 | 5000 |
| 77W | 71 | 805 | 95C | 87 | 323 |
| 81L | 42 | 331 | 96B | 486 | 818 |
| 82C | 461 | 808 | 96D | 180 | 361 |
| 88H | 409 | 1525 | 96R | 257 | 792 |
| 88M | 4504 | 5000 | 97B | 347 | 429 |
| 88N | 99 | 1954 | 97E | 323 | 372 |
| 91A | 4601 | 5000 | 98C | 840 | 562 |
| 91D | 185 | 748 | 98G | 1309 | 1242 |
| 91E | 223 | 1209 | 98H | 177 | 966 |
| 91F | 57 | 474 | 98Z | 461 | 463 |
| 91G | 73 | 309 | | | |

Note. Acquisition numbers (N) based on 1989 Seabrook Reports. Observed N computed from SQT database (N = 257,810) used by Zeidner, Johnson, and colleagues (2000), also used in current replication.

APPENDIX F: RESULTS OF REPLICATION

Table 1
Population Beta Weights Corrected to the 1980 Youth Population by Army Aptitude (AA) Composite (9 Job Families)

| Composite | GS | AR | AS | MK | MC | EI | VE |
|-----------|------------|------------|------------|------------|------------|------------|------------|
| CL | 0.0000000 | 0.24540772 | 0.02709166 | 0.18816961 | 0.03626410 | 0.02708013 | 0.24054988 |
| CO | 0.05217442 | 0.08871463 | 0.12230491 | 0.16687189 | 0.09932356 | 0.05728945 | 0.08820356 |
| EL | 0.02613946 | 0.14188628 | 0.13071219 | 0.15443311 | 0.08129539 | 0.10375059 | 0.17345885 |
| FA | 0.04164027 | 0.11954300 | 0.11243136 | 0.16709168 | 0.11698648 | 0.04957620 | 0.09799372 |
| GM | 0.07546379 | 0.15184787 | 0.18348277 | 0.14563193 | 0.09232459 | 0.10585534 | 0.07644407 |
| MM | 0.02018868 | 0.11387138 | 0.33563979 | 0.09711230 | 0.13224675 | 0.11424816 | 0.07952995 |
| OF | 0.04323428 | 0.16562006 | 0.17212560 | 0.10327540 | 0.10942997 | 0.06495191 | 0.12295242 |
| SC | 0.00377482 | 0.13354737 | 0.08517063 | 0.19492673 | 0.07528012 | 0.10740604 | 0.17844892 |
| ST | 0.04078145 | 0.15861362 | 0.07796219 | 0.15195751 | 0.09722104 | 0.05016700 | 0.21814622 |

Note. GS = General Science; AR = Arithmetic Reasoning; NO = Numerical Operations; CS = Coding Speed; AS = Auto & Shop Information; MK = Mathematical Knowledge; EI = Electronics Information; VE = Verbal.

CL = Clerical; CO = Combat; EL = Electronics Repair; FA = Field Artillery; GM = General Maintenance; MM = Mechanical Maintenance; OF = Operators/Food; SC = Surveillance and Communications; ST = Skilled Technical.

Table 2
Operational Weights and Constants for Computing Army Aptitude (AA) Standard Scores by AA Composite (9 Job Families)

| Composite | GS | AR | AS | MK | MC | EI | VE | Constant |
|-----------|------------|------------|------------|------------|------------|------------|------------|-------------|
| CL | 0.0000000 | 0.72448885 | 0.07997958 | 0.55551137 | 0.10705830 | 0.07994555 | 0.71014761 | 12.85656224 |
| CO | 0.18428367 | 0.31334625 | 0.43198942 | 0.58940312 | 0.35081772 | 0.20235033 | 0.31154110 | 19.18658098 |
| EL | 0.07647172 | 0.41509224 | 0.38240212 | 0.45179833 | 0.23783193 | 0.30352521 | 0.50745868 | 18.72901174 |
| FA | 0.14018903 | 0.40246179 | 0.37851925 | 0.56254251 | 0.39385484 | 0.16690670 | 0.32991249 | 18.71933070 |
| GM | 0.21608285 | 0.43480084 | 0.52538413 | 0.41700213 | 0.26436202 | 0.30310592 | 0.21888978 | 18.98138275 |
| MM | 0.05343197 | 0.30137537 | 0.88831422 | 0.25702031 | 0.35000817 | 0.30237258 | 0.21048632 | 18.15044685 |
| OF | 0.13160275 | 0.50413824 | 0.52394073 | 0.31436456 | 0.33309875 | 0.19771000 | 0.37426031 | 18.95576672 |
| SC | 0.01142475 | 0.40419005 | 0.25777461 | 0.58995881 | 0.22784032 | 0.32507156 | 0.54008761 | 17.81738514 |
| ST | 0.12016020 | 0.46734586 | 0.22971108 | 0.44773401 | 0.28645619 | 0.14781417 | 0.64275524 | 17.09883705 |

Table 3
Population Beta Weights Corrected to the 1980 Youth Population by Army Aptitude (AA) Composite (17 Job Families)

| Composite | GS | AR | AS | MK | MC | EI | VE |
|-----------|------------|------------|------------|------------|------------|------------|------------|
| CL1 | 0.0000000 | 0.24818270 | 0.00000000 | 0.22718282 | 0.00000000 | 0.00000000 | 0.31784687 |
| CL2 | 0.0000000 | 0.23471688 | 0.06118002 | 0.16707584 | 0.06309115 | 0.04109346 | 0.18704274 |
| CO1 | 0.04622850 | 0.07153084 | 0.11741642 | 0.17833439 | 0.09494484 | 0.04672735 | 0.07103920 |
| CO2 | 0.06270323 | 0.11914310 | 0.13096127 | 0.14657450 | 0.10707724 | 0.07599245 | 0.11859760 |
| EL1 | 0.00921053 | 0.13745876 | 0.16330157 | 0.13198248 | 0.08274267 | 0.11752091 | 0.16277002 |
| EL2 | 0.04468357 | 0.12111499 | 0.12948177 | 0.19040515 | 0.09021013 | 0.10586813 | 0.12851111 |
| EL3 | 0.02906170 | 0.19212752 | 0.05852517 | 0.13633379 | 0.06076890 | 0.06815552 | 0.28471265 |
| FA | 0.04164027 | 0.11954300 | 0.11243136 | 0.16709168 | 0.11698648 | 0.04957620 | 0.09799372 |
| GM1 | 0.06902522 | 0.20618259 | 0.19221595 | 0.12653791 | 0.08838131 | 0.14099515 | 0.08545673 |
| GM2 | 0.08110807 | 0.10421622 | 0.17582696 | 0.16237039 | 0.09578140 | 0.07505059 | 0.06854328 |
| MM1 | 0.02396093 | 0.10285152 | 0.36850881 | 0.08824955 | 0.13230042 | 0.12667491 | 0.05043867 |
| MM2 | 0.00402387 | 0.16109364 | 0.19478959 | 0.13509092 | 0.13201677 | 0.06099710 | 0.20419174 |
| OF | 0.04323428 | 0.16562006 | 0.17212560 | 0.10327540 | 0.10942997 | 0.06495191 | 0.12295242 |
| SC | 0.00377482 | 0.13354737 | 0.08517063 | 0.19492673 | 0.07528012 | 0.10740604 | 0.17844892 |
| ST1 | 0.06230523 | 0.14140888 | 0.07283551 | 0.12003187 | 0.10512087 | 0.05183379 | 0.15959357 |
| ST2 | 0.03363149 | 0.18822437 | 0.04939113 | 0.16886138 | 0.07484071 | 0.03299229 | 0.27959832 |
| ST3 | 0.02568328 | 0.15372511 | 0.10304183 | 0.16988257 | 0.10569916 | 0.06079261 | 0.22941320 |

Note. GS = General Science; AR = Arithmetic Reasoning; NO = Numerical Operations; CS = Coding Speed; AS = Auto & Shop Information; MK = Mathematical Knowledge; EI = Electronics Information; VE = Verbal.
 CL = Clerical; CO = Combat; EL = Electronics Repair; FA = Field Artillery; GM = General Maintenance; MM = Mechanical Maintenance; OF = Operators/Food; SC = Surveillance and Communications; ST = Skilled Technical.

