

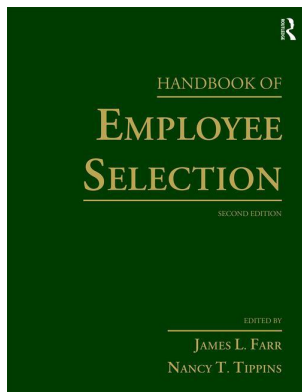
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### **Selection and Classification in the U.S. Military**

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# SELECTION AND CLASSIFICATION IN THE U.S. MILITARY

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WAYNE S. SELLMAN, TERESA L. RUSSELL, AND WILLIAM J. STRICKLAND

The quality of a military workforce, or any workforce for that matter, depends on the quality of its people. Successful attainment of military missions requires a force composed of dedicated, knowledgeable, and competent members. When an organization can hire persons with prior experience, an evaluation of past performance can serve as the primary criterion for selection and assignment into jobs. Other characteristics such as aptitudes and education assume less importance. However, when organizations hire young people without job experience, it becomes important to evaluate aptitudes, education, interests, and other characteristics known to predict success in jobs sought by the applicants.

The Department of Defense (DoD) is the largest employer of young people in the United States. Depending on personnel requirements, the DoD screens hundreds of thousands of youth for enlistment annually. During the late 1970s, the DoD screened approximately 600,000 applicants each year; that number declined to about 380,000 during the first years of the 21st century and to around 250,000 in 2010 (U.S. Department of Defense, 2013). As noted above, the military's task in screening potential recruits is complicated by the fact that the available personnel pool is composed predominantly of young men and women who have never held a permanent full-time job of any kind, and almost exclusively have no experience performing jobs similar to those in which they will be trained. Consequently, the services must depend mainly on indicators of potential performance, such as aptitude and education.

## MILITARY PERSONNEL SYSTEM

The U.S. military separates its personnel into two or three categories: enlisted personnel, commissioned officers, and (for all services except the Air Force) warrant officers. Comprising approximately 85% of the entire military, the enlisted force consists of (a) entry-level soldiers, sailors, airmen, and marines; (b) noncommissioned officers and petty officers (NCOs); and (c) senior NCOs and senior petty officers. These levels correspond to different levels of training, education, experience, and leadership. Individuals at the entry level are in training, or have just achieved initial competence in their occupational specialties. NCOs are technical experts in their primary jobs and serve as first-line supervisors, who teach, train, and supervise entry-level personnel. Senior NCOs are seasoned individuals who have experienced a myriad of technical jobs, held numerous supervisory positions, and have performed their technical and supervisory duties at high levels of proficiency.

Commissioned officers are the senior leadership and management of the military. Similar to the enlisted force, the officer force also is divided into three categories: (a) company-grade officers, (b) field-grade officers, and (c) general or flag officers. Company-grade officers are the military's action officers and are largely involved in the tactical level of the military organization. Field-grade officers typically fill many operational-level positions and most command and staff assignments. General or flag officers are executives and are primarily engaged in strategic, policy-making decisions that affect the organization in the long term.

The Army, Navy, and Marine Corps also have warrant officers who fill highly specialized leadership positions. Unlike their commissioned officer counterparts, whose experiences are broad and service-encompassing, warrant officers are employed in positions that require highly specialized or technical skills (e.g., helicopter pilots). Selection as a warrant officer is highly competitive and only available to those who meet rank and length-of-service requirements in the enlisted force.

Distinct from the civilian sector, the military has a completely closed personnel system; this means that the services fill personnel vacancies with members who are already employed within their ranks. The services do not hire individuals from outside the military to enter mid- or senior-level ranks. Because it takes years to successfully replace a member who leaves the military, attracting officer and enlisted candidates is a high priority for military policy makers. Each service uniquely recruits, trains, and professionally develops its members. Moreover, selecting the correct number of high-quality individuals each year is essential to sustain a flow of seasoned leaders for the future.

Within the services, there are literally hundreds of military occupations. Although many are similar to civilian jobs, there also are large numbers of occupations that are unique to the military. Because of the large number of military enlistees (about 245,000 in the active and reserve components in Fiscal Year 2014) (D. J. Drogo, personal communication, 2015) who must be assigned into a large number of military occupations, the services, unlike most civilian employers, must be proficient at job classification as well as personnel selection. However, classification into military occupations depends on eligibility, individual preference, and availability of openings (Campbell & Knapp, 2001; Rumsey & Arabian, 2014a). With an enormous diversity of occupations, a vast number of openings at specific positions, and a variety of individual skills, the challenge of military job classification is appreciable.

## NEED FOR ENLISTED MILITARY SELECTION AND CLASSIFICATION

Military recruiting is a supply-and-demand phenomenon (Sellman, Born, Strickland, & Ross, 2010; Sellman, 1999) that is influenced by the costs of recruiting qualified individuals for enlistment. When recruiting prospers, the services raise their enlistment standards. When times are bad, the services sometimes lower their standards and allow enlistment of somewhat lower-quality recruits, thus allowing the services to meet their recruiting goals. Military recruiting, assignment, and training of young, unskilled people is an investment; the underlying purpose of the personnel selection and job classification process is to reduce the risk that an investment will be made in persons who are unable (or unwilling) to perform their duties. There are costs associated with recruit quality levels. It is more difficult and costly to recruit high-quality youth than their lower-quality peers. Thus, recruit quality standards directly influence recruiting resource requirements.

Once admitted into service, recruits are expected to progress through training, to perform their duties competently, and to observe military order and discipline. Nevertheless, not all enlistees get through basic training and job skill training and, even for those who do, not all manage to avoid disciplinary problems. Still others may play by the rules but may perform well below par on the job for reasons not related to low aptitude but rather to lack of motivation. The consequences for substandard performance may include slow promotion progress, reassignments, various forms of punishment from reprimands to incarceration, and in many cases an early exit from service.

The most analyzed indicator of maladjustment to the military is first-term attrition, failure to complete an obligated period of service (White, Rumsey, Mullins, Nye, & LaPort, 2014).

According to the U.S. Government Accountability Office (GAO), it cost \$40,000 in 1997 to replace (recruit, train, and equip) each individual who failed to successfully complete a first tour of duty (U.S. Government Accountability Office, 1997, 1998). Given the substantial increase in recruiting resources associated with recruiting challenges brought on by the wars in Iraq and Afghanistan, today that number is considerably higher, with recruiting resources expended in FY 2014 alone running about \$17,600 for each enlistee (D. J. Drogo, personal communication, 2015; U.S. Department of Defense, 2014). Cost information on training and equipping new recruits who replace those who leave service early is not available at this time.

McCloy (2012) calculated that the cost of training a single soldier from recruitment to his/her first duty station was \$50,000 in 2005. With an estimated 30% attrition rate, he calculated the annual cost of attrition to be \$2.5 billion. If more service members leave prematurely, then the recruiting requirements and related recruiting, training, and equipping costs must increase to maintain the force. In addition, there are non-pecuniary or indirect costs, which include force instability, lowered morale, and lack of readiness. Individuals also may pay a personal price. Failure in military service may significantly affect their future employment opportunities and earning potential. Consequently, it is in the interest of recruits and the services to reduce first-term attrition (Strickland, 2005).

### DEFINING RECRUIT QUALITY

The use of aptitude and educational attainment as measures of “recruit quality” within the DoD and the services goes back more than 50 years (Sellman, 1997; Sellman & Valentine, 1981; Sticha, Sellman, Axelrad, McCloy, Barnes, & Gribben, 2014). These quality indices are used in lieu of evaluating past work experience—a criterion that rarely exists for enlisted military applicants, who are mostly recent high school graduates.

Recruits who score above average in aptitude on the DoD enlistment test are more trainable, have higher levels of job performance, and are less likely to get into trouble than their lower-scoring peers. In addition, recruits with a traditional high school diploma are twice as likely to complete a three-year enlistment as recruits with alternative educational credentials (e.g., high school equivalency exams, adult high school diploma programs, experiential learning) or high school dropouts. Since it is costly to recruit, train, and equip a recruit to replace people who leave the military prematurely, the services prefer to enlist traditional high school graduates with above average aptitude (Sellman, Born, Strickland, & Ross, 2010).

