

# PRELIMINARY OPERATIONAL FINDINGS FROM THE ARMY'S TIER TWO ATTRITION SCREEN (TTAS) MEASURE<sup>1</sup>

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## ABSTRACT

This paper reports preliminary operational findings on a new non-high school diploma graduate (NHSDG) quality indicator called the Tier Two Attrition Screen (TTAS). TTAS combines several indicators of adaptability from the motivational (Assessment of Individual Motivation (AIM)), cognitive (Armed Services Vocational Aptitude Battery (ASVAB)), and physical fitness (Body Mass Index) domains to measure the attrition propensity of NHSDG applicants. The TTAS measure is being used as part of an Army NHSDG recruiting market expansion pilot program that was fully implemented in April 2005. Under this ongoing program, DoD is allowing the Army to access thousands of additional TTAS-qualified NHSDG recruits because these recruits are projected to have attrition rates that are lower and more similar to those of high school diploma graduates (HSDG). Our preliminary results for General Educational Development (GED) credential holders indicate that the operational TTAS measure predicts both 6- and 9-month attrition. Those who passed the current TTAS standard (set at the 50th percentile) had a 6-month attrition rate (6.2%) that was nearly as low as the attrition rate for HSDG (i.e., 5.6%); and considerably lower than the attrition rate of those NHSDG who failed the TTAS standard (i.e., 10.3%). Consistent with previous projections, we also found that those applicants scoring in the top 30% of the TTAS score distribution had 6- and 9-month attrition rates that were nearly identical to those of HSDG. The use of the TTAS measure as an NHSDG quality indicator is projected to save the Army \$100 million in recruiting resources over the course of this market-expansion pilot program. Future directions in ARI's TTAS evaluation research are discussed.

## 1. BACKGROUND

First-term enlisted attrition has been a persistent concern for the Army. This type of turnover is disruptive, degrades unit performance, and wastes

valuable training and recruiting resources. As the Army transforms to the Future Force, effective attrition management will be a key requirement for its success.

The Army places a premium on recruiting high school diploma graduates (HSDG) because earning a high school diploma is predictive of an individual's potential for adapting to military life. In contrast, non-high school diploma graduates (NHSDG) have historically had relatively high attrition rates, with approximately half of them failing to complete their initial term of enlistment. Collectively, their high attrition is costly to the Army, reduces available manpower for deployment, and reduces the pool of potential Noncommissioned Officers for the Future Force. This is why the Department of Defense (DoD) has limited the percentage of NHSDG that the Army can bring in during a given year --- to 10% of all Regular Army enlisted accessions. However, these youth are relatively inexpensive to recruit, and some NHSDG do make very good Soldiers. Since nongraduates are relatively abundant in the youth population, they represent a potential Army recruiting market which has been underutilized. For these reasons, along with the ongoing challenges of an extremely difficult recruiting environment, there has been considerable interest in developing screening measures that can identify the subset of NHSDG that have an attrition propensity more comparable to that of high school diploma graduates.

In our 2004 Army Science Conference paper (White, Young, Heggstad, Stark, Drasgow, & Piskator, 2004), we described how the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) developed a pre-enlistment attrition screening measure that could be used to reduce first-term attrition among NHSDG. This measure is called the Tier Two Attrition Screen (TTAS). TTAS combines several indicators of

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adaptability from the motivational (Assessment of Individual Motivation or AIM), cognitive (Armed Services Vocational Aptitude Battery or ASVAB), and physical fitness (Body Mass Index) domains to measure the attrition propensity of NHSDG applicants. In FY05, TTAS was implemented nationwide as one component of the Army's NHSDG recruiting market expansion pilot program of the same name. Given the extremely challenging recruiting environment, ARI's TTAS measure has made it feasible for the Army to expand NHSDG recruiting at a time of critical need. Under this ongoing program, qualified NHSDG recruits with above-average scores on TTAS are given enlistment incentives that are normally restricted to high school diploma graduates. Importantly, the Army will be able to access several thousand of these high-quality NHSDG recruits through FY07 without counting them against DoD's 10% cap for nongraduate enlisted accessions. This is because TTAS-qualified NHSDG are projected to have attrition rates that are lower and more similar to those of HSDG. Compared with the costs of digging deeper into the relatively expensive HSDG recruiting market, the Army's ability to recruit more high-quality NHSDG could save millions of dollars in recruiting resources.

The current paper reports preliminary findings on how well TTAS is working for Regular Army recruits who applied for enlistment under this operational, market-expansion pilot program.