Table 4
Operational Weights and Constants for Computing Army Aptitude (AA) Standard Scores by AA Composite (17 Job Families)

| Composite | GS | AR | AS | MK | MC | EI | VE | Constant |
|-----------|------------|------------|------------|------------|------------|------------|------------|-------------|
| CL1 | 0.0000000 | 0.68564204 | 0.0000000 | 0.62762672 | 0.0000000 | 0.0000000 | 0.87809980 | 9.56842796 |
| CL2 | 0.0000000 | 0.71792549 | 0.18713053 | 0.51103272 | 0.19297609 | 0.12569205 | 0.57210523 | 15.34310529 |
| CO1 | 0.17608191 | 0.27245714 | 0.44723288 | 0.67926619 | 0.36163984 | 0.17798198 | 0.27058454 | 19.26222366 |
| CO2 | 0.19596598 | 0.37235711 | 0.40929235 | 0.45808829 | 0.33464778 | 0.23749870 | 0.37065226 | 18.92512342 |
| EL1 | 0.02727560 | 0.40706335 | 0.48359292 | 0.39084617 | 0.24502992 | 0.34802042 | 0.48201882 | 19.19236006 |
| EL2 | 0.13113305 | 0.35543663 | 0.37999067 | 0.55878274 | 0.26474004 | 0.31069162 | 0.37714207 | 18.89584087 |
| EL3 | 0.08095384 | 0.53518749 | 0.16302682 | 0.37976931 | 0.16927692 | 0.18985298 | 0.79309121 | 15.55792840 |
| FA | 0.14018903 | 0.40246179 | 0.37851925 | 0.56254251 | 0.39385484 | 0.16690670 | 0.32991249 | 18.71933070 |
| GM1 | 0.18000417 | 0.53768357 | 0.50126134 | 0.32998595 | 0.23048106 | 0.36768757 | 0.22285431 | 18.49789842 |
| GM2 | 0.25377717 | 0.32607975 | 0.55014094 | 0.50803699 | 0.29968821 | 0.23482407 | 0.21446348 | 19.35053085 |
| MM1 | 0.06285076 | 0.26978487 | 0.96661776 | 0.23148317 | 0.34703087 | 0.33227488 | 0.13230326 | 17.11727902 |
| MM2 | 0.01076023 | 0.43078076 | 0.52088716 | 0.36124684 | 0.35302625 | 0.16311244 | 0.54602945 | 19.29215697 |
| OF | 0.13160275 | 0.50413824 | 0.52394073 | 0.31436456 | 0.33309875 | 0.19771000 | 0.37426031 | 18.95576672 |
| SC | 0.01142475 | 0.40419005 | 0.25777461 | 0.58995881 | 0.22784032 | 0.32507156 | 0.54008761 | 17.81738514 |
| ST1 | 0.20522752 | 0.46578740 | 0.23991323 | 0.39537357 | 0.34625813 | 0.17073557 | 0.52568604 | 17.44907288 |
| ST2 | 0.09355802 | 0.52361339 | 0.13739911 | 0.46974832 | 0.20819620 | 0.09177985 | 0.77780273 | 15.10488055 |
| ST3 | 0.07134240 | 0.42701389 | 0.28622710 | 0.47189570 | 0.29360858 | 0.16886826 | 0.63725843 | 17.81071762 |

Table 5
Population Beta Weights Corrected to the 1980 Youth Population by Job Family (150 Job Families)

| Job Family | GS | AR | AS | MK | MC | EI | VE |
|------------|-------------|-------------|-------------|------------|------------|-------------|-------------|
| 1 | 0.03111769 | 0.03435428 | 0.09279803 | 0.15323153 | 0.09346832 | 0.04261359 | 0.03001711 |
| 2 | 0.03509516 | 0.13816538 | 0.17451750 | 0.11687375 | 0.07826396 | 0.04935321 | 0.05484866 |
| 3 | 0.06562117 | 0.08076352 | 0.16740956 | 0.17952703 | 0.06085484 | 0.04121511 | 0.05182405 |
| 4 | 0.06517126 | 0.08582561 | 0.11033235 | 0.09512695 | 0.08154666 | 0.05033486 | 0.01915725 |
| 5 | 0.07793688 | 0.08072966 | 0.10732869 | 0.15714220 | 0.11792696 | 0.04501370 | 0.03599025 |
| 6 | 0.07585060 | 0.08605320 | 0.16565327 | 0.16044883 | 0.16821978 | 0.01035791 | -0.00029500 |
| 7 | -0.10155637 | 0.12415979 | 0.35841317 | 0.11760807 | 0.06530678 | 0.00767781 | 0.10902906 |
| 8 | 0.03627317 | 0.06245528 | 0.11585828 | 0.12926024 | 0.14106542 | 0.03602600 | 0.04324248 |
| 9 | 0.01952954 | 0.00399668 | 0.23902674 | 0.23394009 | 0.13934448 | 0.07640383 | 0.05902420 |
| 10 | -0.01830002 | 0.25762690 | 0.03452605 | 0.21733096 | 0.04459127 | 0.07695441 | 0.12975943 |
| 11 | 0.05884086 | 0.15373170 | 0.11869195 | 0.16176565 | 0.02182462 | 0.06568485 | 0.10502301 |
| 12 | 0.01235211 | 0.17230726 | 0.08141107 | 0.16674939 | 0.03740025 | 0.02039266 | 0.11094840 |
| 13 | -0.00444608 | 0.09584553 | 0.13453566 | 0.19819329 | 0.07434809 | 0.02704855 | 0.11198899 |
| 14 | 0.02489058 | 0.17134612 | 0.19475457 | 0.05950136 | 0.05832087 | 0.03056358 | 0.08973216 |
| 15 | 0.08236732 | 0.28747993 | 0.31235025 | 0.00260243 | 0.06295911 | -0.07301595 | 0.07178906 |
| 16 | 0.11644208 | 0.16524757 | 0.14156014 | 0.13030822 | 0.08622777 | 0.02053839 | 0.02479054 |
| 17 | 0.05364506 | 0.08893608 | 0.23342429 | 0.11728463 | 0.16978328 | 0.05670414 | 0.05273233 |
| 18 | 0.03290769 | 0.17985448 | 0.17998166 | 0.11374621 | 0.13214147 | 0.10757679 | -0.04782463 |
| 19 | 0.02227232 | 0.14338656 | 0.09610806 | 0.12864031 | 0.11160929 | 0.00396851 | 0.12332469 |
| 20 | 0.03522712 | 0.10894093 | 0.13919300 | 0.10783345 | 0.08677233 | 0.10112202 | 0.09541941 |
| 21 | 0.08045541 | 0.09044489 | 0.13713938 | 0.10415727 | 0.12048517 | 0.06659417 | 0.07868485 |
| 22 | 0.05053649 | 0.16402259 | 0.15771897 | 0.07327221 | 0.14815848 | 0.08242572 | 0.05743542 |
| 23 | -0.01824534 | 0.17006370 | 0.12108318 | 0.01624618 | 0.09355890 | 0.13643637 | 0.08732430 |
| 24 | 0.06832238 | -0.03033857 | 0.11820303 | 0.28763964 | 0.08263473 | 0.14373142 | 0.16264071 |
| 25 | -0.04028171 | 0.20415884 | -0.01971285 | 0.02108390 | 0.14273017 | 0.07010898 | 0.12118712 |