For enlisted selection and classification, the Armed Services Vocational Aptitude Battery (ASVAB) is the single test used to determine enlistment eligibility and job placement for all services (including the Coast Guard) as well as their reserve components. The ASVAB comprises 10 tests that measure verbal, mathematics, and science/technical skills and knowledge and is administered in computer adaptive format. The Armed Forces Qualification Test (AFQT), a weighted composite of the ASVAB, measures verbal (word knowledge and paragraph comprehension) and mathematics (arithmetic reasoning and mathematics knowledge) abilities. A measure of general mental ability, the AFQT is the primary enlistment screen for all services and is the DoD’s first index of recruit quality (Sellman, 1997; Sticha et al., 2014). Tests of science/technical knowledge include general science, electronics information, mechanical comprehension, auto information, shop information, and assembling objects (Sackett, Eitelberg, & Sellman, 2013; Sellman, 2004). Tests in the current ASVAB and a brief description of the abilities, or constructs, they measure are shown in Table 31.1.

Each service develops and validates its own set of aptitude area composites based on the combination of tests that correlate most closely with performance criteria for its occupational clusters (Campbell & Knapp, 2001; Rumsey, Walker, & Harris, 1994). Each service’s composites take into account the distinct functions required to fulfill its respective missions and are used to assign new recruits to the occupations that are most well-suited to their abilities. For example, the Army and Marine Corps have extensive ground combat responsibilities that are quite different from most Navy and Air Force activities. Consequently, for ostensibly the same occupations, such as electronic repair specialists, motor mechanics, cooks, supply technicians, or clerks, the

TABLE 31.1  
ASVAB Tests and Measured Constructs

TEST	CONSTRUCT
<b>Verbal</b>	
Word Knowledge (WK)	Ability to select the correct meaning of words presented in context and to identify the best synonym for a given word
Paragraph Comprehension (PC)	Ability to obtain information from written passages
<b>Mathematics</b>	
Arithmetic Reasoning (AR)	Ability to solve arithmetic word problems
Mathematics Knowledge (MK)	Knowledge of high school mathematics principles
<b>Science/Technical</b>	
General Science (GS)	Knowledge of physical and biological sciences
Electronics Information (EI)	Knowledge of electricity and electronics
Auto Information (AI)	Knowledge of automobile terminology and technologies
Shop Information (SI)	Knowledge of tools and shop terminology and practices
Mechanical Comprehension (MC)	Knowledge of mechanical and physical principles
Assembling Objects (AO)	Ability to figure out how an object will look when its parts are put together

Source: Sackett, Eitelberg, & Sellman, 2013; Sellman, 2004.

particular equipment used by personnel in the different services or the environment in which they serve might dictate a different mix of abilities (Sackett et al., 2013; Sellman, 2004; Waters, Laurence, & Camara, 1987). Table 31.2 shows the composites currently used by the services (Diaz, Ingerick, & Lightfoot, 2004; Sackett et al., 2013).

The ASVAB is normed against a nationally representative sample of young people ages 18–23 years old tested in 1997 as part of the Bureau of Labor Statistics' National Longitudinal Survey of Youth (Sackett et al., 2013; Segall, 2004). Such norms allow the comparison of applicant and recruit aptitude levels with those of the contemporary civilian youth population from which they come. AFQT scores are expressed on a percentile scale and grouped into five categories for reporting purposes. Table 31.3 shows the percentile score ranges and percentage of civilian youth that correspond with each AFQT category. Persons who score in Categories I and II tend to be above average in cognitive ability; those in Category III, average; those in Category IV, below average; and those in Category V, markedly below average. (Category III is divided at the 50th percentile into subcategories A and B. This facilitates reporting the proportion of scores above and below the mean of the AFQT distribution.) By law, Category V applicants and those in Category IV who have not graduated from high school are not eligible for enlistment.

The best single predictor of successful adjustment to military life is possession of a high school diploma. About 80% of high school diploma graduates complete their first three years of service, compared to only 50% of high school dropouts (Laurence, 1997; U.S. Department of Defense, 1996; 2013; White et al., 2014). Completion rates for enlistees holding an alternative credential such as a General Education Development (GED) certificate fall between the high school diploma graduate and non-graduate rates (Elster & Flyer, 1981; Flyer, 1959; Laurence, 1993, 1997). Thus, educational achievement is the DoD's second index of recruit quality (Sellman, 1997; Sellman et al., 2010).

Over the past 25 years, there has been a proliferation of education credentials in the United States. In addition to earning a regular high school diploma, young people can receive alternative educational credentials through adult education programs and homeschooling, through experiential learning, and by taking high school equivalency tests (Laurence, 1984; Sticha et al., 2014).

**TABLE 31.2**  
*ASVAB Tests Used for Classification by Service*

COMPOSITE TESTS	ASVAB TESTS
<b>ALL SERVICES</b>	
Armed Forces Qualification Test (AFQT)	AR + MK + (2 X VE) where VE = WK + PC
<b>ARMY</b>	
General Technical	AR, WK, PC
Clerical	GS, AR, AI, SI, MK, MC, EI, WK, PC
Combat	GS, AR, AI, SI, MK, MC, EI, WK, PC
Electronics Repair	GS, AR, AI, SI, MK, MC, EI, WK, PC
Field Artillery	GS, AR, AI, SI, MK, MC, EI, WK, PC
General Maintenance	GS, AR, AI, SI, MK, MC, EI, WK, PC
Mechanical Maintenance	GS, AR, AI, SI, MK, MC, EI, WK, PC
Operators/Food	GS, AR, AI, SI, MK, MC, EI, WK, PC
Surveillance/Communications	GS, AR, AI, SI, MK, MC, EI, WK, PC
Skilled Technical	GS, AR, AI, SI, MK, MC, EI, WK, PC
<b>NAVY</b>	
General Technical	WK, PC, AR
Electronics	AR, MK, EI, GS
Basic Electricity & Electronics	AR, MK, GS
Engineering	MK, AI, SI
Mechanical	AR, MC, AI, SI
Mechanical 2	AR, MC, AO
Nuclear Field	WK, PC, AR, MK, MC
Operations	WK, PC, AR, MK, AO
Hospitalman	WK, PC, MK, GS
Administration	WK, PC, MK
<b>AIR FORCE</b>	
Mechanical	AR, WK, PC, MC
Administrative	WK, PC, MK
General	WK, PC, AR
Electronic	AR, MK, EI, GS
<b>MARINE CORPS</b>	
Mechanical Maintenance	AR, EI, MC, AI, SI
General Technical	WK, PC, AR, MC
Electronics Repair	AR, MK, EI, GS

**Test Abbreviations:**

WK	Word Knowledge
PC	Paragraph Comprehension
AR	Arithmetic Reasoning
MK	Mathematics Knowledge
GS	General Science
EI	Electronics Information
AI	Auto Information
SI	Shop Information
MC	Mechanical Comprehension
AO	Assembling Objects

Note: With the exception of the AFQT, weights for the tests are not included in the above composites. The formula for computing the AFQT is  $AR + MK + (2 \times VE)$ , where VE (Verbal) =  $PC + WK$ . The VE score is determined by adding the raw scores from the PC and WK tests.

Source: Diaz, Ingerick, & Lightfoot, 2004; Sackett et al., 2013; U.S. Department of Defense, 2004.

**TABLE 31.3**  
*Armed Forces Qualification Test (AFQT) Categories by Corresponding Percentile Score Ranges and Percent of Civilian Youth Population*

AFQT Categories	Percentile Score Range	Percent of Civilian Youth
I	93–100	8
II	65–92	28
IIIA	50–64	15
IIIB	31–49	19
IV	10–30	21
V	01–09	9

Source: Sticha et al., 2014; U.S. Department of Defense, 1996.

The DoD uses a three-tier system to classify education credentials. The system was developed after research indicated a strong relationship between level of education and successful completion of the first term of military service (Laurence, 1997; U.S. Department of Defense, 1996). Tier 1 includes regular high school diploma graduates, adult diploma holders, and non-graduates with at least 15 hours of college credit. Tier 2 comprises alternative credential holders, such as those with GED diplomas or certificates of completion or attendance, and Tier 3 is composed of non-high school graduates (Sackett et al., 2013; Sellman et al., 2010).

