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ABSTRACT

The reading abilities of enlisted personnel are of interest to the Air Force for a number of reasons. One important reason is that the Air Force must ensure that airmen have the abilities necessary to read and comprehend training material and job aides such as technical orders (TOs). Since reading ability tends to differ among the Air Force Specialties (AFSs), each AFS is a potentially unique group of readers that needs instructional material written at a level commensurate with their abilities. A common measure of reading ability is reading grade level (RGL). This study identifies several RGLs of interest for specific specialties which may be of use to those responsible for writing training and instructional materials. The mean RGL, and RGL at one standard deviation below the mean were determined. Also, RGLs that can accommodate 70%, 80%, and 90% of the individuals within an AFS were determined. (Four tables of data are included; two appendixes of data are attached.) (Author/RS)

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1988 READING GRADE LEVEL (RGL) DATA FOR AIR FORCE SPECIALTIES

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August 1990

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Reading grade level (RGL) is a common measure of reading ability. The Air Force is interested in determining the RGL of its enlisted personnel for several reasons. A table developed by Waters, Barnes, Foley, Steinhaus, and Brown (1988) allows for conversion of Armed Services Vocational Aptitude Battery (ASVAB) Verbal (VE) composite standard scores to RGL on several reading test scales. The current study used the table to determine RGL at several different points of interest for each Air Force Specialty (AFS). For example, mean RGL and one standard deviation below the mean are reported, as are RGLs that can accommodate 70%, 80%, and 90% of the personnel within each AFS.

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SUMMARY

The reading abilities of enlisted personnel are of interest to the Air Force for a number of reasons. One important reason is that the Air Force must ensure that airmen have the abilities necessary to read and comprehend training material and job aides such as technical orders (TOs). Since reading ability tends to differ among the Air Force Specialties (AFSs), each AFS is a potentially unique group of readers that needs instructional material written at a level commensurate with their abilities. A common measure of reading ability is reading grade level (RGL). This study identifies several RGLs of interest for specific specialties which may be of use to those responsible for writing training and instructional materials. The mean RGL, and RGL at one standard deviation below the mean were determined. Also, RGLs that can accommodate 70%, 80%, and 90% of the individuals within an AFS were determined.

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PREFACE

This research and development effort was accomplished as part of Project 7719, Force Acquisition and Distribution System. The reading grade level (RGL) data provided through this study will be of potential use to manpower, personnel, and training decision makers responsible for enlisted selection and classification. Matching the reading abilities of personnel within the various career fields with the reading ability required to comprehend instructional material, may result in higher success rates in training and on the job.

I would like to thank the Information Sciences Division of the Air Force Human Resources Laboratory for their rapid and accurate computer support. Mr. W. Glasscock and Sgt R. Shutt provided outstanding support.

I would also like to thank Dr. W. Alley, Technical Director of the Manpower and Personnel Division, for suggesting this effort and providing guidance throughout.

TABLE OF CONTENTS

LIST OF TABLES

1988 READING GRADE LEVEL (RGL)
DATA FOR AIR FORCE SPECIALTIES

I. INTRODUCTION

Reading grade level (RGL) is a common measure of reading ability. RGL is a scale corresponding to school grades 1 through post-high school. For example, an individual reading at an RGL of 10.2 is reading at a level similar to a student in the second month (October) of the 10th grade. An RGL scale is developed by giving a reading abilities test to students at every grade. The RGL scale points are then determined in reference to the average score within each grade, as reflected by school year and month. It must be pointed out that someone scoring at an RGL of 10 may not necessarily be able to read 10th grade material. More accurately, it means that the individual is able to answer the type of questions on the reading test as well as average 10th graders (Waters, Barnes, Foley, Steinhaus, & Brown, 1988).

Although the Armed Services Vocational Aptitude Battery (ASVAB) is not characterized as a reading ability test, several of its subtests and composites correlate with reading tests ($r \cong .7$). The ASVAB is a 10-subtest battery designed to measure multiple aptitudes. Because the ASVAB correlates with reading tests and is given to all service applicants, past research has focused on conversion of ASVAB scores to RGL on various reading test scales.

The services combine ASVAB subtests into composites which are used for selection and classification into various career fields. Table 1 provides a list of ASVAB subtests and Table 2 provides a list and definition of Air Force composites.

Table 1. **ASVAB Subtests**

Subtest name	Number of items	Testing time (minutes)	Test type
General Science (GS)	25	11	Power
Arithmetic Reasoning (AR)	30	36	Power
Word Knowledge (WK)	35	11	Power
Paragraph Comprehension (PC)	15	13	Power
Numerical Operations (NO)	50	3	Speed
Coding Speed (CS)	84	7	Speed
Auto-Shop Information (AS)	25	11	Power
Mathematics Knowledge (MK)	25	24	Power
Mechanical Comprehension (MC)	25	19	Power
Electronics Information (EI)	20	9	Power

The Air Force uses four composites called selector aptitude indices (AIs) for classification into the various specialties. The AIs are Mechanical, Administrative, General and Electronic; these are also known as MAG&E. All services also use the Armed Forces Qualification Test (AFQT) composite for selection of personnel. The formula for calculating the AFQT changed 1 January 1989 when ASVAB Forms 15 to 17 became operational, thus references are made to old AFQT corresponding to pre-January 1989 and new AFQT corresponding to post-January 1989. The Verbal (VE) composite is made up of the Word Knowlege (WK) and Paragraph Comprehension (PC) subtests, and is closest in content to most reading tests. Reading tests are commonly divided into vocabulary which is similar to ASVAB WK, and comprehension, which is similar to PC. Reading test vocabulary and comprehension scores are usually combined into a total reading score which is similar to ASVAB VE.

