



ASVAB Validation Technical Report

Aviation Support Equipment Technician (AS) Rating

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February 14, 2023

REPORT DOCUMENTATION PAGE			<i>Form Approved</i> <i>OMB No. 0704-0188</i>	
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1. REPORT DATE (DD-MM-YYYY) 14-02-2023	2. REPORT TYPE Technical Report		3. DATES COVERED (From - To) August 2020 – August 2022	
4. TITLE AND SUBTITLE ASVAB Validation Technical Report Aviation Support Equipment Technician (AS) Rating			5a. CONTRACT NUMBER	
			5b. GRANT NUMBER	
			5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S) Zannette A. Uriell			5d. PROJECT NUMBER	
			5e. TASK NUMBER	
			5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Navy Selection and Classification Office, OPNAV N132, 701 S. Courthouse Road, Arlington, VA 22204			8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES) Director, Navy Selection and Classification Office OPNAV N132 701 S. Courthouse Road Arlington, VA 22204			10. SPONSOR/MONITOR'S ACRONYM(S) OPNAV N132	
			11. SPONSOR/MONITOR'S REPORT NUMBER(S) 23-01	
12. DISTRIBUTION / AVAILABILITY STATEMENT Approved for public release; distribution is unlimited				
13. SUPPLEMENTARY NOTES				
14. ABSTRACT The Armed Services Vocational Aptitude Battery (ASVAB) is used by the Navy to classify Sailors into occupations, or ratings. As tasks that a rating is responsible for, and the training to accomplish those tasks, changes periodically, the selection criteria used must be reevaluated for validity. This report presents a study undertaken to change the selection criteria for the Aviation Support Equipment Technician (AS) rating. The data analyzed, the processes used to determine the most valid selection composites, and the final decision of the ASVAB Validation Review Committee are included.				
15. SUBJECT TERMS ASVAB, selection and classification, Navy ASVAB validation/rating entry standards, validity coefficients, cutscores, diversity				
16. SECURITY CLASSIFICATION OF: UNCLASSIFIED			17. LIMITATION OF ABSTRACT UNLIMITED	18. NUMBER OF PAGES 14
a. REPORT UNCLASSIFIED	b. ABSTRACT UNCLASSIFIED	c. THIS PAGE UNCLASSIFIED		
			19b. TELEPHONE NUMBER (include area code) 703-604-5103	
Standard Form 298 (Rev. 8-98) Prescribed by ANSI Std. Z39.18				

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Introduction

The Armed Services Vocational Aptitude Battery (ASVAB) has been used for Navy entrance since 1974 (*History of Military Testing*, n.d.). This battery consists of several tests to predominantly assess crystallized intelligence, although there are tests of fluid intelligence included as well (see Appendix A for brief descriptions of each test, or visit <https://www.officialasvab.com>). The ASVAB is administered to all those attempting to become enlisted personnel either at the Military Entrance Processing Stations (MEPS) or Military Entrance Testing (MET) sites, or at another location as determined by the recruiter.

Based upon test scores, needs of the Navy, and Sailor interests, the Sailors are selected into specific occupations, or Navy ratings, based upon each rating's ASVAB composite(s) and cutoff score (the rating's ASVAB standard) as well as other rating specific requirements (see Appendix B for a list of ratings and their current ASVAB selection composites). Upon completion of Navy recruit training and dependent upon the unique requirements of each rating, Sailors may attend initial rating-specific training, or "A" School. Once "A" School and any rating-specific follow-on "C" School training is complete, Sailors are sent to their first assignment to work in their rating.

Historically, initial selection criteria have been based on analyses of the final school grade and how scores correlate to the ASVAB test scores (see Held, Hezlett, Johnson, McCloy, Drasgow, and Salas (2014) for more information). More recently, this focus has shifted to First-Pass Pipeline Success (FPPS), or the ability to pass the school(s) successfully the first time with no academic setbacks. Those who have FPPS are sent to the Fleet fastest and therefore cost the least to train as compared to those who were not able to successfully complete the course and therefore need to be replaced and retrained in another rating, or who had an academic setback during training. Additionally, passing a course first time through may improve self-confidence and morale, potentially leading to a Sailor who retains in the Navy for a longer period of time.

As part of the on-going effort by the ASVAB Validation Review Committee (AVRC) to ensure rating selection criteria are up-to-date and reflect the requirements of the rating and the training undertaken, the Aviation Support Equipment Technician (AS) rating ASVAB selection standards were modified in April of 2020. Approximately 18 months later, the changes were reviewed and found to not be executing as expected. This report describes the re-validation effort conducted to improve the ASVAB selection criteria.

Aviation Support Equipment Technician Work

There are two primary sources of information about a rating and the work that Sailors in that rating will be doing during their career. The first is the Navy Enlisted Manpower and Personnel Classifications and Occupational Standards (NEOCS), specifically Volume I (available at <https://www.mynavyhr.navy.mil/References/NEOCS-Manual/>), which provides detailed task statements for each paygrade in each rating. While the NEOCS is consulted early in the ASVAB validation process, the primary source used for analyses is the Navy

Credentialing Opportunities On-Line (COOL) rating cards, available from <https://www.cool.osd.mil/usn/> .

The June 2022 COOL rating card for AS indicates:

“Aviation Support Equipment Technicians operate, maintain, repair and test automotive electrical systems in ground equipment, gasoline and diesel systems, and associated automotive, hydraulic and pneumatic systems. They also maintain gas turbine compressor units and ground air-conditioning units, perform metal fabrication, repair and painting of tow tractors and other aircraft servicing units.

WHAT THEY DO:

- Automotive electrical and mechanical repair;
- Inspect, test and repair electric generators, motors, hydraulic, pneumatic, and transmission systems;
- Gasoline and diesel engine repair and tune-up;
- Manufacture and install belts and hoses;
- Body work, minor welding and painting;
- Brake service and repair;
- Service and repair refrigeration and air conditioning systems;
- Train and test people in vehicle operation.”

The first column in Table 1 below has been adapted from the COOL rating card information to capture the key overarching skills/tasks done by an AS. When conducting an ASVAB validation, an intuitive link between these skills/tasks and the individual ASVAB tests can be helpful as a rational check on the composites chosen for implementation, and Table 1 was created to show this linkage. For example, the first task listed in Table 1, “Test/repair electric generators”, may be linked to the GS, EI, and AS subtests. For the AS rating, all skills/tasks included seem to link to the AS subtest, so it is likely that a useable composite for this rating would contain the AS scores.

Table 1: ASVAB Linkages to the AS Rating

AS Rating Skills/Qualifications	GS	AR	WK	PC	MK	EI	AS	MC	AO	CS	VE
Test/repair electric generators	X					X	X				
Test/repair motors/engines							X	X	X		
Test/repair hydraulic/pneumatic/transmission systems	X						X	X	X		
Manufacture/install belts/hoses	X						X	X			
Welding and painting							X				
Test/repair brakes							X				
Test/repair refrigeration and air conditioning						X	X				
Vehicle operation							X				

Methods

Student Data Used

Although all AS Sailors attend “A” School, only some immediately attend “C” School, therefore only “A” School data was used for analyses. All Corporate Enterprise Training Activity Resource Systems (CeTARS) data for the Course Data Processing (CDP) code 625K (Aviation Support Equipment Technician (AS) Course) were downloaded for those with Active Duty Service Dates (ADSD) 1 October 2016 and beyond. Because the last change to the AS selection criteria was effective as of 15 April 2020, the decision was made to eliminate all data that had an enrollment Person-Event Code (PEVT) from before 15 August 2020 under the assumption that those going through training in the first 4 months after the change might have been selected based on the previous ASVAB standards. An enrollment code after that date also ensures that a complete training history, including all setbacks, has been recorded for the data being used.