The services prefer to enlist people in Tier 1 because they have a higher likelihood of completing a first term of service than do individuals in Tiers 2 and 3. Consequently, education enlistment standards refer to the application of progressively higher aptitude test score minimum requirements for high school diploma graduates, alternative credential holders, and non-graduates, respectively. The rationale for this policy is based on the differential attrition rates of individuals in these three education groups. That is, members of Tiers 2 and 3 are about twice as likely as those in Tier 1 to leave service before completing their enlistment contract. Higher aptitude requirements for Tiers 2 and 3 are used to accept only the “best” from the statistically less successful and thus less preferred group of applicants (Sticha et al., 2014; U.S. Department of Defense, 1996).

### **SHORT HISTORY OF MILITARY PERSONNEL TESTING (BEFORE AN ALL-VOLUNTEER FORCE)**

Although current testing methods are codified into U.S. law today, these testing methods have not always been in place. Because of the advent of new weaponry in World War I (tanks, airplanes, chemicals, etc.), the American military started using tests to screen people for service and assign them to military occupations. In 1917–1918, the Army Alpha and Army Beta tests were developed so commanders could have some measure of the ability of their men (Waters, 1997). Army Alpha was a verbal, group-administered test that measured verbal ability, numerical ability, and ability to follow directions and information. Army Beta was a non-verbal, group-administered counterpart to Army Alpha. It was used to evaluate the aptitude of illiterate, unschooled, or non-English-speaking inductees (Yerkes, 1921). Both tests are recognized as prototypes for subsequent group-administered cognitive ability tests.

Rising from Army Alpha and Beta tests’ foundations, the Army General Classification Test (AGCT) of World War II replaced its predecessors. The AGCT’s intent was similar to the Alpha and Beta tests in that it was designed to be a general learning test used for job placement. Although it served the services successfully throughout the World War II years, at the war’s conclusion, each service developed its own aptitude test for service entry. Eitelberg, Laurence, and Waters (1984) noted, “Though different in structure, primarily with respect to qualifying scores,

the service tests were essentially the same with respect to content area, relying on the time-honored items of vocabulary, arithmetic, and spatial relationships.”

In 1950, the military returned to a single test, the AFQT, to be used in conjunction with the Selective Service System draft. The AGCT served as the AFQT’s model, in which the AFQT measured basically the same variables as the AGCT and the previous Army Alpha and Beta tests; however, contrary to the previous tests, the AFQT was specifically designed to be used as a screening device (Karpinos, 1966). Thus, the AFQT was established for the purpose of (a) measuring examinees’ general ability to absorb military training and (b) providing a uniform measure of examinees’ potential usefulness in the service, if qualified, on the test (Maier, 1993; Uhlaner & Bolanovich, 1952).

### MOVING TO AN ALL-VOLUNTEER FORCE

Throughout most of American history, our military has been composed of volunteers. However, conscription was the primary means of obtaining military personnel during World Wars I and II and the Korean Conflict to the point that its renewal became perfunctory. The decision to move to an all-volunteer military evolved from criticism of the inequities of conscription during the Vietnam War—who shall serve when not all serve? In the late 1960s, President Richard Nixon established a commission to develop a comprehensive plan for eliminating conscription and moving toward an all-volunteer force. The commission built a case for a volunteer military by pointing out the unfairness of conscription, establishing the feasibility of a volunteer force on economic grounds, and refuting all major arguments against ending conscription and relying totally on volunteers (Gates, 1970; Lee & Parker, 1977).

The commission believed that sufficient numbers of qualified youth could be persuaded to volunteer by increasing military pay to levels more competitive with civilian wages. They disputed claims that total reliance on volunteers would lead to a mercenary force consisting mainly of minorities, the poor, and the uneducated, and loss of civilian control. After much debate within the Administration and Congress and across the country, it was decided that an all-volunteer force was feasible, affordable, and would not jeopardize the nation’s security (Defense Manpower Commission, 1976; Rostker, 2006). Thus, the authority for conscription was allowed to lapse on July 1, 1973, and the last conscript entered the Army in December 1972.

With adequate resources and support to attract and retain higher aptitude and better educated personnel, conscription is not needed to meet future military personnel requirements (Bicksler & Nolan, 2006). An all-volunteer force is more expensive than a conscription force in terms of military compensation and funds for advertising and enlistment incentives, but a voluntary military is less expensive in overall costs (Fredland, Gilroy, Little, & Sellman, 1996; Lee & McKenzie, 1992; Warner & Asch, 1996). It is more stable and career-oriented, thereby leading to extra performance and experience, with reduced training and other turnover costs (Oi, 1967). During conscription, 10% of new inductees reenlisted; today’s new recruits reenlist at a 50% rate. In short, military service is an economically rational choice for high-quality men and women looking for an edge on life. The military also is a good choice for people who want to serve a greater cause (Bicksler, Gilroy, & Warner, 2004).

During the first years of the all-volunteer force, the AFQT was used to identify individuals who had a reasonable probability of success in service, and other service-specific tests were required for job classification. The Army Classification Battery, the Navy Basic Test Battery, and the Airman Qualifying Examination, just to name a few, were used from the late 1950s to the mid-1970s (Waters, 1997). During this period, the AFQT was administered to military applicants (including draft inductees) at Armed Forces Examining and Entrance Stations (AFEES) across the country for selection purposes. Because women were not subject to the draft, a different aptitude test was used for female applicants for enlistment. The Armed Forces Women’s Selection Test was administered to female applicants in lieu of the AFQT from 1956 to 1974. If individuals successfully “passed” the AFQT and were accepted for service, they were sent to basic training, although the specific occupation to which they would be assigned had not yet been



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determined. During basic training, new enlistees were administered their service's classification tests and were assigned to their appropriate military occupations.

During the mid-1970s, the DoD determined that a single test that measured aptitude and job placement was to be used, resulting in the development and implementation of the ASVAB, which is still in use today (Sellman, 2012; Sellman & Valentine, 1981). The ASVAB's creation and implementation enabled the DoD to successfully screen applicants, match applicants with job positions, reserve job skill training for applicants if they qualified, and provided a uniform standard measure on which all applicants across the board could be ranked. This was a departure from previous procedures when selection testing was conducted at AFEES during the entrance process (for either enlistment volunteers or draft inductees) and classification testing was accomplished at service basic training centers preparatory to assigning new enlistees to military occupations and sending them for job skills training.

By combining selection and classification testing at the AFEES, the testing process was made more expedient for the newly implemented all-volunteer military. Young people volunteering for enlistment would take one test and come away from the AFEES knowing not only if they qualified for enlistment but also, if qualified, the military occupation to which they would be assigned. Thus, the new testing process enabled the services to improve the matching of applicants with available occupations before they actually reported for duty and allowed job guarantees for individuals who qualified for enlistment (Sellman, 2012).

With the end of conscription and the advent of the all-volunteer force, there was a significant change in the composition of new recruit cohorts (Sellman, Carr, & Lindsley, 1996). The percentage of African American enlisted accessions rose slightly, with some fluctuation, following the end of the draft (MacGregor, 1981). In 1973, the last year of the draft, African Americans made up 17% of new recruits. As African American men and women viewed the military as an opportunity for upward mobility, a gradual increase in African American accessions ensued through the 1990s. Participation for active component African American enlisted has remained relatively stable at around 20% thus far in the 21st century (U.S. Department of Defense, 2008, 2013). It also should be noted that with the exception of the ASVAB misnorming period described in the following section, African American recruits have met all aptitude and education enlistment standards, thereby demonstrating their qualifications for military service.

The percentage of female enlisted accessions more than tripled, rising from 5% in 1973 (Goldman, 1973) to approximately 17% in 2006 among non-prior service members (Manning & Griffith, 1998; U.S. Department of Defense, 2008). As of 2013, that percentage remained stable at approximately 17% (U.S. Department of Defense, 2013). Although the services have increased their proportions of women, youth propensity polls indicate that young women are still approximately 50% less likely than young men to indicate an interest in joining the military (Handy & Ramsberger, 2014; Ramsberger, 1993; Sackett & Mavor, 2004; U.S. Department of Defense, 2008).