Table 2. **Air Force ASVAB Composites**

Composite name	Definition
Verbal (VE)	WK + PC
New Armed Forces Qualification Test (AFQT)	2VE + AR + MK
Old AFQT	WK + AR + PC + NO/2
Mechanical (M)	MC + GS + 2AS
Administrative (A)	NO + CS + VE
General (G)	VE + AR
Electronic (E)	AR + MK + EI + GS

Note. All composites are sums of subtest standard scores except Old AFQT which is the sum of subtest raw scores, and VE which is the standard score of the sum of WK and PC raw scores.

An early RGL study involving the ASVAB developed conversion tables and regression equations to predict RGL from the selector AI of the Air Force Specialty (AFS) (Madden & Tupes, 1966). Correlations between MAG&E and reading ability as measured by the total reading score on the California Reading Test ranged from .54 to .82. On the Davis Reading Test, the level of comprehension score correlated from .51 to .71 with MAG&E. These moderate to high correlations indicate that MAG&E can predict RGL reasonably well.

Another study used the old AFQT and the G composite to predict RGL (Mathews, Valentine, & Sellman, 1978). The AFQT correlated .76 with average RGL as measured on the Gates-MacGinitie and Nelson-Denny reading tests. The G composite correlated .79 with average RGL. Again, these correlations suggest that the ASVAB could be a reasonable predictor of RGL.

More recently, the VE composite of the ASVAB was selected from among several alternative composites, as the most acceptable anchor for an RGL scale (Waters et al., 1988). A table was developed for conversion of VE standard scores to RGL as measured on five different reading abilities tests. The Waters et al. (1988) study began with the testing of service applicants on the ASVAB and one of six reading abilities tests. The reading tests used were the Gates-MacGinitie, the Test of Adult Basic Education (TABE), the Adult Basic Learning Examination (ABLE), the Stanford Test of Academic Skills (TASK), and the Air Force Reading Abilities Test (AFRAT). The Nelson-Denny reading test was initially included but was removed from the study because of dissimilarity with the other tests. A new composite RGL scale, called the Department of Defense (DOD) scale, was also developed. It is based on all five reading abilities tests that were used. Five ASVAB composites were considered as RGL anchors--the old and new AFQT, VE, G, and VRB (VRB = VE + GS, a composite used in the DOD student testing program). The objective was to select the composite which best matched the content, distribution, and psychometric characteristics of the reading tests. Based on several analyses, VE was selected as the best RGL scale anchor, and thus the VE to RGL conversion table was developed.

The Air Force is interested in determining RGL for a number of reasons. First, RGL is considered a measure of recruit quality that must be reported to congress annually. Second, RGL can be used to show force quality trends. For example, Table 3 shows the RGL of Air Force accessions from 1982 through 1987.

Third, the reading abilities of potential readers must meet or exceed the Reading Requirement Level (RRL) of training material to maximize the effectiveness of training. RRL pertains to the RGL needed to read the material. Finally, perhaps the most important reason is that airmen reading abilities must meet or exceed the RRLs of technical orders and other job aides. An inability to read and understand technical orders and other potentially difficult material could lead to the inability of an airman to effectively perform the job.

Table 3. **Reading Ability Trend of Air Force Recruits**

Fiscal year	Mean RGL[a]
1982	9.6
1983	9.8
1984	9.7
1985	10.0
1986	10.6
1987	10.8

Note. "Reading Ability Trends" by D. L. Leighton, 1989.
[a]RGL is on the AFRAT scale.

Mockovac (1974) looked at 56 Air Force job specialties to determine if there was a difference between the RRL of instructional material and the abilities of the readers in those specialties. In 31 of the 56 jobs, RRL exceeded average RGL of the readers by at least one grade level. The impact of such literacy gaps is unknown, but it is possible that they pose significant limitations on job performance.

In the past, to avoid literacy gaps for Technical Orders (TOs), Military Standard 1752 (MIL-STD-1752), "Military Standard Reading Level Requirements for Preparation of Technical Orders," provided AFS-specific RGL guidance to writers. However, the standard became outdated due to the changing abilities of recruits, and restructuring of career fields. The standard was thus made obsolete.

Besides writing material corresponding to reader abilities, there are other solutions to the problem of matching potential readers and appropriate material. The Air Force could attempt to recruit individuals for each AFS such that their reading ability would allow them to read and understand existing instructional information. However, another constraint on the selection and classification systems is probably not desirable. Or, comprehensive remedial reading courses could be offered to recruits to insure necessary reading skills. Finally, some combination of approaches could be used. No matter what solution is chosen, it is frequently necessary to measure the reading ability of Air Force personnel.

The purpose of the study documented in this paper is to provide RGL data for the various Air Force specialties, using current ASVAB data and the Waters et al. (1988) conversion table. The RGL scales of greatest interest to the Air Force are the AFRAT and DOD scales. As a result, RGL was estimated on both.

II. METHOD

Subjects

Airmen at 3- or 5-skill levels were subjects for this study. Skill level, which ranges from one to nine, reflects job training, experience, and expertise. Airmen at 3- or 5-skill levels were chosen because they perform the greatest amount of hands-on work, and are most likely to refer to written job aides. The December 1988 Uniform Airman Record (UAR) computer file provided a sample of all enlisted personnel in the Air Force in December 1988. All records of airmen with 3- or 5-skill levels were selected from the UAR, with the exception of those with a special duty identifier. Approximately 235,000 airmen were initially selected. Approximately 33,000 or 14% of these cases could not be used due to the unavailability of appropriate ASVAB data. The final sample size was 202,393.