Those who had not yet ended the course through either graduation or academic failure were excluded unless the student already had an academic setback; an academic setback even without course completion would automatically indicate they had not completed the course successfully in the first pass, which is the dependent variable being used for these analyses. Those with non-academic failures were dropped from analyses, and non-academic setbacks were not considered in any selection computations. Table 2 contains the PEVT applicable to the sample selected in addition to the enrollment code (2) and the graduation code (288); see the CeTARS database for full descriptions. (NOTE: Historically PEVT 135, 138, and 141, categorized as motivational attrition, are considered academic failures for ASVAB validation analyses as these students are judged to be unable keep up in the course.)

Table 2

Category	Academic Code	Non-Academic Code
Setback	48	73
	51	294
	53	296
		297
		298
		299
		300
		303
		305
	308	
Failure	81	148
	135	214
	138	311
	141	969
	142	970
	309	971
	371	973
	987	

A total of 218 student records were retained. These were categorized based upon how they qualified for the rating using the two composites in place at the time: $VE+AR+MK+AS \geq 210$ or $MK+AS+AO \geq 152$. Table 3 provides the number of students, the rate of academic setbacks, the number who were still in training but had already had an academic setback, graduation/failure rates, and observed FPPS rates for the total sample for the 3 qualification groups, and whether or not the student was qualified or included through a selection waiver (12-point waiver allowed for a 4-test composite and 9-point waiver allowed for a 3-test composite, see *Class "A" School and Rating Entry Requirements (2016)*).

Table 3
Qualification and FPPS Rates for Each Qualification Method

	Student #	% of Sample	Academic Setback Rate	Academic Setback, Still in Training	Grad Rate	Academic Failure Rate	Observed FPPS%
Total Sample	218	100%	.1835	5	.9343	.0657	80.73%
Qualified Only Through $VE+AR+MK+AS \geq 210$	4	1.8%	0	0	1.000	0	100.00%
Qualified Only Through $MK+AS+AO \geq 152$	135	61.9%	.2370	3	.9394	.0606	75.56%
Qualified On Both	54	24.8%	.0556	1	.9623	.0377	92.59%
Qualified On Either	193	88.5%	.1813	4	.9471	.0529	80.83%
Waivered	25	11.5%	.2000	1	.8333	.1667	80.00%

The top row of Table 3 shows that FPPS rate was 80.73% for the 218 students in the sample; the expectation of the FPPS rate when the standards were changed in April 2020 was a 93.8% rate. The three rows that follow show how students qualified and the various rates for each qualification method, with the four qualifying based solely on the first equation all being first pass pipeline successes and the 135 qualifying based solely on the second equation (61.9% of the sample) having a FPPS rate of only 75.56%. Notably, those who were not qualified but were granted a waiver (25 students) had a higher FPPS rate (80.00%) than those who qualified based solely on the second equation, although both rates were lower than the prediction of a 93.8% FPPS rate. The 83.33% graduation rate for those waived is also noticeably lower than for those who were qualified (93% or higher).

Table 4 shows the descriptive details for each ASVAB subtest for the sample.

Table 4
ASVAB Test Descriptives for AS Sample

Test	Count	Min	Max	Mean
GS	218	26	73	50
AR	218	23	71	51
WK	218	24	71	49
PC	218	31	66	50
MK	218	41	69	55
EI	218	21	72	49
AS	218	29	69	48
MC	218	28	70	51
VE	218	29	68	50
AO	214	36	68	58
CS	76	27	72	52

Histograms were created of the scores on the two composites. Figure 1 shows the first composite (VE+AR+MK+AS), which had a mean score of 203. Figure 2 shows the second composite (MK+AS+AO); the mean was 160. When comparing the four-test and the three-test scores, linear equating can be used to show that the mean of 203 for a four-test composite is equivalent to 152 on a three-test composite; 160 on a three-test composite is equivalent to 213 on a four-test composite.

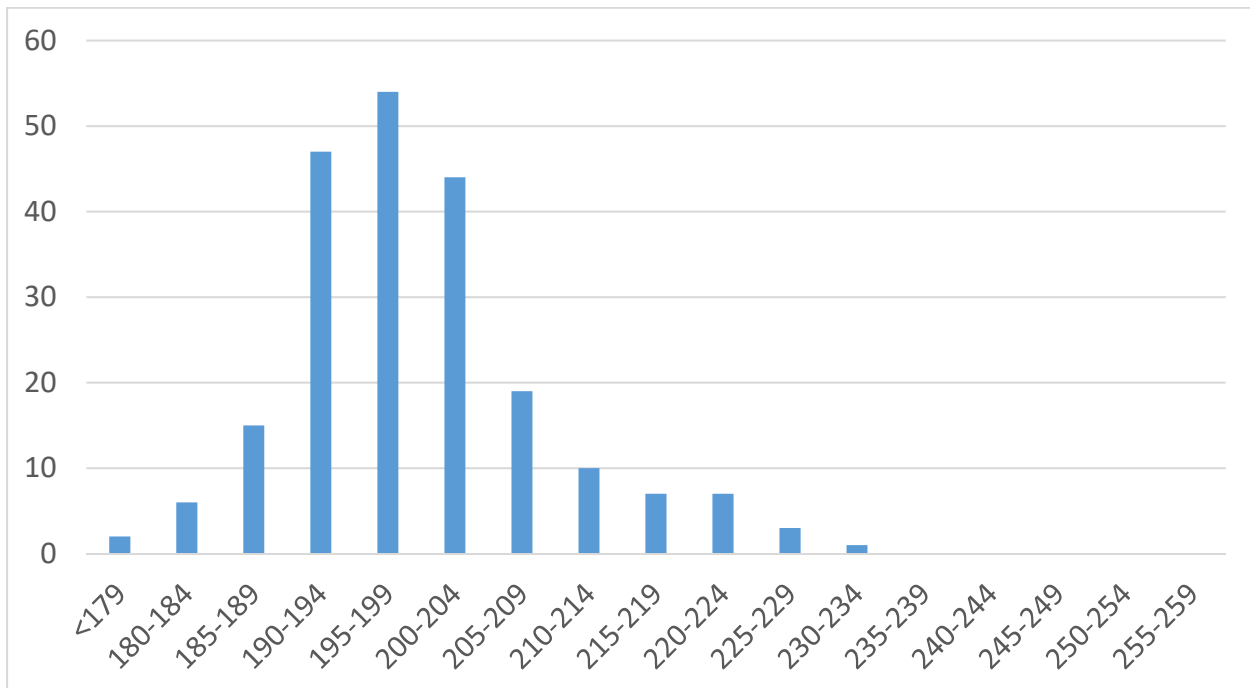


Figure 1. VE+AR+MK+AS Scores of AS Students.