Hispanics make up a smaller but growing proportion of the military services than do African Americans. Enlisted Hispanics constituted just over 1% in the early 1970s, but by the late 1980s, that percentage had increased to nearly 5%. There has been a steady rise in new recruits of Hispanic descent ever since. In 2013, that percentage had increased to 16%. However, this group remained underrepresented relative to the growing comparable civilian population (20%; U.S. Department of Defense, 2013).

### **ASVAB MISNORMING AND JOB PERFORMANCE MEASUREMENT PROJECT**

In 1980, the DoD announced that the ASVAB in use since 1976 had been misnormed, with the result that scores in the lower ranges were artificially inflated (Boldt, 1980; Jaeger, Linn, & Novick, 1980; Maier & Grafton, 1980; Sims & Truss, 1978, 1979, 1980). In other words, in developing norms for the ASVAB, an error was made in the sample and method used to convert raw scores to percentile scores. As a result, approximately 360,000 men and women entered service during the period 1976–1980 who would not otherwise have met enlistment standards (Eitelberg, 1988). About one out of every four male recruits across all services in those years

would have been disqualified under the aptitude standards the services intended to apply. Young African American men appear to have been the biggest beneficiaries of the misnorming. Over 40% of African American recruits during this period had test scores that ordinarily would have kept them out of the military. Hispanics, too, were affected by the misnormed ASVAB. Almost 33% would have been ineligible under the correct aptitude standards (Eitelberg, 1988). The quality of Army recruits fell to an all-time low during this period, even lower than during the period of heavy mobilization for World War II (U.S. Department of Defense, 1985).

The ASVAB misnorming episode turned out to be a natural experiment with large numbers of new recruits entering service “unselected.” The misnorming presented a unique opportunity to study, on a large scale, the validity of selection standards in a less restricted population. The people who were admitted to the military with aptitude scores below the cutoff points were assumed by their supervisors to have had scores above the enlistment standards. Individuals with legitimately qualifying scores did appreciably better than their lower-scoring peers in terms of training performance, promotions, disciplinary problems, and attrition. At the same time, the low-aptitude recruits were able to successfully perform in low- and medium-demand occupations (Greenberg, 1980; Means, Nigam, & Heisey, 1985; Shields & Grafton, 1983). As a consequence of the misnorming, members of Congress and policy makers in the DoD became interested in the methods used to set enlistment standards and to establish recruit quality requirements (Sellman, 2012; Sellman & Campbell, 2012).

In the congressional view, the fact that the ASVAB traditionally had been validated against success in training rather than on-the-job performance was potentially problematic. Supporting studies regarding the relationship between recruit quality and military performance lacked persuasive power because proxy measures (e.g., attrition, promotion rates, or reenlistment eligibility) were used rather than actual measures of job performance. Congressional scrutiny of the ASVAB misnorming and surrounding issues of recruit quality and entry standards led to the Joint-Service Job Performance Measurement/Enlistment Standards Project (JPM Project; Sellman & Campbell, 2012; Sellman, 1991).

The JPM Project comprised three phases: (a) determine the feasibility of measuring hands-on job performance; (b) if feasible, validate the ASVAB against on-the-job performance; and (c) develop an enlistment standards cost/performance tradeoff model that linked recruit quality, recruiting resources, and job performance. The overall project strategy called for each service to develop and demonstrate various job performance measurement approaches that could be used to link enlistment standards to job performance (U.S. Department of Defense, 1991; Wigdor & Green, 1986, 1991). Because of the complexity of the JPM research goals, the DoD turned to the National Research Council to provide scientific oversight and an independent technical review by nationally recognized experts as the research progressed (Wigdor & Green, 1991).

An exemplar of this research, documenting the relationship between the ASVAB and various measures of job performance, is Project A, the Army’s JPM contribution. This multiyear effort sought to assess the validity of cognitive abilities as well as supplemental predictors, such as temperament, vocational interests, and psychomotor skills. The ultimate goal was to generate a database of validity information needed for developing an organization-wide selection and classification system that would generalize across Army jobs (Campbell, 1990a, 1990b; McHenry, Hough, Toquam, Hanson, & Ashworth, 1990; Sellman & Campbell, 2012; Wise, McHenry, & Campbell, 1990).

Each service developed and demonstrated hands-on job performance measures in several military occupations. These job performance measures were used to evaluate certain surrogate measures of performance (less expensive, easier to administer tests or existing performance information) as substitutes for the more expensive, labor-intensive, hands-on job performance tests (Armor & Roll, 1984; Green, Wing, & Wigdor, 1988). Performance tests consisted of tasks chosen from the domain of tasks in selected military occupations, on which examinees (job incumbents) were evaluated. These measures were designed to replicate actual job performance yet provide objective evaluation of the performance demonstrated.

Integration of the different service research efforts into a joint service product was accomplished through development of a common data analysis plan. These analyses (a) described the distributions of hands-on performance test scores, aptitude scores, job experience, and

educational attainment; (b) assessed the reliability of the hands-on performance test scores; and (c) measured the degree of relationship (i.e., correlation) between performance test scores and other variables of interest.

These tests were administered to 8,000 incumbent, first-term soldiers, sailors, airmen, and marines assigned to 24 different occupations (U.S. Department of Defense, 1991). Occupations were selected to be representative of all military occupations with large numbers of recruits entering job skills training (McCloy, 1994). The examinees averaged 25.1 months in service, and the average AFQT score was 55.1 on a 100-point percentile scale (U.S. Department of Defense, 1991).

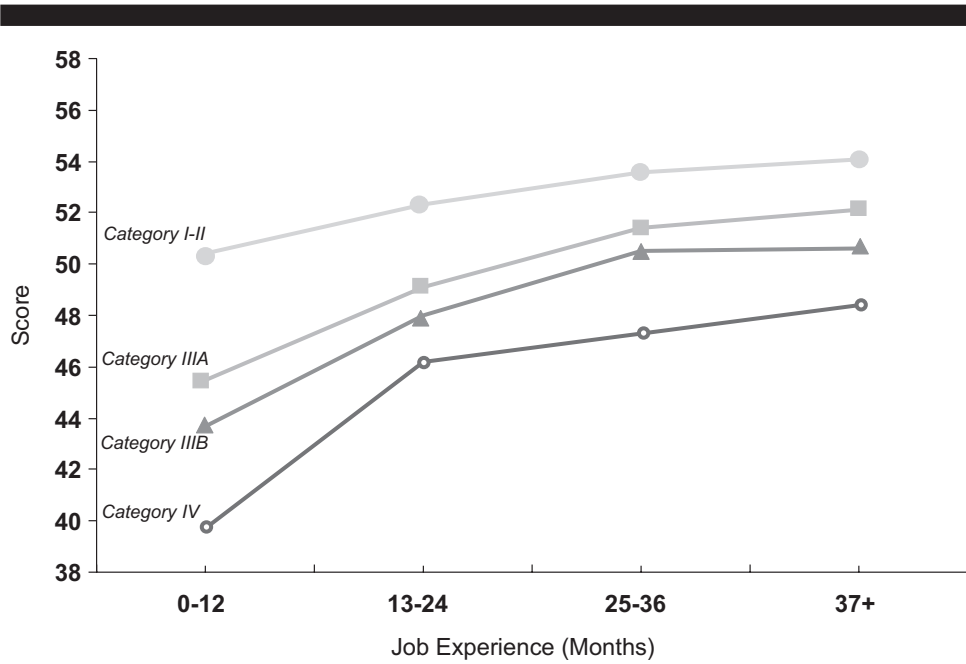
The average split-half reliability coefficient for the performance tests across all 24 occupations in the JPM Project was .72 (U.S. Department of Defense, 1991). Split-half estimates were preferred to Cronbach's alpha given the heterogeneous task content of the performance tests. Measures of reliability showed an acceptable degree of consistency in the performance test scores, suggesting that a reliable benchmark measure had been developed against which to compare the various surrogate measures of job performance (U.S. Department of Defense, 1991). The National Research Council scientists also wanted an established benchmark to which they could then compare other potential performance measures. Performance tests represented the pinnacle of the performance measure in their minds, and given the acceptable reliability that performance tests demonstrated, they were confident in fielding the surrogate measures as part of the subsequent selection and classification research.