Procedure

Subjects' UAR records were matched with records in the Armed Forces Entrance and Examining Station computer files (AFEES files), because the UAR does not include ASVAB scores. Raw subtest scores were obtained from the AFEES file and then ASVAB raw score to standard score conversion tables were applied. Once ASVAB VE standard scores were determined, the subjects were sorted by Primary Air Force Specialty Code (PAFSC).

The mean, median, and modal VE standard scores were calculated for each AFS, and were then entered into the Waters et al. (1988) VE to RGL conversion table. RGL was determined on the AFRAT and DOD scales. Also for each AFS, RGL was determined at one standard deviation below the mean VE standard score.

VE standard scores were then distributed within each AFS, and converted to RGL. Distributing RGL within an AFS and observing the cumulative percentage allowed for the determination of RGLs that can accommodate specified proportions of the population. The 70%, 80%, and 90% RGLs were selected for this study. The 70% RGL for instance, means that 70% of the individuals can theoretically read at or above this level.

III. RESULTS

For all 3- or 5-skill level airmen (undifferentiated by AFS), RGL on the AFRAT scale ranged from less than 4 to greater than 12.9, with an average of 10.7. On the DOD scale, it ranged from less than 2.8 to greater than 12.9, with an average of 11.5.

Also, RGLs differed among the AFSs. Average RGLs among the AFSs ranged from 10.1 to 12.6 on the AFRAT scale. On the DOD scale average RGL ranged from 10.9 to greater than 12.9. The 70%, 80%, and 90% RGLs differed by AFS as well. RGL data for all AFSs with 10 or more subjects are reported in Appendixes A and B for the AFRAT and DOD scales, respectively.

Table 4 provides an example of how cumulative percentage distributions were used for determination of the 70%, 80%, and 90% RGLs. These are marked by asterisks in the table. Consider the 70% RGL which occurs at a VE standard score of 57. The cumulative percentage distribution indicates that 29.25% of the people scored 56 or below, implying 70.75% scored 57 or above. Conversion to RGL suggests that 70.75% are reading at or above 11.7 AFRAT, or 12.4 DOD.

Table 4. **Cumulative Percentage Distribution of RGL for Air Force Specialty 201X1**

VE stan. score	Freq	Percent	Cumulative percent	70% RGL	80% RGL	90% RGL	RGL AFRAT	RGL DOD
50	3	1.31	1.31				9.6	10.3
51	2	.87	2.18				9.8	10.6
52	4	1.75	3.93				10.1	10.9
53	10	4.37	8.30				10.5	11.2
54	12	5.24	13.54			*	10.7	11.5
55	13	5.68	19.21			.	11.0	11.8
56	23	10.04	29.25		*	.	11.3	12.1
57	35	15.28	44.54	*	.	.	11.7	12.4
58	26	11.35	55.89	.	.	.	12.2	12.7
59	32	13.97	69.86	.	.	.	12.4	>12.9
60	31	13.54	83.40	.	.	.	12.6	>12.9
61	21	9.17	92.57	.	.	.	12.9	>12.9
62	17	7.42	100.00	.	.	.	>12.9	>12.9

Note. A (>) symbol designates converted RGL values that exceeded grade 12, ninth month.

IV. DISCUSSION

The results show that there is disparity between RGLs reported on the different scales. To illustrate, a VE standard score of 55 corresponds to an RGL of 11.0 AFRAT or 11.8 DOD according to the Waters et al. (1988) conversion table. The implication is that RGL data derived from different scales aren't comparable. Therefore, when comparing RGL results, great caution must be exercised.

Average RGL among the AFSs differed by as much as 2.5 grade levels. This means that each AFS is a potentially unique group of readers. It seems reasonable to target the RRL of material at the average RGL of the AFS in question, however, this may not always be desirable. To illustrate, assume a normal distribution of RGL. Half of the population may be unable to read information written at the mean RGL. A decision rule has to be applied to identify an RGL to accommodate some reasonable portion of the population.

One decision rule that has been applied is to determine RGL at one standard deviation below the mean RGL. This has been called "Reduced RGL." Again assuming a normal distribution of RGL, about 16% of the population may not be able to read material written at this level. The result of this rule may be more or less conservative than desired.

Mockovak (1974) discussed a decision rule referencing both percent of the population and percent of the material the readers can comprehend. For example, a 75-50 rule means that 50% of the population would be capable of reading and understanding 75% of the reading material encountered. This rule applies well where instructional materials are written at different levels within an AFS. The actual proportions specified by the decision rule are a policy decision.

If the 70%, 80%, or 90% RGLs identified in this study were observed when writing instructional materials, then the respective proportions of the AFSs would be accommodated.

V. RECOMMENDATIONS

The need exists to match the reading ability of airmen within AFSs to the ability needed to read instructional material. It is recommended that either recruit abilities be tailored to the material through literacy training or recruiting, or the material be tailored to recruit abilities. Regardless of the approach, it is necessary to periodically monitor the reading abilities of Air Force enlisted personnel.

If RGL data were to be used exclusively for Air Force purposes, AFRAT-scale data can be used. However, if data were to be compared among services, it would be wise for all services to report data on the DOD scale to ensure standardization, and hence comparability.