## 2. METHOD

Our evaluation reported here focused specifically on the performance of the TTAS measure – irrespective of the other program requirements. No attempt was made to evaluate overall program effects. We used a predictive validation design to examine relationships between scores on the operational TTAS measure and subsequent Initial Entry Training (IET) attrition.

### 2.1 Evaluation Approach

We originally planned to examine the relationship between TTAS scores and attrition for several education credential subgroups. These include General Educational Development (GED), National Guard Youth Challenge, and Home School Diploma credential holders in Tier 2, as well as Job Corps credential holders in Tier 1. However, only the GED subgroup had a sufficient sample size to enable a reliable validity estimation at this time. Six-month attrition was used as the primary outcome measure for assessing the validity of TTAS.

The attrition rate for all Regular Army Tier 1 Soldiers ( $n = 53,734$ ) who accessed during the same TTAS program time period (April 2005 through January 2006) was used as a comparison benchmark.

### 2.2 Subjects and Validation Samples

The validation samples included 9,551 Regular Army non-prior-service enlisted recruits who (1) had a valid TTAS score, (2) subsequently accessed into the Army from April 2005 through January 2006, and (3) had a 6-month attrition status (coded 1 = separated; 0 = still in service) that could be determined as of July 2006. Soldiers in these samples included all accessions with a valid TTAS score; a subset of those passed the TTAS enlistment standard and subsequently entered the Army under the TTAS program. These samples are described in Table 1. The GED sample consists of 8,593 accessions and accounted for 90% of all those in our validation samples shown in the table. In addition to the GED credential holders, a total of 69 accessions (less than 1%) with other alternative credentials (i.e., Distance Learning School Diploma, High School Certificate of Attendance, Certificate of Special Education, and other Non-Traditional High School credentials) were included with this GED validation sample. The GED sample had the following characteristics: 57% Armed Forces Qualification Test Category I-III A, 12% female, 9% Black, and 10% Hispanic. At the time of contract, the mean age of these Soldiers was 21.

As shown in Table 1, 51% of the GED validation sample passed the current TTAS standard (102) which is set at approximately the 50<sup>th</sup> percentile for NHSDG. Note that all accessions in this sample were compared against the current standard, even if they actually accessed when the original standard of 112 was in place. The 6-month attrition rate for the overall GED sample is 8.2%. This contrasts with the overall Tier 1 attrition rate of 5.6, based on 53,734 cases (see bottom row of the table).

Among the samples shown in Table 1, only the TTAS scores for our GED validation sample were actually used as a standard for qualifying applicants for enlistment under the TTAS pilot program. The remaining educational groups (i.e., National Guard Youth Challenge, Home Study, and Job Corps) completed TTAS for research purposes only. No Tier 1 applicants, including those with the Job Corps credential, currently participate in the TTAS pilot program.

Table 1  
*TTAS Validation Samples*

Educational Credential Group	<i>n</i>	Mean TTAS Score <sup>a</sup>	% Passing TTAS (102 or higher)	6-month Attrition Rate For Total Group
GED <sup>b</sup>	8,593	98.2 (20.8)	51%	8.2%
Other Credentials:				
NGYC <sup>cd</sup>	360	103.7 (18.1)	62%	5.0%
Home School <sup>d</sup>	314	95.7 (25.8)	48%	7.3%
Job Corps <sup>d</sup>	284	94.7 (23.1)	44%	8.5%
Combined Sample	9,551	98.2 (21.0)	51%	8.0%
Tier 1				
Comparison Sample <sup>e</sup>	53,734	N.A.	N.A.	5.6%

<sup>a</sup>Standard deviations are shown in parentheses. The operational TTAS scores are standardized to a mean of 100 and a standard deviation of 20 based on norms developed prior to the program's implementation. The TTAS score distribution for the combined sample is comparable (mean = 92, standard deviation = 21) to previous norms.

<sup>b</sup>A very small number (<1%) of Soldiers with other alternative credentials were included in this group.

<sup>c</sup>NGYC = National Guard Youth Challenge

<sup>d</sup>The sample size for this group was too small to obtain a reliable validity estimate at this time.

<sup>e</sup>This sample was used for providing Tier 1 (High School Diploma Graduate) attrition benchmarks for comparison against the samples completing the TTAS measure. Since the TTAS program was designed for non-high school graduates, very few applicants in the Tier 1 comparison sample actually have TTAS scores.