The correlation between the AFQT and hands-on performance tests, corrected for restriction in range, yielded an average validity coefficient of .40 (U.S. Department of Defense, 1991). This level of validity is of interest because the AFQT is a test of general aptitude, whereas the performance test scores reflected observable performance in different types of occupations. Thus, the JPM Project established the link between measured aptitude for performing a job and the demonstration of doing it. Given the nature of the performance test criterion, a validity coefficient of .40 compared well with other military validity studies (Armor & Sackett, 2004).

The job performance measurement research completed by the services provided measures that closely replicated actual job performance. Rather than assessing, via a paper-and-pencil test, what enlisted personnel might know about calibrating a piece of precision avionics equipment or operating a weapon's targeting system, the services were able to assess how well enlisted job incumbents did such tasks. Although the two are related, knowledge about a job is not the same thing as being able to do the job. Typically, (corrected) validities of military aptitude tests for predicting training success or supervisor ratings have ranged between .30 and .60 (Hartigan & Wigdor, 1989).

Research shows a strong relation between ASVAB (including AFQT) scores and success in military job skills training and hands-on job performance across a range of occupations (Campbell, 1990a; Claudy & Steel, 1990; Dunbar & Novick, 1988; Earles & Ree, 1992; Holmgren & Dalldorf, 1993; Hunter, Crosson, & Friedman, 1985; Mayberry & Carey, 1997; Welsh, Kucinkas, & Curran, 1990; Wigdor & Green, 1991). The services value recruits with above average aptitude because they are more trainable and their job performance is superior to that of their lower-scoring peers. Even with on-the-job experience, enlistees with lower aptitude continued to lag behind those with higher aptitude. As is shown in Figure 31.1, below average (AFQT Category IV) recruits require more than three years of experience to attain the level of performance at which the higher aptitude recruits (AFQT Categories I-II) begin (Armor & Roll, 1984; Armor & Sackett, 2004; U.S. Department of Defense, 1991). Higher aptitude personnel also experience fewer disciplinary problems.

The information shown in Figure 31.1 came from the JPM Project (U.S. Department of Defense, 1991). Although collected more than two decades ago, these job performance data continue to be the best source of information about the job performance of enlisted personnel. For one thing, research has consistently demonstrated that cognitive ability, such as is measured by the AFQT, is a strong predictor of job performance across a variety of occupations (Campbell, 1990a; Campbell, 1990b; Hunter & Hunter, 1984; Schmitt, Gooding, Noe, & Kirsch, 1984; Welsh, Watson, & Ree, 1990). In addition, recent interviews with military training specialists responsible for the occupations used in the research reported that the occupations had changed



**FIGURE 31.1 Hands-On Job Performance Scores as a Function of Aptitude and Experience.**  
 AFQT Percentile: I (93–99); II (65–92); IIIA (50–64); IIIB (31–49); IV (10–30)

Source: Based on Office of the Assistant Secretary of Defense—Force Management and Personnel (1991:2–4).

little since the original job performance data were collected. Thus, it is safe to generalize from these data and to conclude that the relation between aptitude, experience, and job performance is still pertinent.

One of the major objectives of the JPM Project was development of a mathematical model to link recruit quality, recruiting resources, and job performance. Working with the National Research Council, in 1991 the DoD used that model to establish the DoD recruit quality benchmarks (Sellman, 1997; Sellman & Campbell, 2012; Sticha et al., 2014). In general, enlistment standards are based on judgments by service policy makers as to the level of job performance required. However, standards should be guided by empirical evidence of the relationship between recruit quality and the required level of performance. Although it is extremely difficult to specify an absolute value of performance that can be considered sufficient to guarantee successful military mission accomplishment, even so, research performed within the JPM Project developed reliable and valid measures of individual job performance that became the basis for the linkage model.

For years, industrial psychologists contended that job performance was the ultimate criterion for validating selection tests. In fact, S. Rains Wallace (1965), an eminent psychologist, once called it the holy grail of industrial psychology. Measuring job performance is a very expensive proposition. With the support of Congress and the DoD’s effort to recover from the embarrassing misnorming episode, \$40 million was made available for the JPM Project. Another aspect of this research effort that made it unique was its sustainability. It was widely recognized as a project of great merit and it lasted for more than 15 years, spanning five presidential administrations, both Democrat and Republican.

### ENLISTED SELECTION AND CLASSIFICATION IN TODAY’S MILITARY

Currently, the U.S. military recruits nearly 200,000 young people annually into full-time, active-duty service and another 150,000 into the reserve components (U.S. Department of

Defense, 2013). Standards for enlistment are established under the authority of Title X of the U.S. Code (January 2009). Enlistment criteria are based on the needs of the services and are designed to ensure that those individuals accepted are qualified for general military duties. These individuals must be able to cope successfully with a wide range of demands occurring in a military situation, such as exposure to danger, emotional stress, harsh environments, and the handling or operation of dangerous equipment. Furthermore, the services require all military members to be available for worldwide duty 24 hours a day without restriction or delay.

Operating at the service-wide level are several mechanisms that probably do more than formal enlistment standards to determine the character of entering recruits. The most important of these is the general recruiting environment—the ever-varying willingness of high-aptitude youth with high school diplomas to enter the military. This willingness cannot be considered part of a service's enlistment standards, but it sometimes directly affects the standards that a service sets. For example, during good recruiting times, a service may stop accepting non-graduates in AFQT Category IIIIB (percentiles 31–49), even though they satisfy the entrance standards codified in Title X of the U.S. Code.

Each service attempts to assign the highest quality recruit possible into the various military occupations. Consequently, composite cut scores for occupational classification represent a compromise between service ideals and fluctuating supply/demand pressures. Service officials set cut scores on the basis of personnel requirements, equipment used, training curricula, retention, the economy, and the availability of recruits with various composite aptitudes.

Because the ASVAB is used to determine enlistment eligibility and job placement, it is important to the DoD and the services that the test be fair and equitable for all military applicants, no matter their gender or race/ethnicity. Over the years, military personnel researchers have devoted considerable effort to ensure that the ASVAB is a valid predictor of job training success and performance on the job and to minimize adverse impact for various subgroups. While the ASVAB yields subgroup differences that are similar in magnitude to those typically observed for comparable cognitive test batteries (Roth, Bevier, Bobko, Switzer, & Tyler, 2001; Sackett & Shen, 2009), research indicates that the ASVAB is valid for minorities and women. Equations for prediction of final grades in military training courses from the ASVAB were essentially the same for Whites and minorities and men and women (Held, Fedak, Crookenden, & Blanco, 2002; Mayberry, 1997; Wise et al., 1992).

Where differences in prediction of school grades were observed, technical training performance of minorities was overpredicted by the ASVAB. For women, the ASVAB slightly overpredicted technical training performance in non-traditional career fields. No differences were found for traditional military occupations. The Office of the Secretary of Defense asked the Defense Advisory Committee on Military Personnel Testing to review the Wise et al. (1992) research, which looked at applicants across all services. In responding, the chair of that committee noted: “The conclusions from the analyses—that the ASVAB technical composites are fair and sensitive—are clear and compelling, and the use of the same enlistment standards and qualification scores for military occupations for all young people is justified” (Drasgow, 1992, p. 2).

## ENLISTMENT PROCESS

Young men and women interested in joining the military enter the enlistment process by contacting service recruiters. In addition to providing information about service life, opportunities, and benefits, recruiters also begin the initial screening of applicants. Most prospects take an enlistment-screening test at a recruiting office. This enlistment-screening test is used to predict the likelihood of “passing” the AFQT (Barnes & Brown, 2013). Estimates are that 10–20% of prospects do not continue beyond this point (U.S. Department of Defense, 2004).

Applicants must meet multiple requirements before they are selected for service. After recruiters have completed the preliminary screening and prospects have decided to enlist, they can go either to a Military Entrance Processing Station (MEPS) or a military entrance testing (MET) site to take the ASVAB. Military and civilian staffs at MEPS evaluate applicants' medical qualifications, aptitude, and moral character on the basis of standards predetermined by the

services. Some services also require a test of physical ability at the MEPS. (Military Entrance Processing Stations were previously known as Armed Forces Examining and Entrance Stations.)