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APPENDIX A: READING GRADE LEVEL ON THE AFRAT SCALE

PAFSC	N	Mean RGL	Mean RGL - 1 SD	70% RGL	80% RGL	90% RGL
111X0	190	11.7	10.5	10.7	10.7	10.1
112X0	362	11.3	10.1	10.7	10.5	9.8
113X0	201	10.7	9.3	9.8	9.6	8.9
114X0	584	11.0	9.6	10.5	9.8	9.3
115X0	71	11.3	10.1	10.7	10.5	10.1
116X0	158	11.0	9.6	10.5	9.8	9.3
117X0	127	11.7	10.5	11.0	10.7	10.1
118X0	64	12.2	10.7	11.3	11.0	10.1
118X1	21	11.7	10.5	11.3	10.7	9.6
118X2	42	11.7	10.5	11.0	10.5	9.6
121X0	148	12.2	10.7	11.7	11.0	10.7
122X0	1237	10.5	9.3	9.6	9.3	8.9
201X0	572	11.3	10.1	10.7	10.5	9.6
201X1	229	12.2	11.0	11.7	11.3	10.7
202X0	676	11.7	10.7	11.3	10.7	10.5
205X0	295	12.2	11.0	11.3	11.0	10.7
206X0	389	12.2	10.7	11.3	11.0	10.5
207X1	911	10.5	9.4	9.8	9.4	9.1
207X2	502	10.5	9.4	9.6	9.4	9.1
208X1	100	12.4	11.3	12.2	11.7	10.7
208X2	188	12.2	11.0	11.7	11.3	10.7
208X3	622	12.6	11.7	12.4	12.2	11.3
208X4	310	12.4	11.7	12.4	12.2	11.0
208X5	158	12.6	11.7	12.4	12.2	11.3
209X0	99	11.7	10.7	11.0	10.7	10.1
222X0	25	10.7	9.6	9.8	9.6	9.4
231X0	126	11.0	9.8	10.5	9.8	9.4
231X1	338	11.3	10.1	10.7	10.5	9.6
231X2	326	11.0	9.6	10.1	9.8	9.3
231X3	104	11.7	10.7	11.0	10.7	10.5
233X0	405	11.0	9.8	10.5	10.1	9.4
241X0	48	10.5	9.3	9.8	9.4	8.9
242X0	111	10.5	9.3	9.8	9.4	9.1
251X0	1204	11.7	10.7	11.0	10.7	10.5
271X1	547	10.5	9.4	9.8	9.4	9.1
271X2	921	10.5	9.3	9.6	9.3	8.9
272X0	1908	11.0	9.8	10.5	10.1	9.4
273X0	127	11.3	10.1	10.7	10.1	9.6
274X0	672	11.0	9.6	10.5	9.8	9.3
275X0	345	11.0	9.6	10.5	10.1	9.3
276X0	1229	11.3	9.8	10.7	10.1	9.4
277X0	57	11.3	9.8	10.5	10.1	9.6
302X0	392	11.3	10.1	10.7	10.5	9.6
303X1	528	11.3	10.1	10.7	10.5	9.6
303X2	312	11.3	10.1	11.0	10.5	9.6
303X3	415	11.7	10.5	11.0	10.7	10.1

Appendix A (Continued)

PAFSC	N	Mean RGL	Mean RGL - 1 SD	70% RGL	80% RGL	90% RGL
304X0	963	11.3	10.1	10.7	10.5	9.6
304X1	476	11.7	10.5	10.7	10.5	9.8
304X4	2417	11.3	10.1	10.7	10.5	9.6
304X5	208	11.0	9.8	10.7	9.8	9.4
304X6	499	11.3	10.1	10.7	10.5	9.6
305X4	1209	11.7	10.1	11.0	10.5	9.6
306X0	870	11.3	10.1	10.7	10.5	9.6
306X3	644	11.3	10.1	10.7	10.5	9.6
309X0	181	11.3	10.1	10.7	10.5	9.6
316X3	201	11.7	10.1	11.0	10.7	10.1
324X0	1333	11.7	10.7	11.3	10.7	10.1
341X2	11	11.3	10.7	11.3	10.7	10.7
341X4	127	11.0	9.6	10.1	9.6	9.4
341X6	45	11.3	9.8	10.7	10.5	9.4
361X0	418	10.5	9.3	9.6	9.3	8.9
361X1	475	10.1	9.3	9.6	9.3	8.9
362X1	515	10.7	9.3	10.1	9.4	8.7
362X3	61	11.3	10.1	10.7	10.1	9.8
362X4	539	10.7	9.4	10.1	9.4	9.1
391X0	99	11.0	9.8	10.5	9.8	9.4
392X0	892	11.0	9.6	10.5	9.8	9.4
404X0	133	11.0	9.6	10.7	10.1	9.3
411X0	1229	11.3	10.1	10.7	10.5	9.8
411X1	857	10.5	9.3	9.8	9.4	8.9
411X2	458	10.7	9.4	10.1	9.6	9.1
423X0	1758	10.7	9.4	10.1	9.6	9.1
423X1	922	10.5	9.1	9.6	9.3	8.7
427X0	315	10.7	9.4	9.8	9.4	9.1
427X1	756	10.5	9.3	9.8	9.4	8.9
427X4	261	10.5	9.4	9.8	9.4	9.1
427X5	1571	10.5	9.3	9.8	9.4	8.9
451X4	467	11.3	9.8	10.7	10.5	9.6
451X5	237	11.3	9.8	10.7	10.1	9.4
451X6	490	11.3	9.8	10.7	10.5	9.4
451X7	138	11.3	10.1	10.7	10.5	9.8
452X1	665	11.3	10.1	10.7	10.5	9.8
452X2	814	11.3	9.8	10.7	10.5	9.6
452X3	740	11.3	10.1	10.7	10.5	9.6
452X4	7804	10.5	9.3	9.8	9.4	8.9
454X0	5376	10.5	9.3	9.6	9.3	8.9
454X1	4520	10.5	9.3	9.8	9.4	9.1
454X2	410	10.1	9.3	9.6	9.3	8.7
454X3	1261	10.5	9.3	9.8	9.4	8.9
454X4	1829	10.5	9.3	9.6	9.3	8.9
455X0	755	11.7	10.5	11.0	10.7	9.8
455X1	2373	11.3	10.1	11.0	10.5	9.8
455X2	2110	11.7	10.5	11.0	10.5	9.8