**Table 5 (con.)
Population Beta Weights Corrected to the 1980 Youth Population by Job Family (150 Job Families)**

| Job Family | GS | AR | AS | MK | MC | EI | VE |
|------------|-------------|-------------|------------|-------------|-------------|-------------|-------------|
| 26 | -0.00428549 | 0.15053451 | 0.10240003 | 0.04842276 | 0.13387820 | -0.03152672 | 0.33145108 |
| 27 | 0.00351500 | 0.11874638 | 0.12800582 | 0.15308912 | 0.06437358 | 0.13366745 | 0.13724671 |
| 28 | 0.04905625 | 0.08129018 | 0.12446002 | 0.16523990 | 0.10567225 | 0.10662323 | 0.08208079 |
| 29 | -0.02179040 | 0.08709843 | 0.21725048 | 0.10034018 | 0.10056366 | 0.08631938 | 0.09188720 |
| 30 | 0.04764481 | 0.19298383 | 0.07620734 | 0.22529102 | 0.06857431 | 0.14097801 | 0.06647658 |
| 31 | -0.08117887 | 0.04791469 | 0.09425671 | 0.17696357 | 0.00586074 | 0.17675666 | 0.08376536 |
| 32 | -0.04579640 | 0.10458069 | 0.13810341 | 0.16073576 | 0.12390547 | 0.16662791 | 0.04861894 |
| 33 | 0.03808216 | 0.14121766 | 0.13740345 | 0.111315370 | 0.08457348 | 0.12490026 | 0.10351769 |
| 34 | 0.08983760 | 0.21226443 | 0.07334474 | 0.20281622 | 0.01424586 | 0.07760841 | 0.18558215 |
| 35 | -0.02508425 | 0.10202314 | 0.18140048 | 0.15415955 | 0.04896182 | 0.11977371 | 0.10765588 |
| 36 | 0.07022445 | 0.27837383 | 0.13745171 | 0.14487934 | 0.03998958 | 0.04425498 | 0.08112254 |
| 37 | 0.17469826 | 0.17088238 | 0.00203749 | 0.24574195 | -0.05102426 | 0.08441096 | 0.10055704 |
| 38 | 0.07541942 | 0.12825076 | 0.05434803 | 0.20073820 | 0.00834373 | 0.14582594 | 0.22419542 |
| 39 | -0.06310684 | 0.12907385 | 0.07226402 | 0.09894185 | 0.05594719 | 0.07621099 | 0.31049796 |
| 40 | 0.11818890 | 0.02006854 | 0.19217347 | 0.13496767 | 0.09291847 | 0.08948610 | 0.00126487 |
| 41 | 0.00682141 | 0.08277558 | 0.23158458 | 0.10130475 | 0.06708378 | 0.08319718 | 0.12647766 |
| 42 | 0.10937571 | 0.04462835 | 0.32713939 | 0.15167063 | 0.05783243 | 0.04508162 | 0.15701011 |
| 43 | 0.14432150 | 0.11472917 | 0.13278037 | 0.26430588 | 0.17341361 | 0.18161288 | -0.00069111 |
| 44 | -0.03399181 | 0.04469847 | 0.35522119 | 0.12950091 | 0.14694741 | -0.00226911 | 0.19435850 |
| 45 | 0.12789655 | 0.14227855 | 0.16592622 | 0.07129149 | 0.09936639 | 0.09233109 | -0.01793907 |
| 46 | 0.11044896 | 0.04955823 | 0.15563129 | 0.12729529 | 0.07125559 | 0.11459625 | -0.03537109 |
| 47 | -0.07675883 | 0.24846538 | 0.20433623 | 0.12030390 | 0.05241289 | 0.07188497 | 0.13742514 |
| 48 | 0.11541247 | 0.02791267 | 0.12611919 | 0.18317032 | 0.25512255 | -0.02989174 | 0.02366675 |
| 49 | -0.07355743 | -0.00161602 | 0.25350199 | 0.23095668 | 0.06003877 | 0.19066382 | 0.15967828 |
| 50 | 0.13789501 | 0.32096313 | 0.20139275 | -0.12160091 | -0.03490658 | 0.02867959 | 0.12904118 |

Table 5 (con.)
Population Beta Weights Corrected to the 1980 Youth Population by Job Family (150 Job Families)

| Job Family | GS | AR | AS | MK | MC | EI | VE |
|------------|-------------|-------------|-------------|------------|-------------|-------------|-------------|
| 51 | 0.16301288 | 0.05413537 | -0.01047259 | 0.24661714 | 0.01093869 | 0.06228117 | 0.20839397 |
| 52 | 0.02381012 | 0.06839195 | 0.22512281 | 0.16366895 | 0.13384287 | 0.06583369 | 0.01762646 |
| 53 | 0.18250316 | 0.04145494 | 0.16112930 | 0.12468166 | 0.14856458 | 0.16250630 | -0.06743747 |
| 54 | -0.12993039 | 0.06345633 | 0.17455468 | 0.06377760 | 0.02284386 | 0.18820280 | 0.07377658 |
| 55 | -0.08230230 | 0.07703912 | 0.21476370 | 0.27309529 | 0.06009781 | 0.17813531 | 0.03817491 |
| 56 | -0.04675233 | -0.07417477 | 0.30389953 | 0.32593461 | -0.13273471 | 0.18559438 | 0.11517558 |
| 57 | 0.03354242 | 0.18243543 | 0.07769500 | 0.05272184 | 0.04968316 | 0.28425466 | 0.08173884 |
| 58 | 0.05267480 | 0.20923673 | 0.22191273 | 0.16689961 | 0.11527464 | 0.20153538 | -0.00278166 |
| 59 | 0.01969848 | 0.18533925 | 0.23357439 | 0.16514711 | 0.15125790 | 0.11988275 | 0.07032519 |
| 60 | 0.09589512 | 0.15713603 | 0.10621569 | 0.12035911 | -0.00080761 | 0.09239132 | 0.12164888 |
| 61 | 0.16624282 | 0.12734131 | 0.22003596 | 0.02255149 | 0.09034713 | -0.06183251 | 0.23250646 |
| 62 | 0.05193193 | -0.02820960 | 0.14260647 | 0.06701512 | 0.12607880 | 0.06904891 | -0.05976290 |
| 63 | 0.03936785 | 0.10164020 | 0.34469185 | 0.13535301 | 0.12838187 | 0.13343646 | 0.02867507 |
| 64 | 0.10618228 | 0.12941283 | 0.24102230 | 0.10540467 | 0.13018027 | 0.06455584 | 0.00284440 |
| 65 | 0.13948274 | 0.06726175 | 0.13699560 | 0.12283464 | 0.20969730 | 0.18154498 | -0.03028861 |
| 66 | 0.08407852 | 0.03947646 | 0.22533899 | 0.14259657 | 0.15494884 | 0.08237876 | 0.01607191 |
| 67 | 0.05349430 | 0.08359323 | 0.41301978 | 0.07467987 | 0.14981236 | 0.14306031 | -0.02628570 |
| 68 | -0.02992972 | 0.06777349 | 0.45247350 | 0.04762289 | 0.14615664 | 0.08698662 | 0.13185113 |
| 69 | 0.00261230 | 0.01914998 | 0.42984796 | 0.14654519 | 0.08445098 | 0.20028910 | 0.04495475 |
| 70 | 0.03608934 | 0.14939608 | 0.33333694 | 0.01222535 | 0.03585467 | 0.15468260 | 0.02190988 |
| 71 | -0.02284599 | 0.12577101 | 0.15964859 | 0.09900467 | 0.09604916 | 0.03693651 | 0.14413963 |
| 72 | -0.04526733 | 0.12345092 | 0.29826195 | 0.08021848 | 0.12887924 | 0.03320930 | 0.06222827 |
| 73 | 0.07740875 | 0.06728146 | 0.43088268 | 0.08331645 | 0.17241307 | 0.06837730 | -0.00491789 |
| 74 | -0.02390759 | 0.05845042 | 0.43747277 | 0.08446142 | 0.10433012 | 0.10618470 | 0.10715673 |
| 75 | 0.01585816 | 0.09231978 | 0.39939830 | 0.03696892 | 0.07642276 | 0.12534831 | 0.04825867 |