If an applicant achieves qualifying ASVAB scores and wants to continue the application process, a physical examination and background review is conducted at the MEPS. The physical exam assesses medical fitness for military service and includes the measurement of blood pressure, pulse, visual acuity, and hearing; blood testing and urinalysis; drug and HIV testing; and medical history. If a correctable or temporary medical problem is detected, applicants may be required to get treatment before proceeding. Other applicants may require a service waiver for some disqualifying medical conditions before being allowed to enlist (Sackett & Mavor, 2006).

Furthermore, applicants must meet rigorous moral character standards. Applicants undergo detailed interviews covering any involvement with civil law enforcement (e.g., arrests, convictions), and some undergo a financial check or computerized search for criminal records. Some types of criminal activity are immediately disqualifying; other cases may offer the possibility of a waiver of the rule, wherein the services examine applicants' circumstances and make an individual determination of qualification (Putka, Noble, Becker, & Ramsberger, 2004). Moreover, applicants with existing financial problems are not likely to overcome those difficulties on junior enlisted pay. Consequently, credit histories may be considered as part of the enlistment decision.

If the applicant's ASVAB score, education credentials, medical fitness, and moral character qualify for entry, then the applicant meets with a service classification counselor at the MEPS to discuss options for enlistment (Sackett & Mavor, 2003). The counselor considers the applicant's qualifications along with service training or skill openings, schedules, and enlistment incentives. In this classification process, high-scoring recruits are discouraged from choosing jobs that require only low aptitude, and recruits who want to enter jobs for which they barely meet the standard but who have high aptitudes in other areas are encouraged to choose jobs for which they are better qualified. Each service has incorporated its algorithms into computerized job reservation systems that service counselors at MEPS use to match the individuals' desires with the needs of the services so that one component of those needs will be how well recruits' ASVAB scores suit them for the various jobs.

Generally, those who score higher on tests will have more occupational options. Although the process differs by service, specific skills and occupational grouping are arranged similarly to an airline reservation system, with the training "seat" and time of travel (to recruit training) based on the school or the field unit position openings. Using enlistment incentives (cash bonuses or extra money that can be used to cover college costs), recruiters may encourage the applicant to choose hard-to-fill occupational specialties. Ultimately, it is the applicant's decision to accept or reject the offer. Although some applicants discuss options with their family and friends, others decide not to enlist (Sackett & Mavor, 2006).

### RECRUIT QUALITY BENCHMARKS AND ENLISTMENT STANDARDS

With the advent of the all-volunteer force (AVF) in 1974, recruit quality became a significant issue within the DoD and the Congress. Many critics of the AVF believed that the services would not be able to attract a sufficient number of high-quality recruits. Consequently, since that time Congress has tracked trends in recruit quality, just as it does for recruit quantity. In 1975, the Office of the Secretary of Defense (OSD) submitted a report to Congress on service recruit quality requirements (U.S. Department of Defense, 1975). In this report, the OSD retrospectively estimated that the Army would need 22–23% new recruits in AFQT Categories I–II, 57–58% in Category III, and 20% in Category IV. It is interesting to note that in the early days of the AVF, recruiting analysts in the Pentagon were willing to accept a much lower level of recruit quality than became the case with experience and certainly is true today.

A decade later, in 1985, the OSD submitted a second report to Congress on recruit quality requirements (U.S. Department of Defense, 1985). This report reflected 10 years of experience in projecting recruiting requirements and was a more sophisticated effort to tie recruit quality to job performance. The recruit quality requirements in the 1985 report were prepared by the

services, instead of being developed by the OSD, as they were in 1975. In the 1985 report, the Army projected that it would need 90% high school diploma graduates, 59% Categories I–III, and 10% Category IV for FY 1989 recruits. With the exception of the percentage of low-aptitude recruits that the Army said would be acceptable, the Army's other quality requirements were virtually identical to today's recruiting benchmarks (Sticha et al., 2014).

How does the U.S. military decide how many high school diploma graduate and above-average aptitude recruits to enlist? The goal is to maximize recruit quality (aptitude and education) while minimizing recruiting, training, and attrition costs. In conjunction with the National Research Council, and based on the results of the JPM Project discussed earlier, the DoD developed a mathematical model that links job performance to recruit quality and recruiting resources; this model specifies the number of high-quality recruits who will provide the desired level of job performance for the least cost (Harris et al., 1991; McCloy, 1994; Smith & Hogan, 1994; Wise, 1994). Scores from the JPM Project define the job performance variable (Green & Mavor, 1994; Wigdor & Green, 1991). Costs reflect training costs, compensation costs, and recruiting costs (e.g., recruiter compensation and money for advertising, education benefits, and enlistment bonuses). Using these relations, the model allows “what-if” analyses to examine how changes in one or more of these variables affect the other variables. For example, the model could answer how decreasing the DoD advertising budget by \$20 million would affect recruit quality and job performance.

What should be the desired level of performance? Recruit quality benchmarks are used to help ensure that recruit performance is sufficient to complete military missions. The model cannot estimate how much quality is enough; rather, policy decision makers/recruiting analysts within the DoD set the desired level of performance. Nevertheless, the model can help specify a cohort of recruits that will provide the desired level of performance for the lowest cost (Sellman & Campbell, 2012).

The performance level identified by the recruiting analyst is a minimally acceptable value. The DoD has chosen the level of performance provided by the 1990–1991 enlisted cohort (the cohort in service during Operations Desert Shield and Desert Storm). Specifying this level of desired performance resulted in recruit quality benchmarks that call for 60% of recruits to score above the 50th percentile on the AFQT (i.e., to be in Categories I–III) and 90% to have high school diplomas (Sellman, 1994). These benchmarks are not enlistment standards that the services use to establish entrance eligibility. Rather, they are recruiting goals that the services strive to meet to maximize performance and minimize recruiting costs. Standards codified in Title X of the U.S. Code are considerably lower (i.e., AFQT scores at the 10th and 31st percentiles for high school diploma graduates and non-graduates, respectively) than standards actually used by the services for enlistment purposes (Sellman, 2004).

## NEED FOR MILITARY OFFICER SELECTION AND CLASSIFICATION

Military officers must be adept decision makers and problem solvers, good managers and supervisors, and effective leaders (Paullin et al., 2014; Wolters et al., 2014). But, unlike their civilian leader counterparts, military officers must be prepared to endure physical hardships over long periods of time and the strain of being and placing others in harm's way. Officer selection research repeatedly supports the importance of stress tolerance and physical fitness for effective officer performance (Allen et al., 2014; Legree, Kilcullen, Putka, & Wasko, 2014), and U.S. Military Academy research has demonstrated that grit and hardiness are important predictors of performance of West Point graduates (Kelly, Matthews, & Bartone, 2014).

Because officer education represents a substantial investment, the services also need to select officers who will stay in the service beyond their initial active-duty service obligation (ADSO). As mentioned previously, military selection is a closed system. American military leaders are “grown” from the junior ranks. Clearly, officer selection strategies must yield a pool of junior officers who are committed to serving, well-equipped with the skills and abilities they need to serve effectively, and capable of attaining higher ranks (Eitelberg, Laurence, & Brown, 1992).

**SELECTION FOR OFFICER COMMISSIONING PROGRAMS**

Military officers are commissioned through several sources. About 35% of all new active-duty officers are commissioned through Reserve Officer Training Corp (ROTC) programs, with the remaining new officers coming from four-year service academies, Officer Candidate School (OCS)/Officer Training School (OTS) programs, and direct appointments. The Army and Air Force rely more heavily than the other services on ROTC, with roughly half of their new officers being commissioned through ROTC. The Navy's distribution of new officers is fairly even across all sources. The Marine Corps has a very small ROTC program and counts on its OCS program for more than 60% of its new officers.