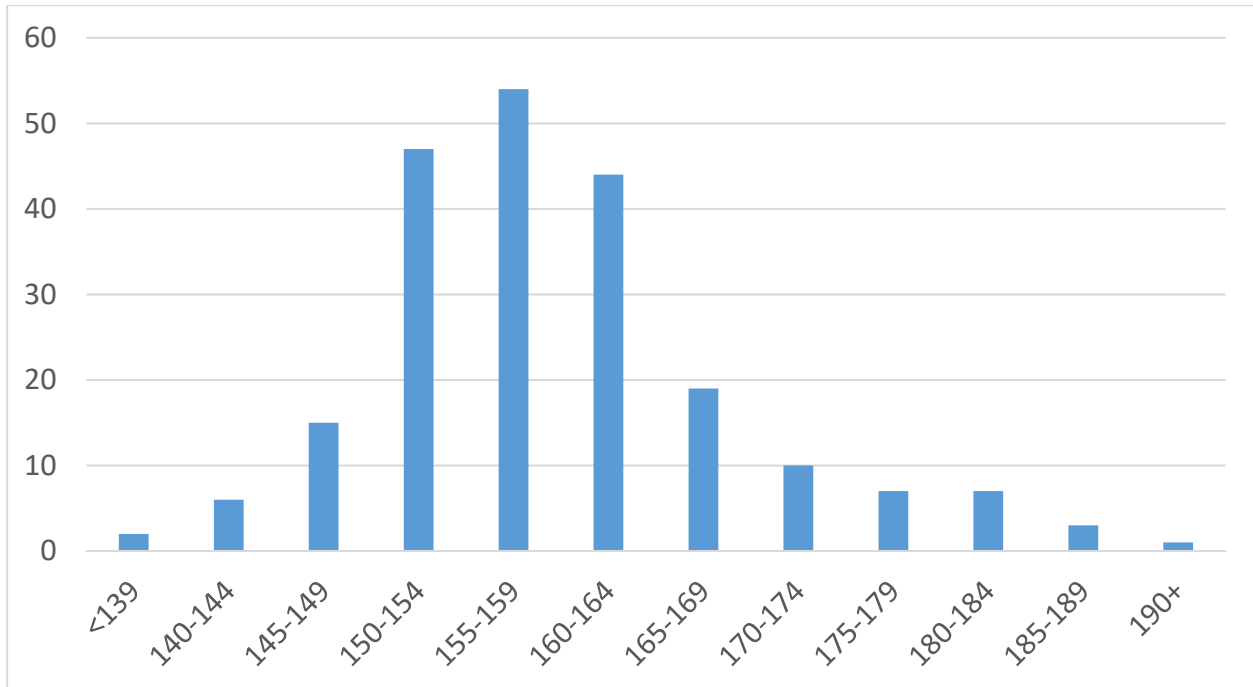


Figure 2. MK+AS+AO Scores of AS Students.

Validity Coefficients

Receiver operating characteristic (ROC) curves were produced for both operational composites; Figure 3 shows the VE+AR+MK+AS ROC curve while Figure 4 shows MK+AS+AO. With the diagonal line of each indicating random classification, the effectiveness of VE+AR+MK+AS in determining True Positives is most notable in the upper right region of the graph, while MK+AS+AO is better in the lower left regions with lower False Positives. The area under the curve (AUC) computations show that the first composite (AUC=0.717) functions better than the second (AUC=0.641).

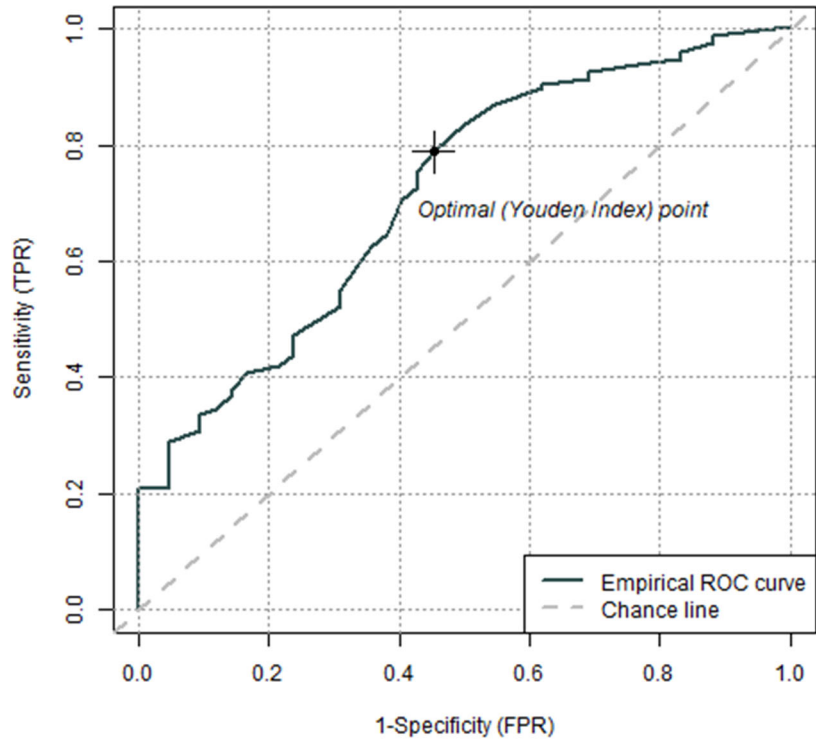


Figure 3. VE+AR+MK+AS ROC.

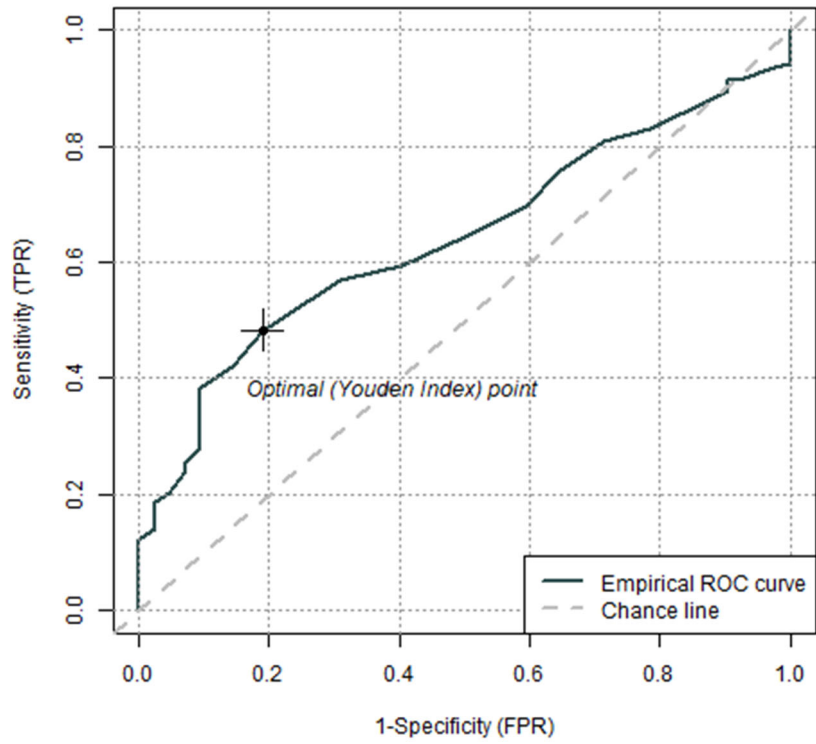


Figure 4. MK+AS+AO ROC.

Because of the importance of the AO score in determining any potential changes to the selection composites, only those with AO scores were used for any further analyses, which eliminated data for 4 Sailors.