**Table 5 (con.)
Population Beta Weights Corrected to the 1980 Youth Population by Job Family (150 Job Families)**

| Job Family | GS | AR | AS | MK | MC | EI | VE |
|------------|-------------|-------------|-------------|------------|-------------|-------------|------------|
| 76 | 0.01865144 | 0.11803576 | 0.35042759 | 0.05258422 | 0.18043301 | 0.12176757 | 0.05624735 |
| 77 | -0.01665519 | 0.13388071 | 0.44502014 | 0.06639025 | 0.13864999 | 0.09890750 | 0.07721315 |
| 78 | -0.02062103 | 0.10381896 | 0.31710072 | 0.18395585 | 0.09792844 | 0.03340015 | 0.16933524 |
| 79 | -0.06146090 | 0.21428389 | 0.16734781 | 0.04271956 | 0.29852214 | -0.02583267 | 0.14684490 |
| 80 | -0.01446125 | 0.09904441 | 0.23300168 | 0.17329381 | 0.11374426 | 0.09139959 | 0.13596923 |
| 81 | 0.06171629 | 0.16853199 | 0.20199277 | 0.14375284 | 0.12530147 | 0.09359370 | 0.09313862 |
| 82 | -0.02147333 | 0.10584773 | 0.17274193 | 0.06846481 | 0.16641407 | 0.08753458 | 0.07531378 |
| 83 | -0.00632047 | 0.12375143 | 0.24330083 | 0.06373884 | 0.14963530 | 0.15524842 | 0.08727075 |
| 84 | 0.00959989 | -0.05686915 | 0.05446055 | 0.19102678 | 0.01558799 | -0.12445937 | 0.21932918 |
| 85 | -0.02271141 | 0.08269807 | 0.19725828 | 0.18001139 | 0.05376655 | -0.06661824 | 0.22021316 |
| 86 | 0.07162249 | 0.18705353 | 0.15708632 | 0.15287285 | 0.08473196 | 0.12532953 | 0.06404562 |
| 87 | 0.08844477 | 0.27505107 | 0.05528562 | 0.14069759 | 0.08466360 | 0.11664122 | 0.04496436 |
| 88 | 0.02907033 | 0.11110092 | 0.07324119 | 0.16279522 | -0.00678362 | 0.10147551 | 0.14296831 |
| 89 | 0.10855611 | -0.09995771 | 0.18640872 | 0.09833233 | 0.15318282 | 0.10633984 | 0.07127505 |
| 90 | -0.01514508 | 0.11760924 | 0.03884351 | 0.24908617 | 0.00934985 | 0.09148413 | 0.24245174 |
| 91 | -0.01640634 | 0.33794164 | 0.00918374 | 0.17864423 | 0.07184360 | 0.00321108 | 0.18085575 |
| 92 | -0.07305526 | 0.20702267 | -0.02780253 | 0.27211495 | 0.03426048 | 0.06918522 | 0.27054354 |
| 93 | 0.05597185 | 0.21788330 | -0.05220114 | 0.15553963 | -0.12147840 | 0.09253943 | 0.26297659 |
| 94 | -0.03424887 | 0.23579741 | -0.06413646 | 0.20042735 | 0.00969360 | -0.02604719 | 0.23657535 |
| 95 | 0.01892603 | 0.12997299 | 0.06563881 | 0.15051055 | 0.04032385 | -0.07365771 | 0.32367506 |
| 96 | -0.02410388 | 0.05957958 | 0.08622419 | 0.22254580 | 0.11312165 | 0.08048394 | 0.05681796 |
| 97 | 0.00712964 | 0.14340096 | -0.04838787 | 0.20071681 | 0.04642086 | 0.08936228 | 0.08814151 |
| 98 | -0.03778973 | 0.21383307 | -0.02713654 | 0.22457006 | -0.02109930 | -0.03198122 | 0.17065883 |
| 99 | 0.07654521 | 0.15064437 | -0.06403440 | 0.31410308 | -0.07315489 | 0.03930632 | 0.17097842 |
| 100 | -0.01008346 | 0.18376091 | -0.06267690 | 0.14485034 | -0.00918275 | 0.08999831 | 0.32772734 |

**Table 5 (con.)
Population Beta Weights Corrected to the 1980 Youth Population by Job Family (150 Job Families)**

| Job Family | GS | AR | AS | MK | MC | EI | VE |
|------------|-------------|------------|-------------|------------|-------------|-------------|-------------|
| 101 | -0.05420188 | 0.25305740 | 0.01168652 | 0.26117212 | 0.01658431 | 0.02866416 | 0.16740679 |
| 102 | 0.01397524 | 0.24488172 | -0.01891129 | 0.18594361 | -0.03840143 | 0.03838258 | 0.16921093 |
| 103 | -0.03463734 | 0.23756235 | -0.01032518 | 0.23094364 | -0.00783453 | 0.07388791 | 0.11082562 |
| 104 | -0.07236003 | 0.29559780 | -0.01504101 | 0.22034884 | -0.06873029 | 0.09027233 | 0.24008972 |
| 105 | 0.01623813 | 0.25874734 | 0.08698924 | 0.18104548 | -0.06308047 | -0.13654996 | 0.18497771 |
| 106 | -0.03929610 | 0.20966419 | 0.02319720 | 0.26882758 | -0.05771797 | -0.01399170 | 0.20185827 |
| 107 | -0.03002394 | 0.23250621 | -0.07829859 | 0.21769986 | -0.00123038 | 0.09437831 | 0.12393439 |
| 108 | 0.01645063 | 0.15582068 | 0.06950469 | 0.09227628 | 0.10688011 | 0.08633042 | 0.09896169 |
| 109 | -0.06452057 | 0.28608960 | -0.00473084 | 0.06716386 | 0.11488031 | 0.07586420 | 0.24865633 |
| 110 | 0.05625695 | 0.15218638 | 0.19263402 | 0.13778618 | 0.10100705 | 0.08392213 | 0.04451323 |
| 111 | -0.03993878 | 0.10999622 | 0.09103364 | 0.14168241 | 0.17995237 | 0.06061666 | 0.04313277 |
| 112 | 0.00238480 | 0.17117645 | 0.15946512 | 0.09561696 | -0.02300704 | -0.00016881 | -0.04019385 |
| 113 | 0.09540249 | 0.15032447 | 0.15583649 | 0.29382200 | 0.06600599 | 0.07533334 | 0.02443133 |
| 114 | -0.00488206 | 0.04389048 | 0.19052047 | 0.21746846 | -0.01406684 | 0.04482972 | 0.06289541 |
| 115 | 0.02035332 | 0.11907677 | 0.22742931 | 0.04512267 | 0.10639384 | 0.07528955 | 0.06203723 |
| 116 | -0.03823583 | 0.12800345 | -0.00788614 | 0.12289262 | -0.05030845 | 0.00727556 | 0.16069409 |
| 117 | 0.04393235 | 0.10289271 | 0.10909682 | 0.09528821 | 0.11187637 | 0.04802996 | 0.09156027 |
| 118 | 0.25059749 | 0.16563994 | -0.03935491 | 0.16765631 | 0.03230471 | 0.03463260 | 0.06434538 |
| 119 | 0.02528986 | 0.19856173 | -0.11214160 | 0.04879112 | 0.02888959 | 0.05468164 | 0.15850771 |
| 120 | -0.14601739 | 0.09622084 | 0.10102201 | 0.15075030 | -0.01293545 | -0.01901909 | 0.07236690 |
| 121 | 0.21007926 | 0.21146016 | 0.01289526 | 0.05857171 | 0.17207014 | 0.05028908 | 0.10644065 |
| 122 | -0.06567883 | 0.09185295 | -0.08023539 | 0.22429669 | -0.01913186 | 0.12937982 | 0.02082642 |
| 123 | 0.01805885 | 0.14948036 | 0.00177770 | 0.08424878 | -0.05954322 | 0.13485435 | 0.28072313 |
| 124 | 0.08822603 | 0.21519148 | 0.05706704 | 0.25620518 | 0.00782912 | -0.00976522 | 0.06314679 |
| 125 | 0.17426557 | 0.18789316 | -0.01359333 | 0.12946213 | 0.14640972 | 0.03406472 | 0.06816393 |