Appendix A (Continued)

PAFSC	N	Mean RGL	Mean RGL - 1 SD	70% RGL	80% RGL	90% RGL
455X3	290	11.3	10.1	10.7	10.5	9.8
455X4	72	11.7	10.7	11.3	10.7	9.8
455X5	54	12.2	11.0	11.7	11.3	11.0
455X6	126	11.7	10.5	10.7	10.7	10.1
456X0	406	11.3	10.1	11.0	10.5	9.6
456X1	1376	11.3	10.1	10.7	10.5	9.6
456X2	179	11.3	10.1	10.7	10.5	9.8
457X0	4582	10.5	9.3	9.6	9.4	9.1
457X1	448	10.7	9.4	9.8	9.6	9.1
457X2	4402	10.5	9.3	9.8	9.4	9.1
457X3	333	11.7	10.1	11.0	10.7	9.8
458X1	387	11.0	9.6	10.5	9.8	9.3
458X3	570	10.5	9.3	9.6	9.3	8.9
461X0	4561	10.5	9.3	9.8	9.4	8.9
462X0	6550	10.5	9.3	9.8	9.4	8.9
463X0	822	11.0	9.8	10.5	9.8	9.3
464X0	304	11.3	9.8	10.7	10.1	9.4
465X0	338	10.5	9.3	9.6	9.3	8.9
472X0	793	10.1	9.1	9.6	9.3	8.9
472X1	302	10.1	8.9	9.4	9.1	8.5
472X2	1082	10.1	9.1	9.6	9.3	8.9
472X3	221	10.5	9.4	9.8	9.4	9.1
472X4	98	10.1	9.1	9.6	9.3	8.9
491X1	5320	11.7	10.5	11.0	10.7	9.8
491X2	602	12.4	11.3	12.4	11.7	11.3
492X1	958	10.5	9.3	9.6	9.3	9.1
493X0	1008	11.3	10.1	10.7	10.5	9.6
496X0	245	11.3	10.5	10.7	10.5	10.1
542X0	689	10.7	9.3	9.8	9.4	8.9
542X1	437	10.5	9.3	9.6	9.4	8.9
542X2	1129	10.5	9.3	9.6	9.3	8.9
545X0	898	10.1	9.1	9.4	9.3	8.7
545X1	184	10.5	9.3	9.8	9.3	8.7
545X2	946	10.1	9.1	9.4	9.3	8.7
545X3	88	10.1	9.1	9.6	9.1	8.9
551X0	889	10.1	9.1	9.6	9.3	8.7
551X1	1061	10.5	9.3	9.6	9.3	8.9
552X0	1061	10.5	9.3	9.6	9.3	8.9
552X2	406	10.1	9.1	9.4	9.1	8.7
552X5	703	10.1	9.1	9.6	9.3	8.9
553X0	524	11.3	9.8	10.7	10.1	9.3
555X0	296	10.7	9.6	10.5	9.8	9.3
566X0	183	10.5	9.3	9.8	9.4	9.1
566X1	634	10.1	9.1	9.4	9.3	8.7
571X0	3815	10.7	9.4	9.8	9.6	9.1
602X0	578	10.1	9.1	9.4	9.3	8.7