### 2.3. Measures

Assessment of Individual Motivation (AIM). The AIM is a 27-item, self-report, paper-pencil instrument for reliably measuring six temperament constructs relevant to military performance: Dependability (Non-delinquency), Adjustment, Physical Conditioning, Leadership, Work Orientation, and Agreeableness. A forced-choice format is used to reduce fakability and to improve the accuracy of the self-report information. In addition, AIM includes an approach for detecting inaccuracies in self-reports caused by intentional or subconscious attempts to manipulate scores by exaggerating one's capabilities. The operational AIM used for the TTAS measure is scored with a new empirical key described by White et al. (2004), and is similar to the one described by Young, White, Heggstad, and Barnes (2004). The U.S. Army Research Institute developed the original AIM form in 1996, and it has since been used in multiple military personnel assessment applications. (For a more detailed description of AIM, see White & Young, 1998; White & Young, 2001; Young, Heggstad, Rumsey, & White, 2000; Young et al., 2004; and Young & White, 1998).

Armed Services Vocational Aptitude Battery Subtests. Two subtests from the Armed Services Vocational Aptitude Battery (ASVAB), Math Knowledge (MK) and Word Knowledge (WK) are used as component scores for the computation of the TTAS composite. The ASVAB is

a measure of cognitive aptitude used in the selection and classification of applicants for the Armed Services.

Gender-Normed Body Mass Index (BMI). A gender-normed body mass index (BMI) was also used as a supplemental measure for the computation of the TTAS composite. The height and weight data for computing BMI scores were obtained from Army applicant databases. The BMI score was computed using the following formula:

$BMI = (\text{weight in kilograms}) / (\text{height in meters})^2$ . To control for the effects of gender, this raw BMI score was transformed to a percentile score based on previous norms obtained separately for male and female applicants. The final gender-normed BMI score was coded as 1 when an individual's BMI fell within the highest 5% or lowest 5% for their gender group, or 0 otherwise.

Criterion Measure. For this paper, six-month attrition was chosen as the primary criterion for validating the operational TTAS scores for the GED validation sample. This measure was coded as 1 when the Soldier was discharged before completing 6 months of service, and as 0 otherwise. The six-month attrition rate for this sample was 8.2%. Soldiers who died or left the enlisted force to become Army officers were not included in the sample used in this research.