**Table 5 (con.)
Population Beta Weights Corrected to the 1980 Youth Population by Job Family (150 Job Families)**

| Job Family | GS | AR | AS | MK | MC | EI | VE |
|------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| 126 | 0.12905332 | 0.27618070 | -0.01969206 | 0.11851126 | 0.09289626 | 0.11585949 | 0.04979553 |
| 127 | 0.04177842 | 0.14136928 | 0.00924912 | 0.09186663 | 0.19449930 | 0.16518070 | 0.00308527 |
| 128 | -0.02818519 | 0.16240525 | 0.05939914 | 0.19200754 | -0.11412779 | 0.03544210 | 0.20796786 |
| 129 | 0.02540171 | 0.14413184 | -0.04158243 | 0.01945031 | 0.12473450 | 0.03436867 | 0.20988337 |
| 130 | -0.03576839 | 0.24472540 | 0.02992377 | 0.19751896 | 0.08068166 | -0.00926058 | 0.12045991 |
| 131 | 0.06251902 | 0.16967625 | 0.17155561 | 0.06063401 | 0.09438320 | 0.07997696 | 0.13420776 |
| 132 | 0.17920602 | 0.29307560 | 0.11380867 | -0.06300697 | 0.05543038 | -0.01590121 | 0.05840615 |
| 133 | -0.00550328 | 0.03390505 | 0.14698945 | 0.23055426 | 0.10878517 | 0.04202669 | -0.04061662 |
| 134 | -0.02386692 | 0.17544545 | 0.02150614 | 0.14790525 | -0.01178449 | 0.04836004 | 0.13083855 |
| 135 | -0.02183500 | 0.05994146 | 0.01570538 | 0.15941880 | -0.00968834 | 0.17541289 | 0.26386964 |
| 136 | -0.02406277 | 0.24787522 | 0.00401485 | 0.17912832 | 0.10435522 | 0.09078772 | 0.29376609 |
| 137 | 0.01130400 | 0.11506933 | 0.0898371 | 0.14289632 | 0.10847643 | 0.04481766 | 0.15490658 |
| 138 | -0.03810761 | 0.19837578 | 0.03487066 | 0.08353336 | 0.10861723 | 0.01386305 | 0.05028711 |
| 139 | -0.02308644 | 0.19168707 | 0.06853030 | 0.26581800 | 0.10845585 | 0.00113551 | 0.31897282 |
| 140 | 0.03832520 | 0.14894144 | 0.21019280 | 0.27894542 | 0.12537841 | -0.03789962 | 0.18563696 |
| 141 | -0.03121307 | 0.11495556 | 0.30735681 | 0.12223235 | 0.08012277 | 0.02672047 | 0.19097213 |
| 142 | 0.13387683 | -0.00318176 | -0.02471205 | 0.18633769 | 0.09251938 | 0.12839269 | 0.26768146 |
| 143 | -0.04866800 | 0.25084402 | 0.05619220 | 0.17200757 | 0.10551510 | 0.05134043 | 0.27315083 |
| 144 | 0.00608455 | 0.17338653 | 0.01794730 | 0.10964830 | 0.05044502 | 0.05943074 | 0.08065850 |
| 145 | -0.04623540 | 0.25389322 | 0.07462585 | 0.18812202 | 0.04005626 | -0.03582186 | 0.12126457 |
| 146 | 0.02061056 | 0.16609431 | 0.16745115 | 0.22098647 | 0.08945763 | -0.04543024 | 0.21093874 |
| 147 | 0.12897188 | 0.19573253 | 0.09383382 | 0.26992264 | 0.01953549 | -0.01704065 | -0.04332394 |
| 148 | 0.01406325 | 0.14478880 | 0.07852945 | 0.14117425 | 0.10229709 | 0.07555128 | 0.13326615 |
| 149 | 0.16737564 | 0.13664634 | 0.08845820 | 0.03012560 | 0.11727415 | 0.02716275 | 0.12617291 |
| 150 | 0.01755699 | 0.02096595 | 0.13061450 | 0.23873151 | 0.11789101 | 0.10409429 | -0.07907066 |

Note. GS = General Science; AR = Arithmetic Reasoning; NO = Numerical Operations; CS = Coding Speed; AS = Auto & Shop Information; MK = Mathematical Knowledge; EI = Electronics Information; VE = Verbal.

Table 6
Operational Weights and Constants for Computing Army Aptitude (AA) Scores by AA Composite (150 Job Families)

| Job Family | GS | AR | AS | MK | MC | EI | VE | Constant |
|------------|-------------|-------------|-------------|------------|------------|-------------|-------------|------------|
| 1 | 0.00412003 | 0.00485726 | 0.01050635 | 0.01972677 | 0.01107532 | 0.00513381 | 0.00537352 | 3.19326075 |
| 2 | 0.00464665 | 0.01953485 | 0.01975841 | 0.01504613 | 0.00927371 | 0.00594576 | 0.00981875 | 4.42167246 |
| 3 | 0.00868835 | 0.01141895 | 0.01895367 | 0.02311200 | 0.00721086 | 0.00496533 | 0.00927730 | 4.38939411 |
| 4 | 0.00862878 | 0.01213466 | 0.01249154 | 0.01224648 | 0.00966269 | 0.00606402 | 0.00342944 | 3.39953728 |
| 5 | 0.01031896 | 0.01141416 | 0.01215147 | 0.02023022 | 0.01397349 | 0.00542296 | 0.00644281 | 4.20106464 |
| 6 | 0.01004274 | 0.01216684 | 0.01875482 | 0.02065591 | 0.01993283 | 0.00124786 | -0.00005281 | 4.35841365 |
| 7 | -0.01344622 | 0.01755463 | 0.04057859 | 0.01514066 | 0.00773838 | 0.00092497 | 0.01951787 | 4.65580276 |
| 8 | 0.00480262 | 0.00883039 | 0.01311717 | 0.01664074 | 0.01671523 | 0.00434018 | 0.00774107 | 3.80386155 |
| 9 | 0.00258574 | 0.00056508 | 0.02706197 | 0.03011705 | 0.01651131 | 0.00920465 | 0.01056624 | 5.08454739 |
| 10 | -0.00242295 | 0.03642520 | 0.00390895 | 0.02797882 | 0.00528374 | 0.00927098 | 0.02322893 | 5.42980204 |
| 11 | 0.00779062 | 0.02173573 | 0.01343799 | 0.02082543 | 0.00258606 | 0.00791329 | 0.01880073 | 4.88071551 |
| 12 | 0.00163544 | 0.02436208 | 0.00921715 | 0.02146703 | 0.00443166 | 0.00245678 | 0.01986147 | 4.37630758 |
| 13 | -0.00058867 | 0.01355135 | 0.01523177 | 0.02551507 | 0.00880971 | 0.00325864 | 0.02004775 | 4.50966012 |
| 14 | 0.00329555 | 0.02422619 | 0.02204960 | 0.00766010 | 0.00691060 | 0.00368211 | 0.01606343 | 4.42321861 |
| 15 | 0.01090556 | 0.04064605 | 0.03536347 | 0.00033503 | 0.00746020 | -0.00879650 | 0.01285134 | 5.21970891 |
| 16 | 0.01541711 | 0.02336393 | 0.01602706 | 0.01677566 | 0.01021737 | 0.00247433 | 0.00443789 | 4.65944531 |
| 17 | 0.00710269 | 0.01257444 | 0.02642768 | 0.01509902 | 0.02011809 | 0.00683135 | 0.00943989 | 5.15177355 |
| 18 | 0.00435703 | 0.02542916 | 0.02037705 | 0.01464349 | 0.01565781 | 0.01296016 | -0.00856134 | 4.46511511 |
| 19 | 0.00294889 | 0.02027306 | 0.01088110 | 0.01656093 | 0.01322489 | 0.00047810 | 0.02207701 | 4.55262110 |
| 20 | 0.00466413 | 0.01540288 | 0.01575906 | 0.01388229 | 0.01028189 | 0.01218254 | 0.01708154 | 4.69700588 |
| 21 | 0.01065242 | 0.01278777 | 0.01552656 | 0.01340903 | 0.01427662 | 0.00802284 | 0.01408579 | 4.67455026 |
| 22 | 0.00669111 | 0.02319073 | 0.01785652 | 0.00943294 | 0.01755571 | 0.00993012 | 0.01028182 | 5.00692578 |
| 23 | -0.00241571 | 0.02404487 | 0.01370872 | 0.00209151 | 0.01108605 | 0.01643698 | 0.01563239 | 4.25243222 |
| 24 | 0.00904599 | -0.00428949 | 0.01338263 | 0.03703024 | 0.00979162 | 0.01731584 | 0.02911518 | 5.83842541 |
| 25 | -0.00533336 | 0.02886549 | -0.00223184 | 0.00271430 | 0.01691249 | 0.00844628 | 0.02169435 | 3.75323729 |