PAFSC	N	Mean RGL	Mean RGL - 1 SD	70% RGL	80% RGL	90% RGL
602X1	964	10.1	9.1	9.4	9.3	8.9
603X0	1995	10.1	9.1	9.4	9.3	8.7
605X0	653	10.1	9.1	9.6	9.3	8.7
605X1	2458	10.1	9.1	9.4	9.3	8.7
612X0	33	10.1	9.1	9.6	9.3	8.4
612X1	375	10.1	9.1	9.6	9.3	8.7
623X0	3188	10.1	9.1	9.6	9.3	8.7
631X0	3498	10.7	9.4	9.8	9.6	9.1
645X0	7657	10.5	9.3	9.6	9.3	8.9
645X1	3378	10.1	9.1	9.6	9.3	8.7
645X2	242	10.1	8.9	9.4	9.1	8.4
651X0	410	10.5	9.3	9.8	9.4	8.9
661X0	122	10.1	8.9	9.6	9.1	8.5
672X1	1036	11.0	9.6	10.1	9.6	9.3
672X2	1510	11.0	9.6	10.5	9.8	9.3
674X0	49	10.7	9.6	9.8	9.6	9.3
702X0	9121	10.1	9.1	9.4	9.3	8.7
703X0	278	10.5	9.3	9.8	9.3	8.9
732X0	4611	10.5	9.3	9.8	9.4	8.9
732X1	246	10.5	9.3	9.6	9.3	8.7
732X4	10	11.0	10.1	10.7	10.5	9.3
733X1	61	11.0	9.8	10.5	10.1	9.6
734X0	36	10.7	9.4	9.8	9.6	9.3
741X1	497	10.1	9.1	9.6	9.3	8.9
742X0	44	11.3	9.8	10.7	10.1	9.6
751X0	49	11.0	9.8	10.5	9.8	9.3
751X1	269	10.5	9.3	9.8	9.4	9.1
753X0	346	11.0	9.6	10.5	10.1	9.3
791X0	284	12.2	11.3	11.7	11.3	10.7
791X1	175	12.4	11.7	12.2	11.7	11.0
792X2	20	12.4	11.7	12.2	11.7	11.3
811X0	15564	10.5	9.3	9.8	9.4	9.1
811X2	7157	10.7	9.4	10.1	9.6	9.3
871X0	418	12.4	11.0	12.2	11.3	10.7
872X0	20	12.4	11.0	11.7	11.3	9.8
881X0	74	10.5	9.3	9.6	9.4	9.1
893X0	285	10.7	9.6	10.1	9.6	9.3
901X0	524	11.0	9.6	10.5	9.8	9.3
902X0	4612	11.0	9.6	10.5	9.8	9.4
902X2	638	11.0	9.6	10.5	9.8	9.3
903X0	662	11.3	10.1	10.5	10.1	9.6
904X0	191	11.0	9.8	10.5	9.8	9.4
905X0	479	11.3	9.8	10.5	10.1	9.4
906X0	1977	10.7	9.6	10.1	9.6	9.3
907X0	414	11.0	9.8	10.5	9.8	9.6
908X0	436	11.0	9.8	10.5	9.8	9.4
911X0	263	11.0	9.8	10.5	9.8	9.4

Appendix A (Concluded)

PAFSC	N	Mean RGL	Mean RGL - 1 SD	70% RGL	80% RGL	90% RGL
912X5	121	11.3	10.5	10.7	10.5	9.8
913X0	180	11.7	10.5	11.0	10.7	10.5
913X1	30	11.3	10.5	10.7	10.7	9.6
914X0	138	11.7	10.7	11.0	10.7	10.5
914X1	165	11.0	9.8	10.7	10.1	9.4
915X0	693	10.7	9.6	10.1	9.6	9.3
918X0	255	11.3	10.1	11.0	10.5	9.8
919X0	24	11.7	10.5	11.7	10.7	9.6
924X0	965	11.3	9.8	10.7	10.1	9.6
924X1	56	11.0	9.6	10.5	10.1	9.4
926X0	403	11.0	9.6	10.5	9.8	9.4
981X0	1591	10.7	9.6	10.1	9.8	9.3
982X0	340	11.3	10.5	11.0	10.7	9.8

APPENDIX B: READING GRADE LEVEL ON THE DOD SCALE

PAFSC	N	Mean RGL	Mean RGL - 1 SD	70% RGL	80% RGL	90% RGL
111X0	190	12.4	11.2	11.5	11.5	10.9
112X0	362	12.1	10.9	11.5	11.2	10.6
113X0	201	11.5	9.7	10.6	10.3	9.1
114X0	584	11.8	10.3	11.2	10.6	9.7
115X0	71	12.1	10.9	11.5	11.2	10.9
116X0	158	11.8	10.3	11.2	10.6	9.7
117X0	127	12.4	11.2	11.8	11.5	10.9
118X0	64	12.7	11.5	12.1	11.8	10.9
118X1	21	12.4	11.2	12.1	11.5	10.3
118X2	42	12.4	11.2	11.3	11.2	10.3
121X0	148	12.7	11.5	12.4	11.8	11.5
122X0	1237	11.2	9.7	10.3	9.7	9.1
201X0	572	12.1	10.9	11.5	11.2	10.3
201X1	229	12.7	11.8	12.4	12.1	11.5
202X0	676	12.4	11.5	12.1	11.5	11.2
205X0	295	12.7	11.8	12.1	11.8	11.5
206X0	389	12.7	11.5	12.1	11.8	11.2
207X1	911	11.2	10.0	10.6	10.0	9.4
207X2	502	11.2	10.0	10.3	10.0	9.4
208X1	100	>12.9	12.1	12.7	12.4	11.5
208X2	188	12.7	11.8	12.4	12.1	11.5
208X3	622	>12.9	12.4	>12.9	12.7	12.1
208X4	310	>12.9	12.4	>12.9	12.7	11.8
208X5	158	>12.9	12.4	>12.9	12.7	12.1
209X0	99	12.4	11.5	11.8	11.5	10.9
222X0	25	11.5	10.3	10.6	10.3	10.0
231X0	126	11.8	10.6	11.2	10.6	10.0
231X1	338	12.1	10.9	11.5	11.2	10.3
231X2	326	11.8	10.3	10.9	10.6	9.7
231X3	104	12.4	11.5	11.8	11.5	11.2
233X0	405	11.8	10.6	11.2	10.9	10.0
241X0	48	11.2	9.7	10.6	10.0	9.1
242X0	111	11.2	9.7	10.6	10.0	9.4
251X0	1204	12.4	11.5	11.8	11.5	11.2
271X1	547	11.2	10.0	10.6	10.0	9.4
271X2	921	11.2	9.7	10.3	9.7	9.1
272X0	1908	11.8	10.6	11.2	10.9	10.0
273X0	127	12.1	10.9	11.5	10.9	10.3
274X0	672	11.8	10.3	11.2	10.6	9.7
275X0	345	11.8	10.3	11.2	10.9	9.7
276X0	1229	12.1	10.6	11.5	10.9	10.0
277X0	57	12.1	10.6	11.2	10.9	10.3
302X0	392	12.1	10.9	11.5	11.2	10.3
303X1	528	12.1	10.9	11.5	11.2	10.3
303X2	312	12.1	10.9	11.8	11.2	10.3
303X3	415	12.4	11.2	11.8	11.5	10.9
304X0	963	12.1	10.9	11.5	11.2	10.3