Correlations between each individual test/composite and FPPS were computed for the data. Because the data range has been restricted by the selection process, these validities were then corrected for range restriction to PAY97 norms (Segall, 2004) as well as for the dichotomous nature of the FPPS variable (see appendix C for a brief description, or Held, Carretta, Hezlett, Johnson, Mendoza, Abrahams, Drasgow, McCloy, and Wolfe (2015) for a detailed description). Table 5 shows the test/composite, grouped by family of test/composite, as well as the uncorrected, partially corrected (for range restriction only), and fully corrected validities. Those highlighted are the 10 highest fully corrected validities, and those underlined are the composites currently in place for selection into the AS rating.

Table 5
Composite Validities

Composite Family	Composite	Uncorrected Validity	Validity Corrected for Range Restriction to PAY97	Validity Corrected for Range Restriction & Dichotomy (Fully Corrected)
ASVAB test	AO	0.008	0.298	0.426
ASVAB test	AR	0.232	0.436	0.623
ASVAB test	AS	0.165	0.293	0.418
ASVAB test	EI	0.197	0.366	0.524
ASVAB test	GS	0.198	0.398	0.568
ASVAB test	MC	0.226	0.368	0.526
ASVAB test	MK	0.090	0.385	0.550
ASVAB test	PC	0.224	0.418	0.598
ASVAB test	VE	0.159	0.405	0.578
ASVAB test	WK	0.101	0.3585	0.512
Administrative	MK+VE	0.185	0.431	0.616
Administrative	PC+MK	0.226	0.439	0.627
Administrative	AR+PC+MK	0.264	0.456	0.651
Mechanical	AR+AS+MC	0.277	0.431	0.616
Mechanical	MK+AS+AO	0.187	0.418	0.598
Mechanical	AR+MK+AS	0.271	0.458	0.654
Mechanical	MK+AS+VE	0.230	0.454	0.649
Operations	AR+MK+AS+VE	0.281	0.467	0.667
Operations	GS+AR+2MK	0.232	0.438	0.626
Operations	AR+MK+AO+VE	0.210	0.439	0.628
Operations	AR+MK+EI+VE	0.271	0.463	0.662
Operations	GS+MK+MC+VE	0.242	0.448	0.640
Operations	MK+EI+VE	0.229	0.451	0.644
Specialized	AR+VE	0.261	0.452	0.645
Specialized	GS+MK+VE	0.213	0.438	0.625
Specialized	AR+WK	0.230	0.435	0.621
Specialized	GS+AR+MK+VE	0.259	0.453	0.647
Specialized	GS+AR+MK	0.256	0.448	0.640
Specialized	GS+MK+2VE	0.205	0.436	0.623
Technical	AR+MK+MC+VE	0.274	0.459	0.656
Technical	GS+AR+MK+EI	0.271	0.458	0.655
Technical	GS+EI+MC	0.240	0.422	0.603
Technical	GS+AR+EI+MC	0.273	0.451	0.644

Results

The impact of any changes to selection composites was estimated based on 12 months of accession data, specifically those with Active Duty Service Date (ADSD) later than or equal to 20 May 2021. Demographic information and test score data were selected for 38,308 accessions. Of the accessions, 23.6% were female and 76.3% were male, while 21.1% were classified as Hispanic, 6.3% Asian, 20.6% African American, 47.4% White, and 4.5% were another or unknown race.

Descriptives about ASVAB test scores for the 12 months of accessions are provided in Table 6. The mean for an ASVAB test is 50 with standard deviation of 10; the AS test was below the expected mean and was the lowest of all tests whereas the AO test the highest.

Table 6
ASVAB Test Descriptives for 12 Month Accessions

Test	Count	Min	Max	Mean
GS	38272	22	76	52.90
AR	38275	23	76	53.33
WK	38275	20	76	52.64
PC	38271	26	69	53.27
MK	38275	30	73	55.15
EI	38213	20	80	50.87
AS	38270	21	80	46.66
MC	38265	21	80	52.45
VE	38273	25	74	53.03
AO	35461	26	70	56.86
CS	6569	22	72	56.21

Standardized group test score mean differences (Cohen's d) were computed for the three composites with the highest validity (VE+AR+MK+AS, VE+AS+MK+EI, and VE+AR+MK+MC), comparing females and males as well as the largest race groups, African American and Hispanic, to White. Cohen's d values are continuous; however .20 is recognized as small, .50 moderate, and .80 large. Table 7 shows the large differences for African American compared to White and moderate differences for the gender and other racial comparisons; there is little difference between the three composites for any of the comparisons, with African Americans having the largest negative impact when compared to Whites.

Table 7
Standardized Group Mean Score Differences Based on 12 Months of Accessions

	VE+AR+MK+AS	VE+AR+MK+EI	VE+AR+MK+MC
Female-Male	-0.652	-0.594	-0.556
African American-White	-1.096	-0.961	-1.006
Hispanic-White	-0.644	-0.592	-0.585

Determinations of likelihood of FPPS and qualification were made for each accessed Sailor. Table 8 shows the predicted FPPS and qualification rate of the three composites with the highest validity at various possible cutscores. In particular, the current cutscore of 210 was used as well as the possible extent of a waiver of 12 points (see *Class "A" School and Rating Entry Requirements* (2016) for waiver policy).

Table 8
Predicted FPPS and Qualification Rates based on 12 Months of Accessions

Score	VE+AR+MK+AS		VE+AR+MK+EI		VE+AR+MK+MC	
	FPPS Rate (%)	Qual. Rate (%)	Predicted FPPS Rate (%)	Qual. Rate (%)	Predicted FPPS Rate (%)	Qual. Rate (%)
233	97.92	14.57	96.43	20.02	96.07	21.92
221	95.29	28.06	93.27	34.36	92.54	36.37
210	90.30	44.29	88.26	50.77	86.94	52.99
203	85.04	56.28	83.59	62.35	81.76	64.48
198	79.98	65.20	79.41	70.20	77.15	72.51

At a cutscore of 210 on the current VE+AR+MK+AS composite, 44.29% of the accessions would qualify for the AS rating with approximately 90% predicted to succeed in school with no academic setback. Qualification rate and predicted FPPS rate vary somewhat across the three composites shown, with the lowest qualification rate for VE+AR+MK+AS consistent with the shortage of high AS test scores in the accession population. Only a slight increase in FPPS rate above the 210 cutscore is predicted to lead to a large drop in qualification rate, so a cutscore of 210 for all three composites was used to further analyze combinations of composites.

The current primary composite of VE+AR+MK+AS, which has the highest validity (although also has the lowest qualification rates at every cutscore when compared to the two other composites) was combined, in turn, with the two other composites with high validity. In addition, a comparison was made combining all three composites. Table 9 provides the predicted FPPS and qualification rates for each of the combination options as well as the current operational AS rating ASVAB standard for comparison.

Table 9
Summary of Qualification Standards Options Considered

	VE+AR+MK+AS \geq 210 or MK+AS+AO \geq 152	VE+AR+MK+AS \geq 210 or VE+AR+MK+EI \geq 210	VE+AR+MK+AS \geq 210 or VE+AR+MK+MC \geq 210	VE+AR+MK+AS \geq 210 or VE+AR+MK+EI \geq 210 or VE+AR+MK+MC \geq 210
	Current Operational Standard	Option 1	Option 2	Option 3
QR	66.4%	52.7%	54.6%	57.2%
Difference from Current Qual #	---	-5,227	-4,493	-3,495
% Qual F::M	.699	.557	.602	.609
% Qual AA::W	.504	.411	.402	.435
% Qual H::W	.632	.634	.656	.676
Predicted FPPS	85.9%	94.9%	94.8%	94.4%

Table 9 shows that Option 3 would have the least decrease in qualification rate when compared to the current operational standard and the other two options, and would be predicted to increase the first pass pipeline success by 8.5%. Additionally, the ratios of qualification rates of the compared demographic subgroups are highest for the three-composite option when compared to the other two options, and the three-composite option actually exceeds the current operational composite for the Hispanic to White ratio.