**Table 6 (con.)
Operational Weights and Constants for Computing Army Aptitude (AA) Scores by AA Composite (150 Job Families)**

| Job Family | GS | AR | AS | MK | MC | EI | VE | Constant |
|------------|-------------|-------------|------------|-------------|-------------|-------------|--------------|------------|
| 26 | -0.00056741 | 0.02128369 | 0.01159346 | 0.00623386 | 0.01586360 | -0.00379814 | 0.05933482 | 5.81645903 |
| 27 | 0.00046539 | 0.01678924 | 0.01449248 | 0.01970843 | 0.00762780 | 0.01610340 | 0.02456927 | 5.24171656 |
| 28 | 0.00649512 | 0.01149341 | 0.01409103 | 0.02127270 | 0.01252140 | 0.01284529 | 0.01469372 | 4.90857817 |
| 29 | -0.00288508 | 0.01231462 | 0.02459652 | 0.01291762 | 0.01191607 | 0.01039921 | 0.01644922 | 4.52348131 |
| 30 | 0.00630825 | 0.02728549 | 0.00862799 | 0.02900358 | 0.00812556 | 0.01698413 | 0.01190033 | 5.66641735 |
| 31 | -0.01074821 | 0.00677453 | 0.01067149 | 0.02278199 | 0.00069446 | 0.02129451 | 0.01499528 | 3.47932895 |
| 32 | -0.00606351 | 0.01478639 | 0.01563570 | 0.02069285 | 0.01468190 | 0.02007427 | 0.00870354 | 4.65548027 |
| 33 | 0.00504214 | 0.01996640 | 0.01555645 | 0.01456721 | 0.01002135 | 0.01504719 | 0.01853125 | 5.19263244 |
| 34 | 0.01189464 | 0.03001152 | 0.00830390 | 0.02611021 | 0.00168803 | 0.00934977 | 0.03322205 | 6.31697725 |
| 35 | -0.00332119 | 0.01442479 | 0.02053768 | 0.01984624 | 0.00580162 | 0.01442957 | 0.01927205 | 4.78355756 |
| 36 | 0.00929783 | 0.03935856 | 0.01556192 | 0.01865152 | 0.00473848 | 0.00533156 | 0.01452218 | 5.63854435 |
| 37 | 0.02313032 | 0.02416062 | 0.00023068 | 0.03163640 | -0.00604601 | 0.01016929 | 0.01800125 | 5.27355316 |
| 38 | 0.00998565 | 0.01813304 | 0.00615314 | 0.02584269 | 0.00098867 | 0.01756818 | 0.04013442 | 6.22361126 |
| 39 | -0.00833544 | 0.01824942 | 0.00818154 | 0.01273760 | 0.00662934 | 0.00918141 | 0.05558390 | 5.38800608 |
| 40 | 0.01564839 | 0.00283744 | 0.02175737 | 0.01737551 | 0.01101017 | 0.01078071 | 0.00022643 | 4.18519338 |
| 41 | 0.00090317 | 0.01170342 | 0.02621939 | 0.01304180 | 0.00794894 | 0.01002307 | 0.02264144 | 4.87628821 |
| 42 | 0.01448151 | 0.00630989 | 0.03703785 | 0.01952582 | 0.00685272 | 0.00543115 | 0.02810722 | 6.20206527 |
| 43 | 0.01910839 | 0.01622126 | 0.01503304 | 0.03402629 | 0.02054826 | 0.02187956 | -0.00012372 | 6.64134344 |
| 44 | -0.00450057 | 0.00631980 | 0.04021720 | 0.01667173 | 0.01741221 | -0.00027337 | 0.03479315 | 5.85831541 |
| 45 | 0.01693370 | 0.02011640 | 0.01878573 | 0.00917794 | 0.01177420 | 0.01112346 | -0.00321137 | 4.45413460 |
| 46 | 0.01462361 | 0.00700691 | 0.01762016 | 0.01638778 | 0.00844327 | 0.01380582 | -0.000633197 | 3.75229877 |
| 47 | -0.01016299 | 0.03512988 | 0.02313440 | 0.01548772 | 0.00621055 | 0.00866024 | 0.02460121 | 5.42806108 |
| 48 | 0.01528079 | 0.00394650 | 0.01427888 | 0.02358103 | 0.03023018 | -0.00360117 | 0.00423671 | 4.64049958 |
| 49 | -0.00973912 | -0.00022849 | 0.02870082 | 0.02973297 | 0.00711416 | 0.02296996 | 0.02858486 | 5.63409319 |
| 50 | 0.01825751 | 0.04538015 | 0.02280115 | -0.01565469 | -0.00413618 | 0.00345513 | 0.02310035 | 4.91627326 |

**Table 6 (con.)
Operational Weights and Constants for Computing Army Aptitude (AA) Scores by AA Composite (150 Job Families)**

| Job Family | GS | AR | AS | MK | MC | EI | VE | Constant |
|------------|-------------|-------------|-------------|------------|-------------|-------------|-------------|------------|
| 51 | 0.02158316 | 0.00765406 | -0.00118568 | 0.03174907 | 0.00129616 | 0.00750324 | 0.03730571 | 5.53450515 |
| 52 | 0.00315250 | 0.00966976 | 0.02548781 | 0.02107046 | 0.01585941 | 0.00793122 | 0.00315541 | 4.54762715 |
| 53 | 0.02416370 | 0.00586121 | 0.01824263 | 0.01605130 | 0.01760383 | 0.01957772 | -0.01207234 | 4.69565743 |
| 54 | -0.01720299 | 0.00897193 | 0.01976262 | 0.00821062 | 0.00270683 | 0.02267347 | 0.01320714 | 3.07610791 |
| 55 | -0.01089695 | 0.01089236 | 0.02431498 | 0.03515782 | 0.00712116 | 0.02146060 | 0.00683389 | 4.97425135 |
| 56 | -0.00619008 | -0.01048738 | 0.03440670 | 0.04196026 | -0.01572810 | 0.02235923 | 0.02061819 | 4.53454948 |
| 57 | 0.00444107 | 0.02579407 | 0.00879642 | 0.00678732 | 0.00588709 | 0.03424519 | 0.01463251 | 5.27964803 |
| 58 | 0.00697423 | 0.02958344 | 0.02512437 | 0.02148637 | 0.01365921 | 0.02427970 | -0.00049796 | 6.33471560 |
| 59 | 0.00260811 | 0.02620464 | 0.02644467 | 0.02126076 | 0.01792297 | 0.01444271 | 0.01258929 | 6.39631755 |
| 60 | 0.01269666 | 0.02221706 | 0.01202546 | 0.01549483 | -0.00009570 | 0.01113072 | 0.02177701 | 4.99289462 |
| 61 | 0.02201081 | 0.01800446 | 0.02491189 | 0.00290324 | 0.01070548 | -0.00744919 | 0.04162222 | 5.95438965 |
| 62 | 0.00687587 | -0.00398848 | 0.01614553 | 0.00862741 | 0.01493943 | 0.00831857 | -0.01069848 | 2.12527991 |
| 63 | 0.00521237 | 0.01437065 | 0.03902510 | 0.01742512 | 0.01521232 | 0.01607557 | 0.00513328 | 5.92894993 |
| 64 | 0.01405870 | 0.01829735 | 0.02728790 | 0.01356962 | 0.01542542 | 0.00777728 | 0.00050919 | 5.10618711 |
| 65 | 0.01846773 | 0.00950997 | 0.01551028 | 0.01581352 | 0.02484761 | 0.02187138 | -0.00542213 | 5.29302610 |
| 66 | 0.01113213 | 0.00558147 | 0.02551228 | 0.01835764 | 0.01836032 | 0.00992447 | 0.00287712 | 4.83461145 |
| 67 | 0.00708273 | 0.01181903 | 0.04676100 | 0.00961416 | 0.01775168 | 0.01723499 | -0.00470554 | 5.57849032 |
| 68 | -0.00396274 | 0.00958232 | 0.05122785 | 0.00613089 | 0.01731851 | 0.01047959 | 0.02360337 | 6.06450930 |
| 69 | 0.00034587 | 0.00270757 | 0.04866624 | 0.01886598 | 0.01000683 | 0.02412955 | 0.00804759 | 5.94614633 |
| 70 | 0.00477828 | 0.02112273 | 0.03773952 | 0.00157387 | 0.00424852 | 0.01863517 | 0.00392220 | 4.85467175 |
| 71 | -0.00302484 | 0.01778244 | 0.01807499 | 0.01274569 | 0.01138113 | 0.00444987 | 0.02580320 | 4.60207659 |
| 72 | -0.00599346 | 0.01745441 | 0.03376843 | 0.01032719 | 0.01527126 | 0.00400084 | 0.01113981 | 4.55095715 |
| 73 | 0.01024904 | 0.00951275 | 0.04878339 | 0.01072602 | 0.02042970 | 0.00823766 | -0.00088038 | 5.66418101 |
| 74 | -0.00316540 | 0.00826415 | 0.04952950 | 0.01087342 | 0.01236237 | 0.01279245 | 0.01918270 | 5.81169888 |
| 75 | 0.00209965 | 0.01305286 | 0.04521881 | 0.00475932 | 0.00905554 | 0.01510116 | 0.00863904 | 5.17772486 |