Appendix B (Continued)

PAFSC	N	Mean RGL	Mean RGL - 1 SD	70% RGL	80% RGL	90% RGL
304X1	476	12.4	11.2	11.5	11.2	10.6
304X4	2417	12.1	10.9	11.5	11.2	10.3
304X5	208	11.8	10.6	11.5	10.6	10.0
304X6	499	12.1	10.9	11.5	11.2	10.3
305X4	1209	12.4	10.9	11.8	11.2	10.3
306X0	870	12.1	10.9	11.5	11.2	10.3
306X3	644	12.1	10.9	11.5	11.2	10.3
309X0	181	12.1	10.9	11.5	11.2	10.3
316X3	201	12.4	10.9	11.8	11.5	10.9
324X0	1333	12.4	11.5	12.1	11.5	10.9
341X2	11	12.1	11.5	12.1	11.5	11.5
341X4	127	11.8	10.3	10.9	10.3	10.0
341X6	45	12.1	10.6	11.5	11.2	10.0
361X0	418	11.2	9.7	10.3	9.7	9.1
361X1	475	10.9	9.7	10.3	9.7	9.1
362X1	515	11.5	9.7	10.9	10.0	8.8
362X3	61	12.1	10.9	11.5	10.9	10.6
362X4	539	11.5	10.0	10.9	10.0	9.4
391X0	399	11.8	10.6	11.2	10.6	10.0
392X0	892	11.8	10.3	11.2	10.6	10.0
404X0	133	11.8	10.3	11.5	10.9	9.7
411X0	1229	12.1	10.9	11.5	11.2	10.6
411X1	857	11.2	9.7	10.6	10.0	9.1
411X2	458	11.5	10.0	10.9	10.3	9.4
423X0	1758	11.5	10.0	10.9	10.3	9.4
423X1	922	11.2	9.4	10.3	9.7	8.8
427X0	315	11.5	10.0	10.6	10.0	9.4
427X1	756	11.2	9.7	10.6	10.0	9.1
427X4	261	11.2	10.0	10.6	10.0	9.4
427X5	1571	11.2	9.7	10.6	10.0	9.1
451X4	467	12.1	10.6	11.5	11.2	10.3
451X5	237	12.1	10.6	11.5	10.9	10.0
451X6	490	12.1	10.6	11.5	11.2	10.0
451X7	138	12.1	10.9	11.5	11.2	10.6
452X1	665	12.1	10.9	11.5	11.2	10.6
452X2	814	12.1	10.6	11.5	11.2	10.3
452X3	740	12.1	10.9	11.5	11.2	10.3
452X4	7804	11.2	9.7	10.6	10.0	9.1
454X0	5376	11.2	9.7	10.3	9.7	9.1
454X1	4520	11.2	9.7	10.6	10.0	9.4
454X2	410	10.9	9.7	10.3	9.7	8.8
454X3	1261	11.2	9.7	10.6	10.0	9.1
454X4	1829	11.2	9.7	10.3	9.7	9.1
455X0	755	12.4	11.2	11.8	11.5	10.6
455X1	2373	12.1	10.9	11.8	11.2	10.6
455X2	2110	12.4	11.2	11.8	11.2	10.6
455X3	290	12.1	10.9	11.5	11.2	10.6

21

Appendix B (Continued)

PAFSC	N	Mean RGL	Mean RGL - 1 SD	70% RGL	80% RGL	90% RGL
455X4	72	12.4	11.5	12.1	11.5	10.6
455X5	54	12.7	11.8	12.4	12.1	11.8
455X6	126	12.4	11.2	11.5	11.5	10.9
456X0	406	12.1	10.9	11.8	11.2	10.3
456X1	1376	12.1	10.9	11.5	11.2	10.3
456X2	179	12.1	10.9	11.5	11.2	10.6
457X0	4582	11.2	9.7	10.3	10.0	9.4
457X1	448	11.5	10.0	10.6	10.3	9.4
457X2	4402	11.2	9.7	10.6	10.0	9.4
457X3	333	12.4	10.9	11.8	11.5	10.6
458X1	387	11.8	10.3	11.2	10.6	9.7
458X3	570	11.2	9.7	10.3	9.7	9.1
461X0	4561	11.2	9.7	10.6	10.0	9.1
462X0	6550	11.2	9.7	10.6	10.0	9.1
463X0	822	11.8	10.6	11.2	10.6	9.7
464X0	304	12.1	10.6	11.5	10.9	10.0
465X0	338	11.2	9.7	10.3	9.7	9.1
472X0	793	10.9	9.4	10.3	9.7	9.1
472X1	302	10.9	9.1	10.0	9.4	8.5
472X2	1082	10.9	9.4	10.3	9.7	9.1
472X3	221	11.2	10.0	10.6	10.0	9.4
472X4	98	10.9	9.4	10.3	9.7	9.1
491X1	5320	12.4	11.2	11.8	11.5	10.6
491X2	602	>12.9	12.1	>12.9	12.4	12.1
492X1	958	11.2	9.7	10.3	9.7	9.4
493X0	1008	12.1	10.9	11.5	11.2	10.3
496X0	245	12.1	11.2	11.5	11.2	10.9
542X0	689	11.5	9.7	10.6	10.0	9.1
542X1	437	11.2	9.7	10.3	10.0	9.1
542X2	1129	11.2	9.7	10.3	9.7	9.1
545X0	898	10.9	9.4	10.0	9.7	8.8
545X1	184	11.2	9.7	10.6	9.7	8.8
545X2	946	10.9	9.4	10.0	9.7	8.8
545X3	88	10.9	9.4	10.3	9.4	9.1
551X0	889	10.9	9.4	10.3	9.7	8.8
551X1	1061	11.2	9.7	10.3	9.7	9.1
552X0	1061	11.2	9.7	10.3	9.7	9.1
552X2	406	10.9	9.4	10.0	9.4	8.8
552X5	703	10.9	9.4	10.3	9.7	9.1
553X0	524	12.1	10.6	11.5	10.9	9.7
555X0	296	11.5	10.3	11.2	10.6	9.7
566X0	183	11.2	9.7	10.6	10.0	9.4
566X1	634	10.9	9.4	10.0	9.7	8.8
571X0	3815	11.5	10.0	10.6	10.3	9.4
602X0	578	10.9	9.4	10.0	9.7	8.8
602X1	964	10.9	9.4	10.0	9.7	9.1
603X0	1995	10.9	9.4	10.0	9.7	8.8