Discussion and AVRC Decision

This study showed that the alternate composite (MK+AS+AO) currently operational is not providing end results expected when it was previously chosen as an alternate and dominates the primary composite, VE+AR+MK+AS, in AS rating qualification. There are composites with higher performance predictive validity based on the current data, possibly due to a change in recruiting population since the composite was put in place or due to changes in training. It may be that the lower observed FPPS for the MK+AS+AO composite is related to the inequivalent cutscores between the two operational composites; the cutscore in place for the 3-test composite (152) is lower when standardized than the 210 cutscore that was used on the primary composite, so the number of Sailors selected using this composite perhaps is more than originally expected and overwhelmed the number being chosen via the primary composite. It may also be related to the fact that the AO scores of Sailors, at least for recent accessions, tend to be higher than for other tests, as indicated in Figure 5 which shows percentage of Sailors with scores that are 1 standard deviation or more above the mean test score.

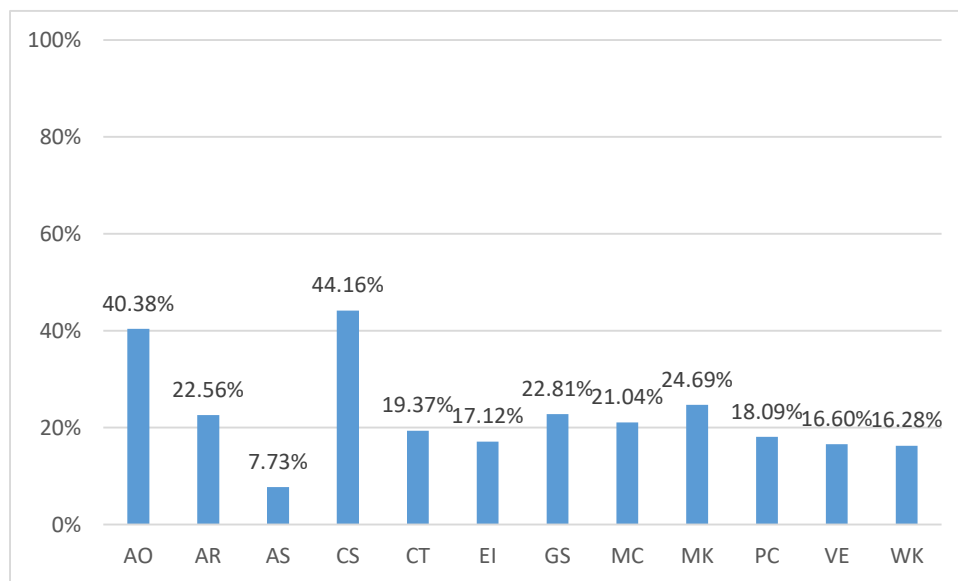


Figure 5. Percentage of ASVAB scores that are 60 or above.

Regardless of reason why, it was suggested that the alternate operational composite be removed and replaced by another. The best option would be to allow accessions to qualify on any of three composites with the highest validity, which would slightly decrease the number qualifying but greatly increase the FPPS rate. When the AVRC met on 3 August 2022 to be briefed on the results of the study (see appendix D), there were concerns expressed about any decrease in qualification rate in light of the on-going recruiting challenges (see, for example, Anderson, 2022). The recommendation was reconsidered in order to maintain or improve the qualification rate while also maintaining or improving the FPPS rate and maintaining or improving the graduation rate. A modified recommendation was made at the next AVRC (see Appendix E) that was adopted (see Table 10); the new composites became effective 12 October 2022 (see Appendix F for the decision memorandum). This recommendation slightly lowers cutscores from 210 to 206 for two of the three composites with the highest validity and retains the MK+AS+AO composite as a third alternative, however, with a higher cutscore (157), allowing the AO test to still function in qualifying many accessions for the AS rating.

Table 10
Composites for Selection

Selection Composites prior to 12 October 2022	Selection Composites as of 12 October 2022
$VE+AR+MK+AS \geq 210$ OR $AS+MK+AO \geq 152$	$VE+AR+MK+MC \geq 206$ OR $VE+AR+MK+EI \geq 206$ OR $MK+AS+AO \geq 157$

References

- Anderson, C. (3 Oct 2022). *Navy Recruiting Command Announces Mission Results for Fiscal Year 2022 and Goals for 2023*. Downloaded October 7, 2022 from <https://www.navy.mil/Press-Office/News-Stories/Article/3177917/navy-recruiting-command-announces-mission-results-for-fiscal-year-2022-and-goal/>.
- Class "A" School and Rating Entry Requirements* (MILPERSMAN 1306-618). (23 Apr 2016). Downloaded July 27, 2022 from https://www.mynavyhr.navy.mil/Portals/55/Reference/MILPERSMAN/1000/1300Assignment/1306-618.pdf?ver=4gog_6-fXVtZNdOtGr7U8g%3d%3d.
- Held, J. D., Hezlett, S. A., Johnson, J. W., McCloy, R. A., Dragow, F., & Salas, E. (2014). *Introductory Guide for Conducting ASVAB Validation/Standards Studies in the U. S. Navy* (NPRST-TR-15-1). Millington, TN: Navy Personnel Research, Studies, and Technology (NPRST).
- Held, J. D., Carretta, T. R., Hezlett, S. A., Johnson, J. W., Mendoza, J. L., Abrahams, N. M., Dragow, F., McCloy, R. A., & Wolfe, J. H. (2015). *Technical Guidance for Conducting ASVAB Validation/Standards Studies in the U. S. Navy* (NPRST-TR-15-2). Millington, TN: Navy Personnel Research, Studies, and Technology (NPRST).
- History of Military Testing*. (n.d.) Downloaded July 27, 2022 from <https://www.officialasvab.com/researchers/history-of-military-testing/>.
- Segall, D. O. (2004). *Development and evaluation of the 1997 ASVAB score scale* (Technical Report No. 2004-002). Seaside, CA: Defense Manpower Data Center.

Appendix A

Description of the ASVAB and Additional Selection Tests

Test Type	Test Name and Abbreviation	Test Description
Standard ASVAB	General Science (GS)	Knowledge of physical and biological sciences
	Arithmetic Reasoning (AR)	Ability to solve arithmetic word problems
	Word Knowledge (WK) ^a	Ability to select the correct meaning of words presented in context and correct synonyms
	Paragraph Comprehension (PC) ^a	Ability to obtain information from written passages
	Mathematics Knowledge (MK)	Knowledge of high school mathematics principles
	Electronics Information (EI)	Knowledge of electricity and electronics
	Auto and Shop Information (AS)	Knowledge of automobile and shop technologies, tools, and practices
	Mechanical Comprehension (MC)	Knowledge of mechanical and physical principles
	Assembling Objects (AO)	Ability to determine correct spatial forms from their separate parts and connection points (not administered in all versions)
Special Tests (May be Given in Conjunction with ASVAB)	Coding Speed (CS)	Ability to quickly identify correct word/number pairings from a key with many options
	MCt	Ability to maintain value of 3 counters that increment and decrement simultaneously
	Cyber Test (CT)	Information and communications technology literacy
	Navy Advanced Placement Test (NAPT)	Knowledge of advanced physics, mathematics, and chemistry
	Defense Language Aptitude Battery (DLAB)	Aptitude to learn a foreign language

^a WK and PC are combined to form the Verbal (VE) composite that is a component of the AFQT and several Navy ASVAB classification composites.