**Table 6 (con.)
Operational Weights and Constants for Computing Army Aptitude (AA) Scores by AA Composite (150 Job Families)**

| Job Family | GS | AR | AS | MK | MC | EI | VE | Constant |
|------------|-------------|-------------|-------------|------------|-------------|-------------|------------|------------|
| 76 | 0.00246948 | 0.01668877 | 0.03967448 | 0.00676960 | 0.02138001 | 0.01466978 | 0.01006914 | 5.91174242 |
| 77 | -0.00220517 | 0.01892905 | 0.05038400 | 0.00854697 | 0.01642902 | 0.01191574 | 0.01382234 | 6.23562152 |
| 78 | -0.00273026 | 0.01467869 | 0.03590130 | 0.02368216 | 0.01160381 | 0.004022384 | 0.03031360 | 6.19570245 |
| 79 | -0.00813752 | 0.03029705 | 0.01894667 | 0.00549964 | 0.03537272 | -0.00311216 | 0.02628749 | 5.58468803 |
| 80 | -0.00191469 | 0.01400363 | 0.02637983 | 0.02230955 | 0.01347787 | 0.01101124 | 0.02434058 | 5.77497893 |
| 81 | 0.00817133 | 0.02382830 | 0.02286908 | 0.01850650 | 0.01484732 | 0.01127557 | 0.01667324 | 6.11478286 |
| 82 | -0.00284310 | 0.01496554 | 0.01955738 | 0.00881404 | 0.01971886 | 0.01054561 | 0.01348232 | 4.45501405 |
| 83 | -0.00083684 | 0.01749690 | 0.02754587 | 0.00820563 | 0.01773070 | 0.01870334 | 0.01562280 | 5.51830175 |
| 84 | 0.00127104 | -0.00804058 | 0.00616588 | 0.02459246 | 0.00184706 | -0.01499407 | 0.03926329 | 2.63378699 |
| 85 | -0.00300703 | 0.01169247 | 0.02233306 | 0.02317436 | 0.00637095 | -0.00802574 | 0.03942153 | 4.84767052 |
| 86 | 0.00948293 | 0.02644702 | 0.01778490 | 0.01968059 | 0.01004012 | 0.01509890 | 0.01146515 | 5.77613915 |
| 87 | 0.01171022 | 0.03888876 | 0.00625929 | 0.01811317 | 0.01003202 | 0.01405219 | 0.00804931 | 5.61437226 |
| 88 | 0.00384896 | 0.01570827 | 0.00829217 | 0.02095798 | -0.00080381 | 0.01222512 | 0.02559352 | 4.49433630 |
| 89 | 0.01437300 | -0.01413276 | 0.02110470 | 0.01265914 | 0.01815106 | 0.01281114 | 0.01275933 | 4.10396057 |
| 90 | -0.00200523 | 0.01662847 | 0.00439776 | 0.03206693 | 0.00110789 | 0.01102142 | 0.04340258 | 5.58451636 |
| 91 | -0.00217222 | 0.04778070 | 0.00103976 | 0.02299835 | 0.00851295 | 0.00038685 | 0.03237595 | 5.82197255 |
| 92 | -0.00967263 | 0.02927040 | -0.00314773 | 0.03503161 | 0.00405962 | 0.00833499 | 0.04843144 | 5.88292749 |
| 93 | 0.00741076 | 0.03080596 | -0.00591007 | 0.02002391 | -0.01439431 | 0.01114856 | 0.04707684 | 5.01650480 |
| 94 | -0.00453460 | 0.03333879 | -0.00726136 | 0.02580267 | 0.00114862 | -0.00313800 | 0.04235061 | 4.59222747 |
| 95 | 0.00250584 | 0.01837655 | 0.00743145 | 0.01937647 | 0.00477808 | -0.00887381 | 0.05794280 | 5.34595766 |
| 96 | -0.00319139 | 0.00842380 | 0.00976207 | 0.02865017 | 0.01340410 | 0.00969619 | 0.01017129 | 4.03655129 |
| 97 | 0.00094398 | 0.02027509 | -0.00547835 | 0.02583994 | 0.00550054 | 0.01076580 | 0.01577868 | 3.84472549 |
| 98 | -0.00500342 | 0.03023331 | -0.00307233 | 0.02891077 | -0.00250012 | -0.00385289 | 0.03055055 | 3.93079631 |
| 99 | 0.01013470 | 0.02129922 | -0.00724981 | 0.04043709 | -0.00866833 | 0.00473537 | 0.03060776 | 4.74362512 |
| 100 | -0.00133507 | 0.02598148 | -0.00709611 | 0.01864778 | -0.00108809 | 0.01084242 | 0.05866822 | 5.48583083 |

Table 6 (con.)
Operational Weights and Constants for Computing Army Aptitude (AA) Scores by AA Composite (150 Job Families)