Appendix B (Continued)

PAFSC	N	Mean RGL	Mean RGL - 1 SD	70% RGL	80% RGL	90% RGL
605X0	653	10.9	9.4	10.3	9.7	8.8
605X1	2458	10.9	9.4	10.0	9.7	8.8
612X0	33	10.9	9.4	10.3	9.7	8.2
612X1	375	10.9	9.4	10.3	9.7	8.8
623X0	3188	10.9	9.4	10.3	9.7	8.8
631X0	3498	11.5	10.0	10.6	10.3	9.4
645X0	7657	11.2	9.7	10.3	9.7	9.1
645X1	3378	10.9	9.4	10.3	9.7	8.8
645X2	242	10.9	9.1	10.0	9.4	8.2
651X0	410	11.2	9.7	10.6	10.0	9.1
661X0	122	10.9	9.1	10.3	9.4	8.5
672X1	1036	11.8	10.3	10.9	10.3	9.7
672X2	1510	11.8	10.3	11.2	10.6	9.7
674X0	49	11.5	10.3	10.6	10.3	9.7
702X0	9121	10.9	9.4	10.0	9.7	8.8
703X0	278	11.2	9.7	10.6	9.7	9.1
732X0	4611	11.2	9.7	10.6	10.0	9.1
732X1	246	11.2	9.7	10.3	9.7	8.8
732X4	10	11.8	10.9	11.5	11.2	9.7
733X1	61	11.8	10.6	11.2	10.9	10.3
734X0	36	11.5	10.0	10.6	10.3	9.7
741X1	497	10.9	9.4	10.3	9.7	9.1
742X0	44	12.1	10.6	11.5	10.9	10.3
751X0	49	11.8	10.6	11.2	10.6	9.7
751X1	269	11.2	9.7	10.6	10.0	9.4
753X0	346	11.8	10.3	11.2	10.9	9.7
791X0	284	12.7	12.1	12.4	12.1	11.5
791X1	175	>12.9	12.4	12.7	12.4	11.8
792X2	20	>12.9	12.4	12.7	12.4	12.1
811X0	15564	11.2	9.7	10.6	10.0	9.4
811X2	7157	11.5	10.0	10.9	10.3	9.7
871X0	418	>12.9	11.8	12.7	12.1	11.5
872X0	20	>12.9	11.8	12.4	12.1	10.6
881X0	74	11.2	9.7	10.3	10.0	9.4
893X0	285	11.5	10.3	10.9	10.3	9.7
901X0	524	11.8	10.3	11.2	10.6	9.7
902X0	4612	11.8	10.3	11.2	10.6	10.0
902X2	638	11.8	10.3	11.2	10.6	9.7
903X0	662	12.1	10.9	11.2	10.9	10.3
904X0	191	11.8	10.6	11.2	10.6	10.0
905X0	479	12.1	10.6	11.2	10.9	10.0
906X0	1977	11.5	10.3	10.9	10.3	9.7
907X0	414	11.8	10.6	11.2	10.6	10.3
908X0	436	11.8	10.6	11.2	10.6	10.0
911X0	263	11.8	10.6	11.2	10.6	10.0
912X5	121	12.1	11.2	11.5	11.2	10.6
913X0	180	12.4	11.2	11.8	11.5	11.2

23

Appendix B (Concluded)

PAFSC	N	Mean RGL	Mean RGL - 1 SD	70% RGL	80% RGL	90% RGL
913X1	30	12.1	11.2	11.5	11.5	10.3
914X0	138	12.4	11.5	11.8	11.5	11.2
914X1	165	11.8	10.6	11.5	10.9	10.0
915X0	693	11.5	10.3	10.9	10.3	9.7
918X0	255	12.1	10.9	11.8	11.2	10.6
919X0	24	12.4	11.2	12.4	11.5	10.3
924X0	965	12.1	10.6	11.5	10.9	10.3
924X1	56	11.8	10.3	11.2	10.9	10.0
926X0	403	11.8	10.3	11.2	10.6	10.0
981X0	1591	11.5	10.3	10.9	10.6	9.7
982X0	340	12.1	11.2	11.8	11.5	10.6

2