Appendix B
Current Composites in Use Across All Ratings

Composite Name	Composite Calculation	Rating/Program Entry Standards
Administration 1	VE+MK	CTI, LN, PS, QM, RP, YN
Administration 2	MK+CS+VE	OS, PS, RP, YN
Administration 3	PC+MK	CTR
Administration 4	AR+PC+MK	AC, CTR
Cyber 1	MK+VE+CT	CTN, IT/ATF, IT/SG, ITS
Cyber 2	AR+MK+CT	CTT/AEF, CTT/SG
Mechanical 1	AR+AS+MC	BU, CM, EO, SW
Mechanical 2	MK+AS+AO	AO, AS, BM, MR, PR
Mechanical 3	AR+MK+AS	UT
Mechanical 4	MK+AS+VE	AD
Operations 1	AR+MK+AS+VE	ABE, ABF, ABH, AIRC, AIRR, AM, AME, AN (APACT), AO, BM, DC, EN, FN (E/PACT), GSM, HT, MM, MR, PR
Operations 2	GS+AR+2MK	AECF, CTN, CTT/SG, EA, ET, FC, FCA, GM, ITS, OS
Operations 3	AR+MK+AO+VE	AE, AME, AT, AV, BU, EN, GSM, IC, IC/ATF, MM, MN, MT, STG, STG/AEF
Operations 4	MK+MC+CS+VE	SO
Operations 5	AR+MK+EI+VE	AS, CTM, IT/SG, MMA, MMS, TM
Operations 6	GS+MK+MC+VE	QM
Operations 7	MK+EI+VE	AD
Specialized 1	AR+VE	AZ, CS, EOD, LN, LS, MC, ND, RS, SB, SN (S/PACT), SO
Specialized 2	GS+MK+VE	AG, CTI, HM/ATF, IT/ATF, IT/SG, NC
Specialized 3	AR+WK	HM/ATF
Specialized 4	GS+AR+MK+VE	HM, HM/ATF, IS, IT/ATF, ITS
Specialized 5	GS+AR+MK	AG
Specialized 6	GS+MK+2VE	HM
Specialized 7	AR+MK+MC+VE+NAPT	EM(NUC), ET(NUC), MM(NUC), NUC
Specialized 8	GS+AR+MK+EI+NAPT	EM(NUC), ET(NUC), MM(NUC), NUC
Technical 1	AR+MK+MC+VE	AC, AE, AIRC, AIRR, AM, AS, AT, AV, CSS, CTN, DC, EM, EM(NUC), ET(NUC), ETV, FT, FN (E/PACT), GSE, HT, LSS, MA, MM(NUC), MN, MR, MT, NUC, SECF, STS, YNS
Technical 2	GS+AR+MK+EI	AECF, CE, CSS, CTT/AEF, EM, EM(NUC), ET, ET(NUC), ETV, FC, FCA, FT, GM, GSE, IC, IC/ATF, LSS, MM(NUC), NUC, SECF, STS, STG, STG/AEF, UT, YNS
Technical 3	GS+EI+MC	EOD, SO
Technical 4	GS+AR+EI+MC	MMA, MMS, TM

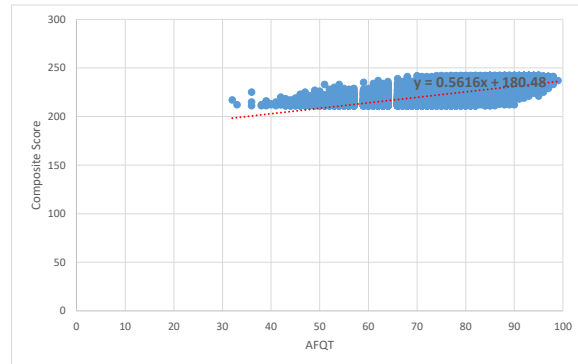
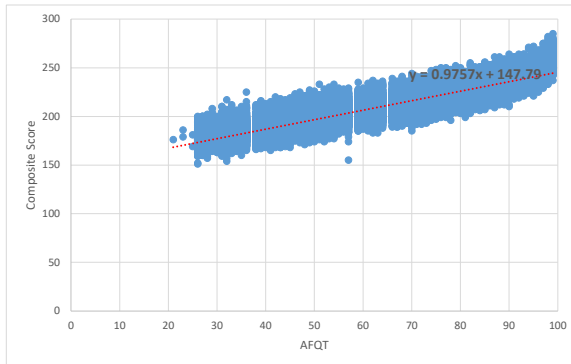
As of 10/12/2022.

Appendix C

Corrections of Validity Coefficients

Two corrections are executed before determining the fully corrected validity coefficients used to determine the best-fitting composites. The first correction is for range restriction, and the second is for dichotomy. A simplistic explanation of both is included below, with more detailed information provided in Held, Carretta, Hezlett, Johnson, Mendoza, Abrahams, Drasgow, McCloy, & Wolfe (2015).

Because a selection for the rating has already occurred prior to analyzing the training data, the validity coefficients initially computed do not cover the entire spectrum of possible ASVAB scores, as can be seen in the two graphs below with the left graph showing the complete spectrum of AFQT scores vs a composite AFQT score, and the right graph showing all AFQT but only the composite scores above a selected cutscore of 210. The correlation line equation is different between the two graphs because of the restriction in range of the graph on the right.



Matrix algebra is used to correct for this range restriction by adjusting the variance/covariance matrix of the test scores and FPPS to the PAY97 variance/covariance matrix created by Segall (2004) in the PAY97 norming process. Once each individual ASVAB score is corrected, each composite of ASVAB scores can also be corrected as laid out in Held, et al (2015).

Correcting for dichotomization accounts for the dependent variable (FPPS in this report) being a 0 or 1, which is actually a measure of an underlying continuous variable Final School Grade. The Table of Normal Deviates and Ordinates is consulted to determine the y ordinate that corresponds to the FPPS rate (“B Area in the larger portion” within the table). Each range restricted correlation is then multiplied by the calculated dichotomy correction factor

$$\frac{\sqrt{FPPS*(1-FPPS)}}{y\text{-ordinate}}$$

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Aviation Support Equipment Technician



Zannette Uriell, Navy S&C

August 2022 AVRC



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About AS

- Aviation Support Equipment Technicians operate, maintain, repair and test automotive electrical systems in ground equipment, gasoline and diesel systems, and associated automotive, hydraulic and pneumatic systems. They also maintain gas turbine compressor units and ground air-conditioning units, perform metal fabrication, repair and painting of tow tractors and other aircraft servicing units. – Navy COOL, June 2022

D-2

	GS	AR	WK	PC	MK	EI	AS	MC	AO	CS	VE
Test/repair electric generators	X					X	X				
Test/repair motors/engines							X	X	X		
Test/repair hydraulic/pneumatic/transmission systems	X						X	X	X		
Manufacture/install belts/hoses	X						X	X			
Welding and painting							X				
Test/repair brakes							X				
Test/repair refrigeration and air conditioning						X	X				
Vehicle operation							X				

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Background

- **Navy S&C develops and monitors ASVAB standards for all Navy ratings**
 - Goal is to balance rating qualification rate and training performance
 - About 18 months after any change in selection standards, a retrospective is conducted to determine if change is functioning as expected

- **AS rating standards prior to April 2020**
 - $VE+AR+MK+AS \geq 210$ OR $VE+AR+MK+MC \geq 210$