| Job Family | GS | AR | AS | MK | MC | EI | VE | Constant |
|------------|-------------|------------|-------------|------------|-------------|-------------|-------------|------------|
| 101 | -0.00717641 | 0.03577913 | 0.00132312 | 0.03362285 | 0.00196512 | 0.00345328 | 0.02996838 | 5.17575022 |
| 102 | 0.00185034 | 0.03462319 | -0.00214109 | 0.02393806 | -0.00455029 | 0.00462409 | 0.03029135 | 4.63002176 |
| 103 | -0.00458604 | 0.03358833 | -0.00116899 | 0.02973129 | -0.00092833 | 0.00890154 | 0.01983948 | 4.45597625 |
| 104 | -0.00958058 | 0.04179381 | -0.00170290 | 0.02836733 | -0.00814404 | 0.01087543 | 0.04297974 | 5.46568701 |
| 105 | 0.00214995 | 0.03658362 | 0.00984869 | 0.02330749 | -0.00747458 | -0.01645067 | 0.03311385 | 4.24582595 |
| 106 | -0.00520286 | 0.02964388 | 0.00262633 | 0.03460840 | -0.00683916 | -0.00168563 | 0.03613572 | 4.66183218 |
| 107 | -0.00397522 | 0.03287345 | -0.00886476 | 0.02802631 | -0.00014579 | 0.01137010 | 0.02218616 | 4.24787571 |
| 108 | 0.00217809 | 0.02203108 | 0.00786914 | 0.01187949 | 0.01266452 | 0.01040054 | 0.01771566 | 4.46015022 |
| 109 | -0.00854262 | 0.04044947 | -0.00053561 | 0.00864656 | 0.01361249 | 0.00913963 | 0.04451330 | 5.65465000 |
| 110 | 0.00744851 | 0.02151724 | 0.02180951 | 0.01773836 | 0.01196861 | 0.01011040 | 0.00796855 | 5.18409234 |
| 111 | -0.00528796 | 0.01555208 | 0.01030659 | 0.01823995 | 0.02132306 | 0.00730271 | 0.00772143 | 3.96423355 |
| 112 | 0.00031575 | 0.02420220 | 0.01805422 | 0.01230956 | -0.00272617 | -0.00002034 | -0.00719532 | 2.35244354 |
| 113 | 0.01263144 | 0.02125399 | 0.01764339 | 0.03782614 | 0.00782123 | 0.00907568 | 0.00437358 | 5.78748367 |
| 114 | -0.00064639 | 0.00620556 | 0.02157022 | 0.02799652 | -0.00166682 | 0.00540080 | 0.01125924 | 3.67089117 |
| 115 | 0.00269481 | 0.01683596 | 0.02574894 | 0.00580902 | 0.01260690 | 0.00907040 | 0.01110561 | 4.43137212 |
| 116 | -0.00506248 | 0.01809808 | -0.00089285 | 0.01582099 | -0.00596119 | 0.00087651 | 0.02876671 | 2.69929867 |
| 117 | 0.00581671 | 0.01454773 | 0.01235165 | 0.01226724 | 0.01325654 | 0.00578634 | 0.01639069 | 4.23709562 |
| 118 | 0.03317950 | 0.02341940 | -0.00445566 | 0.02158379 | 0.00382787 | 0.00417231 | 0.01151881 | 4.86579973 |
| 119 | 0.00334842 | 0.02807413 | -0.01269637 | 0.00628129 | 0.00342321 | 0.00658770 | 0.02837531 | 3.32249235 |
| 120 | -0.01933293 | 0.01360442 | 0.01143744 | 0.01940734 | -0.00153276 | -0.00229130 | 0.01295478 | 1.79748273 |
| 121 | 0.02781482 | 0.02989781 | 0.00145997 | 0.00754042 | 0.02038907 | 0.00605851 | 0.01905451 | 5.90360260 |
| 122 | -0.00869598 | 0.01298685 | -0.00908404 | 0.02887557 | -0.00226699 | 0.01558686 | 0.00372825 | 2.12166885 |
| 123 | 0.00239102 | 0.02113464 | 0.00020127 | 0.01084604 | -0.00705544 | 0.01624639 | 0.05025374 | 4.92859492 |
| 124 | 0.01168126 | 0.03042537 | 0.00646098 | 0.03298342 | 0.00092769 | -0.00117645 | 0.01130424 | 4.83442940 |
| 125 | 0.02307303 | 0.02656573 | -0.00153900 | 0.01666673 | 0.01734849 | 0.00410390 | 0.01220239 | 5.16485992 |

Table 6 (con.)
Operational Weights and Constants for Computing Army Aptitude (AA) Scores by AA Composite (150 Job Families)

| Job Family | GS | AR | AS | MK | MC | EI | VE | Constant |
|------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|------------|
| 126 | 0.01708686 | 0.03904848 | -0.00222948 | 0.01525694 | 0.01100754 | 0.01395801 | 0.00891416 | 5.39724540 |
| 127 | 0.00553153 | 0.01998784 | 0.00104716 | 0.01182675 | 0.02304676 | 0.01989992 | 0.00055231 | 4.30854310 |
| 128 | -0.00373176 | 0.02296206 | 0.00672501 | 0.02471872 | -0.01352332 | 0.00426984 | 0.03722944 | 4.10599495 |
| 129 | 0.00336323 | 0.02037843 | -0.00470785 | 0.00250400 | 0.01478014 | 0.00414052 | 0.03757234 | 4.11942662 |
| 130 | -0.00473579 | 0.03460109 | 0.00338789 | 0.02542825 | 0.00956019 | -0.00111566 | 0.02156417 | 4.65396429 |
| 131 | 0.00827762 | 0.02399009 | 0.01942307 | 0.00780592 | 0.01118373 | 0.00963511 | 0.02402525 | 5.49983696 |
| 132 | 0.02372716 | 0.04143720 | 0.01288512 | -0.00811141 | 0.00656810 | -0.00191568 | 0.01045560 | 4.48234616 |
| 133 | -0.00072864 | 0.00479375 | 0.01664176 | 0.02968116 | 0.01289026 | 0.00506311 | -0.00727100 | 3.20218662 |
| 134 | -0.00316002 | 0.02480578 | 0.00243487 | 0.01904107 | -0.00139638 | 0.00582611 | 0.02342211 | 3.71436230 |
| 135 | -0.00289099 | 0.00847497 | 0.00177812 | 0.02052330 | -0.00114800 | 0.02113263 | 0.04723671 | 4.98572339 |
| 136 | -0.00318595 | 0.03504644 | 0.00045455 | 0.02306067 | 0.01236534 | 0.01093753 | 0.05258863 | 6.90052405 |
| 137 | 0.00149667 | 0.01626936 | 0.01007450 | 0.01839623 | 0.01285367 | 0.00539935 | 0.02773065 | 4.85470037 |
| 138 | -0.00504551 | 0.02804784 | 0.00394796 | 0.01075394 | 0.01287036 | -0.00167013 | 0.00900216 | 3.22663717 |
| 139 | -0.00305668 | 0.02710214 | 0.00775882 | 0.03422096 | 0.01285123 | 0.00013680 | 0.05710103 | 7.15596826 |
| 140 | 0.00507432 | 0.02105845 | 0.02379747 | 0.03591096 | 0.01485644 | -0.00456590 | 0.03232186 | 6.80402470 |
| 141 | -0.00413266 | 0.01625327 | 0.03479812 | 0.01573598 | 0.0094 | 0.00321911 | 0.03418694 | 5.78606288 |
| 142 | 0.01772550 | -0.00044986 | -0.00279783 | 0.02398880 | 0.01096288 | 0.01546793 | 0.04791909 | 5.91939106 |
| 143 | -0.00644372 | 0.03546619 | 0.00636193 | 0.02214396 | 0.01250278 | 0.00618517 | 0.04889819 | 6.58394973 |
| 144 | 0.00080560 | 0.02451467 | 0.00203195 | 0.01411593 | 0.00597737 | 0.00715984 | 0.01443911 | 3.62146741 |
| 145 | -0.00612164 | 0.03589731 | 0.00844894 | 0.02421851 | 0.00474638 | -0.00431559 | 0.02170822 | 4.43842446 |
| 146 | 0.00272887 | 0.02348365 | 0.01895837 | 0.02844942 | 0.01060008 | -0.00547314 | 0.03776127 | 6.12989849 |
| 147 | 0.01707608 | 0.02767412 | 0.01062362 | 0.03474938 | 0.00231481 | -0.00205295 | -0.00774051 | 4.30584981 |
| 148 | 0.00186200 | 0.02047131 | 0.00892486 | 0.01817453 | 0.01212147 | 0.00910194 | 0.02385668 | 4.97044193 |
| 149 | 0.02216080 | 0.01932007 | 0.01001500 | 0.00387832 | 0.01389614 | 0.00327240 | 0.02258688 | 5.01324135 |
| 150 | 0.00232457 | 0.00296432 | 0.01478783 | 0.03073389 | 0.01396923 | 0.01254062 | -0.01415486 | 3.30546649 |

Note. Operational weights and intercepts are simply unstandardized b-weights and intercepts. Unlike the 9 and 17 composites, no additional transformation is required for operational usage.

GS = General Science; AR = Arithmetic Reasoning; NO = Numerical Operations; CS = Coding Speed; AS = Auto & Shop Information; MK = Mathematical Knowledge; EI = Electronics Information; VE = Verbal.