To ensure that the officer corps can meet the rigorous demands placed on officers, the service academies use a highly selective "whole person" approach to select their students, hence, officer candidates. Candidates are selected based on scores on college admission tests, such as the Scholastic Achievement Test (SAT) and American College Test (ACT) and a host of other variables designed to get at leadership potential, achievement orientation, physical fitness, and endurance, such as participation in athletics, high school grades, and teacher recommendations. Applicants must be unmarried, U.S. citizens, and between 17 and 23 years of age. Most applicants must obtain a letter of nomination from a member of the U.S. Congress, and the process of securing a nomination is lengthy and highly selective, with its own requirements and deadlines.

Each service's ROTC has a collection of programs. Four-year ROTC scholarship programs use a whole-person selection approach that resembles service academy selection (without the nomination requirement). Like the service academies, ROTC scholarship programs involve a substantial monetary investment in the candidate's education. Consequently, selection of individuals who will succeed in college is critical at this stage, and SAT and ACT scores have been shown to predict college grades (Morgan, 1990; Richardson, Abraham, & Bond, 2012). The services typically do not require cadets who drop out of school or out of ROTC within the first year or two to reimburse tuition and expenses. Therefore, attrition or disenrollment from college or ROTC is a concern.

In recent years, the Army added a measure of temperament, the Cadet Background and Experience Form (CBEF) to its whole-person score to improve selection of cadets who are likely to complete college and become commissioned officers (Legree et al., 2014). College students also may apply for two- or three-year ROTC scholarships. These students will have taken military coursework, and the evaluation for scholarships takes collegiate performance and course grades into account. Selection for non-scholarship ROTC programs varies by service and location and can include service-specific test scores in conjunction with other academic, physical fitness, and experiential requirements.

ROTC programs make a distinction between the first two basic years of the ROTC curriculum and the last two, advanced or professional, years. As cadets transition to more advanced levels, they participate in field training courses outside of the classroom and may take service-specific aptitude measures. Air Force ROTC cadets take the Air Force Officer Qualifying Test (AFOQT; Weissmuller, Schwartz, Kenney, & Gould, 2004). The Navy and Marine Corps use a similar test, the Aviation Selection Test Battery (ASTB), to select student flight officers and student pilots (Naval Operational Medicine Institute, n.d.).

It takes four years to produce an officer through ROTC programs or the service academies. In contrast, OCS/OTS programs are two to four months long, providing a relatively quick means of meeting officer manning requirements. Consequently, the number of available OCS/OTS seats is highly variable over time, depending upon current demands. OCS/OTS programs provide an avenue for college graduates with no ROTC experience and enlisted service members who also are college graduates to become military officers. Selection is based on college grades, cognitive test scores, and scores on physical fitness measures as well as interviews.

For cognitive measures, the Army and Marine Corps rely primarily on scores on the ACT, SAT, or for enlisted personnel, the ASVAB. The Navy, Marine Corps, and Air Force use service-specific tests, the ASTB and the AFOQT, respectively. The Army and Air Force currently are conducting research using noncognitive measures in an attempt to select candidates who are



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likely to perform well, stay on active duty beyond their initial commitment, and fit well in their military occupations. One salient finding from the Army's longitudinal OCS research is that the two populations in OCS (i.e., college graduates with no military experience and enlisted personnel with college degrees) differ substantially in terms of demographic background, motivation, and experience. Prior enlisted candidates tend to be older and more committed to staying in the Army until retirement (Allen & Young, 2012; Thirtle, 2001). Separate prediction equations are needed to predict important outcomes for the two groups (Allen et al., 2014).

The smallest and most specialized commissioning method is through direct appointment. This program is designed for individuals who currently possess an advanced degree and wish to enter the military in the fields of medicine, dentistry, law, or the chaplaincy. Upon selection, individuals are immediately commissioned and subsequently attend a short training course to prepare them for the military.

## SELECTION OF PILOTS AND AIR CREWS

The Navy, Air Force, and Marine Corps select student pilots well before commissioning, before or during ROTC and OCS/OTS. Pilot and air crew selection has an engaging history, beginning in World War I at a time when the science of flight was in its infancy and psychometric measurement methods were maturing (Russell & Rumsey, 2012). Little was known about the skills and abilities required for pilot and air crew positions, let alone how to select for them. Army and Navy researchers such as E. L. Thorndike (1947) and John Flanagan (1948) pioneered a host of assessment methods during World Wars I and II that serve as the foundation for test batteries used today.

The ASTB grew out of a World War II research effort, the Pensacola 1000 Aviator Study, which examined more than 60 psychological, psychomotor, and physical tests (North & Griffin, 1977). The Naval Operational Medicine Institute (NOMI) revised the ASTB in 2004 (NOMI, n.d.). The current version has seven tests: the Math Skills Test, Reading Comprehension Test, Mechanical Comprehension Test, Aviation and Nautical Information Test, Naval Aviation Trait Facet Inventory, Performance Based Measures Battery, and Biographical Inventory with Response Validation. Four composite scores—Academic Qualifications Rating (AQR), Pilot Flight Aptitude Rating (PFAR), Flight Officer Aptitude Rating (FOFAR), and Officer Aptitude Rating (OAR)—are used to select students for pilot and flight crew jobs.

The AFOQT was developed and validated by the Air Force Human Resources Laboratory and is now managed by the Air Force Personnel Center (Weissmuller et al., 2004). The AFOQT covers areas such as word knowledge, math knowledge, general science, table reading, and aviation information. Scores contribute to five composites: Verbal, Quantitative, Academic Aptitude, Pilot, and Navigator/Technical. Aviator and flight officer candidates (e.g., pilot, combat systems operator, and air battle manager) must meet minimum scores on the Pilot and Navigator/Technical composites and pass the Pilot Candidate Selection Method (PCSM), which comprises results on the AFOQT and the Test of Basic Aviation Skills (TBAS; Carretta, 2005)—a test of spatial, dichotic listening, and psychomotor abilities.

After the Air Force became a separate service in 1947, the Army concentrated on the selection of rotary wing, or helicopter pilots, most of whom were warrant officers coming through the enlisted ranks. Currently, the Army uses the Selection Instrument for Flight Training (SIFT; Paullin, Katz, Bruskiewicz, Houston, & Damos, 2006) for the selection of rotary wing pilots. SIFT includes portions of the ASTB as well as components that were specifically developed for the Army (e.g., the Army Aviation Knowledge Test).

## OFFICER OCCUPATIONAL ASSIGNMENT

To make assignments to occupations other than pilot, flight officers, and direct commissioned occupations, each service begins with an overall officer accession target. Overall targets are divided across commissioning sources so that each source has an assigned target, or quota, for

the number of officers overall and the number of officers in occupations. In turn, commissioning sources try to meet several goals in assigning cadets/candidates to occupations:

- Meet strength and manning distribution requirements;
- Ensure that the higher quality leaders are distributed among all occupations;
- Balance officer demographic characteristics across occupations;
- Maximize satisfaction by assigning cadets to occupations they prefer; and
- Assign cadets to occupations where they will perform the best, based on their skills, abilities, and interests.

These goals often conflict. Assignments that maximize performance might assign a large proportion of the highest-performing cadets to the same occupation, so that quality would not be acceptably distributed. There also are a number of constraints on assignments, the first being the number of available slots for an occupation. Additionally, some occupations require a degree or other special qualifications. For example, a weather officer must have a degree in meteorology or a related field. Clearly, this complicates optimal assignment of cadets/candidates to occupations.

The needs of the service are paramount to other classification goals, and those needs are embedded in algorithmic and judgment-based methods the services use to make assignments. For example, the Air Force uses an optimization algorithm to determine the targets (or quotas) for commissioning programs and make assignments to non-flying occupations. The algorithm takes account of degree requirements and desirable qualifications for occupations, overall accession goals for each occupation, and student preferences (Sickorez, 2003). Mismatches where the remaining occupational requirements do not match candidate qualifications must be resolved judgmentally.

The Army recently has made a number of changes to the officer assignment process. Like the other services, the Army has traditionally slotted cadets from each graduating class (service academy, ROTC, or OCS) into branches (e.g., occupational clusters such as Infantry or Armor) by matching cadets' branch preferences and with their rank ordering on an order of merit list (OML) based on academic, military and physical records. In 2014, the United States Military Academy (USMA) implemented a new officer branching system. The new system involves (a) comprehensive assessment of cadets during their junior year to help them understand their own talents and occupational interests, (b) training and developmental experiences to help cadets become better informed about specific branch characteristics (e.g., typical branch missions, capabilities, equipment, assignments, etc.), and (c) matching of cadet assessment scores to branch requirements. Military Academy OML ranking, cadet preferences, results of the matching process, and Army requirements are all considered in the final branching decision (Sönmez & Switzer, 2013).