- **AS rating standards as of April 2020**
 - $VE+AR+MK+AS \geq 210$ OR $MK+AS+AO \geq 152$

- **Retrospective analyses in February 2022 showed FPPS decline, from 93.8% expected to 84.8% observed**
 - Consistent with a declining recruiting market
 - Possibly due to an imbalance in scores between standards (4-test 210 is equivalent to 158 on a 3-test composite)



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Findings

- Most are qualifying based upon the 2nd (alternative) standard only
- 75.56% of those qualifying only on the 2nd standard are able to pass the class successfully without academic setback

AS Rating CDP 625K	Student #	% of Sample	Academic Setback Rate	Academic Setback Still in Training	Grad Rate	Academic Failure Rate	Observed FPPS%
Total Sample	218	100%	.1835	5	.9343	.0657	80.73%
Qualified Only Through VE+AR+MK+AS≥210	4	1.8%	0	0	1.000	0	100.00%
Qualified Only Through MK+AS+AO≥152	135	61.9%	.2370	3	.9394	.0606	75.56%
Qualified On Both	54	24.8%	.0556	1	.9623	.0377	92.59%
Qualified On Either	193	88.5%	.1813	4	.9471	.0529	80.83%
Waivered	25	11.5%	.2000	1	.8333	.1667	80.00%

Data with CDP start date of 8/15/2020 or later

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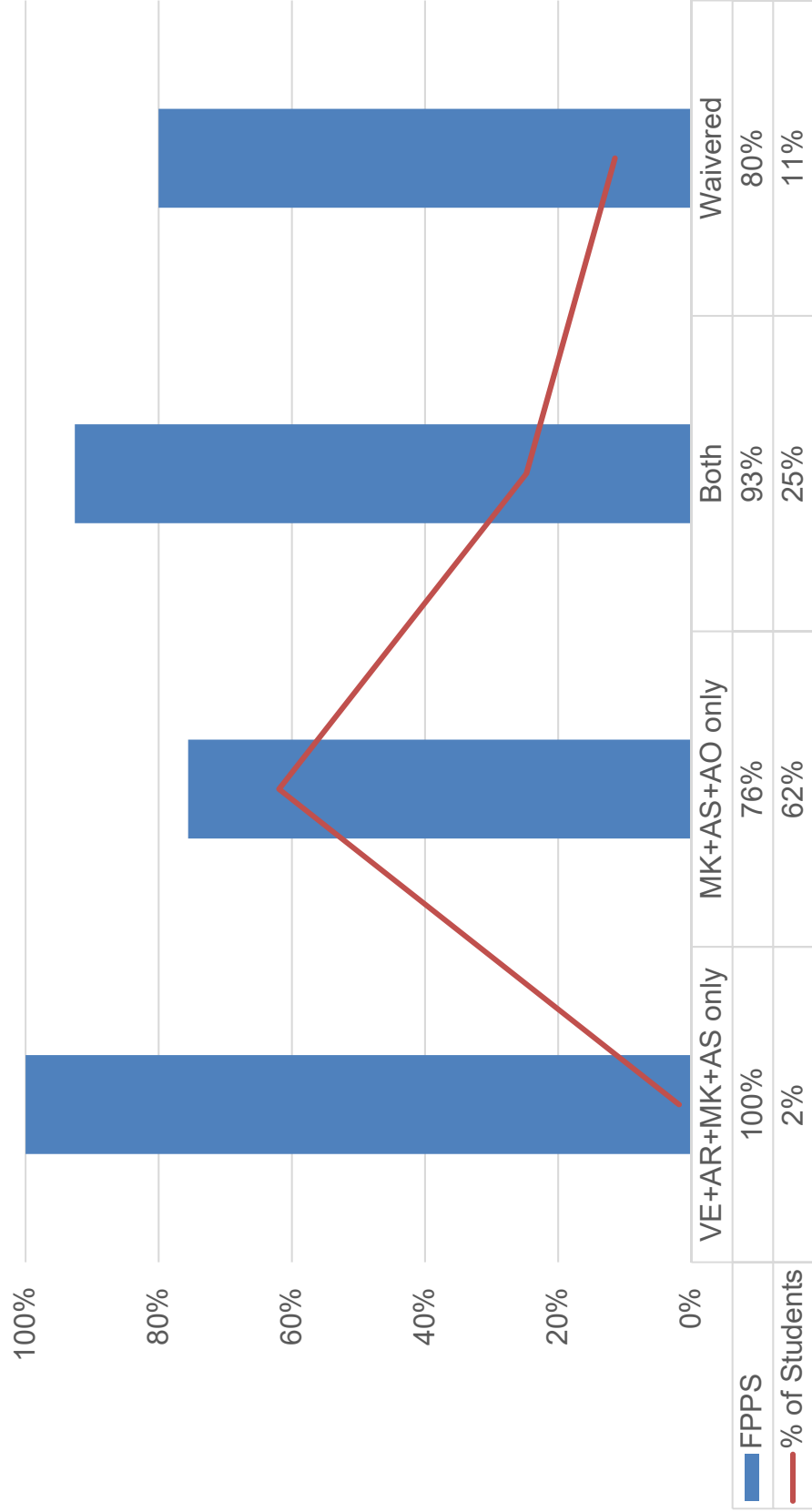
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FPPS vs Student Population



- Visually, the highest percentage of students have the lowest first-pass pipeline success (MK+AS+AO)



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Fully Corrected Validity Coefficients and Diversity

- Composites with highest validity coefficients (after corrections) listed below for comparison

Composites	Composite (Family)	Fully Corrected Validity Coefficients n=214 with AO	Standardized Group Mean Score Differences: 12month Accession Population (n=38,308)		
			F-M	AA-W	H-W
<u>VE+AR+MK+AS</u>	OPS1	.667	-0.652	-1.096	-0.644
<u>MK+AS+AO</u>	MECH2	.598	-0.549	-1.079	-0.514
<u>VE+AR+MK+EI</u>	OPS5	.662	-0.594	-0.961	-0.592
<u>VE+AR+MK+MC</u>	TECH1	.656	-0.556	-1.006	-0.585
GS+AR+MK+EI	TECH2	.655	-0.637	-1.018	-0.612
AR+MK+AS	MECH3	.654	-0.649	-1.058	-0.577
PC+AR+MK	ADMIN4	.651	-0.338	-0.753	-0.436
MK+AS+VE	MECH4	.649	-0.680	-1.130	-0.700
GS+AR+MK+VE	SPEC4	.647	-0.489	-0.934	-0.576
VE+AR	SPEC1	.645	-0.495	-0.894	-0.548
MK+EI+VE	OPS7	.644	-0.602	-0.947	-0.627

* Effect Size, or "Cohen's d", are terms used for measurement of group test score differences with .20 considered small, .50 moderate, and .80 large with zero indicating no difference.