Army ROTC also recently implemented changes to its branching process. Cadets who meet a minimum criterion on the OML ranking have the option of extending their ADSO by three years in exchange for their branch of choice. Finally, OCS branching changed in 2008. The new method rewards candidates for strong performance in OCS. At the end of the sixth week of the 12-week OCS course, each candidate, in order of OML ranking, selects the branch they want from the remaining options. Candidates with lower OML rankings have fewer branch choices.

### NEW DIRECTIONS IN MILITARY SELECTION AND CLASSIFICATION

Enlisted and officer selection and classification programs are maintained by service research organizations and at the DoD level. This involves extensive and ongoing test development and validation and development and analysis of near-term and longitudinal data.

#### ASVAB Research

Since the ASVAB was implemented in 1976, the Cattell-Horn-Carroll (CHC) model of human intellect (Carroll, 1993; Cattell, 1987; Horn, 1989) has garnered a broad base of support in the research literature. It is a hierarchical model. At the highest level, a general factor ( $g$ ) accounts for

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the correlations that exist among all ability measures. There is a wealth of evidence indicating that *g* is a good predictor of job performance (e.g., Ree & Earles, 1992). The next level consists of eight broad factors including crystallized and fluid intelligence. The third, and lowest, level in the hierarchy consists of more specific abilities relating to each of the eight broad factors.

Crystallized and fluid intelligence are particularly important because they are so central to *g* and because they are broader than the other six, more-specific factors of *g*. Crystallized intelligence underlies performance on knowledge or information tests. Fluid intelligence subsumes virtually all forms of reasoning—inductive, conjunctive, deductive, and so forth. It is at the heart of what is typically called intelligence, and it facilitates accumulation of crystallized knowledge (Carroll, 1993; Horn, 1989).

The ASVAB technical tests are crystallized intelligence tests. Identifying a fluid intelligence test is a little trickier. Most tests require both knowledge and reasoning ability. Tests are good reasoning measures to the extent that they contain words or materials that are equally familiar, or unfamiliar, for all examinees; otherwise, variance due to knowledge makes them crystallized intelligence measures (Carroll, 1993; Horn, 1989). Noting that fluid ability is not strongly represented in ASVAB, a panel of experts recommended that the services review tests developed in earlier research projects, looking for fluid intelligence measures and measures of specific abilities that might be useful for classification purposes (Drasgow, Embretson, Kyllonen, & Schmitt, 2006). The services have made a number of steps toward that end, including:

- *Reconsidering Coding Speed (CS)*. CS, a measure of cognitive speediness, was dropped from the ASVAB in 2002 due to concerns about item response theory (IRT) scoring and potential lack of portability across paper-and-pencil and computer-administered modes of administration. Even so, the Navy retained it as a special test (Held, Carretta, & Rumsey, 2014), and the DoD continued to conduct studies of its portability and made scoring improvements (Segall, 1997). In recent validation studies by the Navy, CS provided small increments in validity over AFQT for predicting performance in Navy jobs, reduced adverse impact compared to other measures, and improved classification (Held et al., 2014).
- *Reconsidering Working Memory Capacity (WMC)*. WMC is a process that is involved in the performance of reasoning tasks (Carroll, 1993; Kyllonen & Christal, 1990). The DoD is evaluating the Mental Counters test (MCt), a WMC test that was a part of the Enhanced Computer Administered Test (ECAT) battery (Alderton, Wolfe, & Larson, 1997). ECAT research showed that MCt (a) loaded strongly on *g*, (b) provided incremental validity over AFQT for predicting performance in military occupations, (c) showed classification potential, and (d) minimized male–female and White–Hispanic subgroup differences (Sager, Peterson, Oppler, Rosse, & Walker, 1997). MCt is currently being administered to all Navy applicants at MEPS (Moreno, 2014).
- *Adding a matrix-type test*. Matrix-type tests are well-established measures of fluid intelligence (Carroll, 1993). Trends are embedded in the rows and columns of a figural matrix, and examinees must find the figure that belongs in a specified cell of the matrix based on those trends. The DoD is currently preparing to pilot the test (Moreno, 2014).
- *Making better use of Assembling Objects (AO)*. AO was a part of the JPM research test batteries (Alderton et al., 1997; Campbell & Knapp, 2001; Peterson et al., 1990) and became part of the ASVAB in 2002. Factor-analytic research suggests that AO, which has spatial content, is a measure of visual perception and nonverbal reasoning. In the ECAT project, it provided modest incremental validity over the ASVAB for predicting performance in a wide array of military occupations and demonstrated classification potential for some occupations (Held et al., 2014; Sager et al., 1997).
- *Identifying cyber talent*. A Cyber Test was developed and validated as a special supplement to ASVAB for selection into cybersecurity occupations (Trippe, Moriarty, Russell, Carretta, & Beatty, 2014). In June 2014, the Air Force began operational use of the Cyber Test, and the Army is currently conducting validation studies on it.

## Noncognitive Measures

The biggest stumbling block the services have encountered in trying to implement noncognitive measures of personal characteristics such as personality and interests is that applicants tend to present themselves in an overly positive light, or “fake.” Knowing this, the services have conducted a number of research efforts, including (a) evaluating noncognitive measures in

an operational setting, (b) conducting additional research on reducing or detecting faking, and (c) using test development and administration methods known to reduce faking.

Decades of research have culminated in two forced-choice, adaptive personality measures to overcome faking—the Tailored Adaptive Personality Assessment System (TAPAS) and Navy Computer Adaptive Personality Scales (NCAPS) (Rumsey & Arabian, 2014b). The TAPAS presents pairs of statements, often representing different traits, and asks test takers to select the one that is most like them (see Stark et al., 2014). The Army uses TAPAS to make decisions about applicants who have a high school diploma but fall into AFQT Categories IIIB and IV. Those with very low TAPAS scores are screened out. The Army also is conducting research on the possible use of TAPAS in officer selection. The Air Force does not use TAPAS for selection but does use TAPAS scores for classification into Special Operations Forces positions. The NCAPS presents examinees with pairs of statements representing different levels of a trait (unlike TAPAS, which often presents pairs of statements representing different traits) and asks them to select the statement that is most like them. Up to 15 pairs of statements are presented for each trait, until a precise estimate is obtained. Ongoing research continues to investigate the NCAPS (e.g., Oswald, 2010; Schneider et al., 2007), and it has been used operationally to help the Navy select individuals into Special Operations training assignments.

### Educational Attainment

Another possible use of noncognitive measures would be to replace educational achievement in the enlistment screening process. The DoD has moved some alternative educational credentials from Tier 2 to Tier 1, despite higher attrition rates for personnel attaining them because the DoD wants to avoid the appearance of devaluing alternative programs, but doing so reduces the effectiveness of the tier system in minimizing attrition. One solution to this issue would be to discontinue educational achievement as an enlistment screen. Education credentials could be replaced by noncognitive measures, which have been shown to be useful predictors of attrition. Educational credentials would still be documented, reported, and included in research but not used for selection. Research simulating the effects of such a move could help support or reject the notion. If this policy were adopted, the recruit quality benchmarks, described earlier in the chapter, would need to be redefined and revalidated to include noncognitive measures in place of educational credentials, using contemporary data.

### CONCLUDING REMARKS

Given the size of the military, the services need selection and classification methods that can be implemented efficiently on a large scale and used to identify personnel who will fit well in the military, perform well in their jobs, and stay in their assigned occupations, at least long enough for the services to make the investment in soldier/sailor/airman/marine/officer education worthwhile. Over the last century, these needs have driven the services to pioneer testing methodologies such as computer-based testing, IRT, adaptive personality measurement, statistical methods, and a host of other techniques that are beyond the scope of this chapter. These accomplishments are the product of a vibrant military testing community that continues to conduct large-scale, cutting-edge, short-term, and longitudinal investigation of methods to enhance selection and classification.

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