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Options Under Consideration

1. No change at present

- Gather more data and reassess in future

2. Change 2nd (MK+AS+AO) composite

- VE+AR+MK+EI has much higher validity than MK+AS+AO
- Some of the AS rating work involves electronics

3. Change 2nd (MK+AS+AO) composite

- VE+AR+MK+MC has much higher validity than MK+AS+AO and only minimally less than VE+AR+MK+EI
- Some of the AS rating work is mechanical
- Had been the alternate selection equation prior to March 2020

4. Change 2nd (MK+AS+AO) composite

- PC+AR+MK has higher validity than current option 2 but less impact on diversity
- No direct links to work



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Predicted FPPS with Individual Composites

- Possible scores and impact on FPPS and Qualification Rate (QR) listed below, with the bold scores being the current cutscore and the maximum waiver currently possible

Cutscore Analysis for Predicted FPPS "at or above" Key Scores Applied to 12month Navy Accessions N=38,308												
Transformed Score	VE+AR+MK+AS (Current Eq.1)			VE+AR+MK+EI (Eq. 2 Option 1)			VE+AR+MK+MC (Eq. 2 Option 2)			PC+AR+MK (Eq. 2 Option 3)		
	Score	FPPS	QR	Score	FPPS	QR	Score	FPPS	QR	Score	FPPS	QR
175	233	97.92%	14.57%	233	96.43%	20.02%	233	96.07%	21.92%	175	95.06%	24.69%
166	221	95.29%	28.06%	221	93.27%	34.36%	221	92.54%	36.37%	166	91.22%	40.82%
158	210	90.30%	44.29%	210	88.26%	50.77%	210	86.94%	52.99%	158	85.74%	57.49%
152	203	85.04%	56.28%	203	83.59%	62.35%	203	81.76%	64.48%	152	79.95%	71.15%
149	198	79.98%	65.20%	198	79.41%	70.20%	198	77.15%	72.51%	149	76.46%	78.00%

Notes.

1. Tests transformed to be equivalent to a 3-test score.
2. 12-month Navy accessions 20 April 2021 – 19 April 2022.

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Summary of Full Options

- Estimates for each full option (qualifying on VE+AR+MK+AS OR each option) are based on 12 months of recent accessions

		Qualification Standard			
		VE+AR+MK+AS ≥ 210 or MK+AS+AO ≥ 152 [Current]	VE+AR+MK+AS ≥ 210 or VE+AR+MK+EI ≥ 210 [Option 1]	VE+AR+MK+AS ≥ 210 or VE+AR+MK+MC ≥ 210 [Option 2]	VE+AR+MK+AS ≥ 210 or PC+AR+MK ≥ 158 [Option 3]
QR		66.4%	52.7%	54.6%	57.9%
Diff from Current #		---	-5,227	-4,493	-3,232
%Qualified F::M		.699	.557	.602	.723
%Qualified AA::W		.504	.411	.402	.501
%Qualified H::W		.632	.634	.656	.720
Predicted FPPS		85.9%	94.9%	94.8%	94.4%

*12-month Navy accessions 20 April 2021 – 19 April 2022.

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Summary of Full Options (continued)

- Combining option 1 and option 2 increases the QR from those options while only slightly decreasing expected FPPS

Qualification Standard	
VE+AR+MK+AS ≥ 210 or MK+AS+AO ≥ 152 [Current]	VE+AR+MK+AS ≥ 210 or VE+AR+MK+EI ≥ 210 [Option 1]
66.4%	52.7%
---	-5,227
.699	.557
.504	.411
.632	.634
85.9%	94.9%
VE+AR+MK+AS ≥ 210 or VE+AR+MK+AS ≥ 210 [Option 2]	VE+AR+MK+AS ≥ 210 or VE+AR+MK+MC ≥ 210 [Option 4]
54.6%	57.2%
-4,493	-3,495
.602	.609
.402	.435
.656	.676
94.8%	94.4%
QR	
Diff from Current #	
%Qualified F::M	
%Qualified AA::W	
%Qualified H::W	
Predicted FPPS	

*12-month Navy accessions 20 April 2021 – 19 April 2022.

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Conclusions/Recommendations

- **Currently experiencing lower than expected FPPS %, especially for those only qualifying on the alternate composite (MK+AS+AO)**
 - Majority qualify only on the alternate composite

- **Recommend changing the alternative composite, to increase FPPS and better balance between multiple composites**
 - Changing the alternate composite to another related composite (including EI or MC, or both) is expected to increase the FPPS rate more than 8% over operational standards
 - The number qualifying decreases about 3,000-5,000 (across 1 year of accessions) compared to standards currently in place

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Backup



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ASVAB Tests and Special Classification Tests

Test	Content
General Science (GS)	Biological and physical sciences
Arithmetic Reasoning (AR)	Arithmetic word problems
Word Knowledge (WK)	Synonyms/meaning of words in context
Paragraph Comprehension (PC)	Written passages
Mathematics Knowledge (MK)	Algebra, geometry, fractions, decimals, exponents
Electronic Information (EI)	Electrical principles and electronics
Auto and Shop Information (AS)	Automotive, tool, shop, practices
Mechanical Comprehension (MC)	Mechanical and physical principles
Assembling Objects (AO)	Patterns and connection point recognition
Verbal (VE)	Combination of 1/3 PC and 2/3 WK
Coding Speed (CS)	Perceptual speed and accuracy test; not administered to all candidates
Defense Language Aptitude Battery (DLAB)	Administered to CTI candidates
Navy Advanced Placement Test (NAPT)	Administered to about 1/2 of NF candidates
Cyber Test (CT)	Used for some computer intensive ratings
Mental Counters (MCt)	Working memory test

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Suggested AS Composite

- Option 5 below is recommended, slightly improving predicted FPPS while also improving qualification rate

	Qualification Standard	
	VE+AR+MK+AS ≥ 210 or MK+AS+AO ≥ 152 [Current]	VE+AR+MK+MC ≥ 206 or VE+AR+MK+EI ≥ 206 or MK+AS+AO ≥ 157 [Option 5]
QR	66.4%	69.1%
Diff from Current #	---	+1,048
%Qualified F::M	.699	.692
%Qualified AA::W	.504	.530
%Qualified H::W	.632	.775
Predicted Grad Rate	95.3%	96.7%
Predicted FPPS	85.9%	86.4%

*12-month Navy accessions 20 April 2021 – 19 April 2022.

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DEPARTMENT OF THE NAVY
OFFICE OF THE CHIEF OF NAVAL OPERATIONS
2000 NAVY PENTAGON
WASHINGTON DC 20350-2000

1230
OPNAV S&C/010
27 Sep 2022

MEMORANDUM FOR THE RECORD

SUBJ: RATING ENTRY STANDARDS FOR THE AVIATION SUPPORT EQUIPMENT
TECHNICIAN (AS) RATING

Ref: (a) MILPERSMAN 1306-618
(b) COMNAVCRUITCOMINST 1130.8 (CRUITMAN-ENL)
(c) Catalog of Navy Training Courses (CANTRAC)

1. The Navy Selection and Classification Office (OPNAV N132G) ASVAB Validation Review Committee analyzed observed training outcomes for Initial Skills Training for the AS rating and simulated the effects of possible alternative entry standards.

2. Based on the analysis and coordination with all stakeholders, the new minimum composite test score criteria for the AS rating is:

$VE+AR+MK+MC \geq 206$ OR
 $VE+AR+MK+EI \geq 206$ OR
 $MK+AS+AO \geq 157$

3. Organizations responsible for references (a) through (c) and other publications, manuals, articles, and instructions referencing minimum rating entry requirements should update their materials and classification systems to reflect this standard. Navy Selection and Classification Office will ensure the appropriate RIDE WEB Service Qualification Policy Tables reflect this standard.

4. The new standard will become effective 12 October 2022.

LAMBRIX.DONALD.H.1.1 Digitally signed by
70809897
Date: 2022.10.06 10:22:49 -0400

D. H. LAMBRIX, JR

Copy to:
OPNAV N132
BUPERS 3
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CNRC (Codes N3, N35, N6)
NETC N3