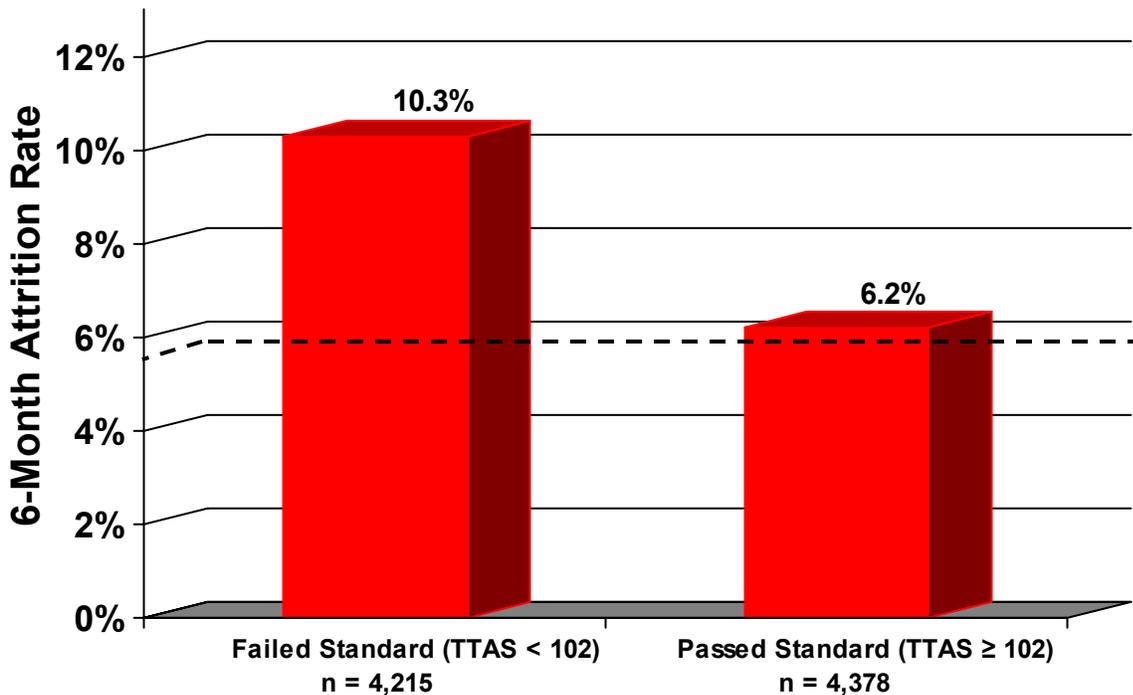
### 3. RESULTS AND CONCLUSIONS

#### 3.1 Validation Findings For GED Credential Holders

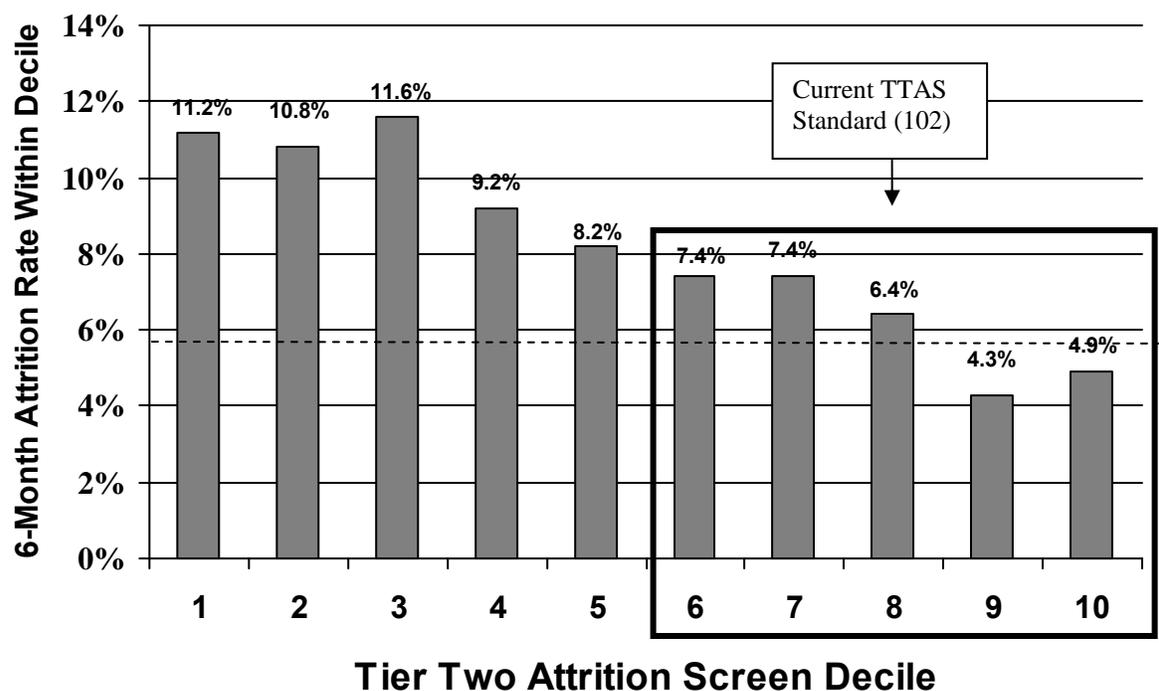
The relationship between TTAS scores and 6-month attrition for the GED credential holders is shown in Figures 1 and 2. As predicted, *higher* TTAS scores were associated with *lower* attrition ( $r = -.08, p < .05$ ). Those GEDs passing the current TTAS standard (50<sup>th</sup> percentile) had a 6-month attrition rate of 6.2% -- versus 10.3% for those who failed this standard (see Figure 1). Consistent with the goals of the pilot program, under the current standard, TTAS-identified NHSDG Soldiers had a 6-month attrition rate that was only slightly higher than that of HSDG Soldiers. The six-month attrition rate for HSDGs is 5.6%, as shown in the horizontal dotted line in Figure 1.

Figure 2 shows the relationship between TTAS score deciles and 6-month attrition. The black box on the graph highlights those TTAS scores that qualify under the

current TTAS standard (top 50%). The deciles (shown along the x axis) represent ten ranked TTAS score categories – with approximately equal numbers of persons represented within each decile. Individuals scoring below the 11<sup>th</sup> percentile on TTAS were assigned the lowest ranking (i.e., decile 1), while those scoring in the top 10% of the TTAS distribution were assigned the highest ranking (i.e., decile 10). The vertical bars indicate the mean attrition rates observed within each of the ten TTAS deciles. Those scoring in the top 30% of the TTAS distribution (i.e., deciles 8 – 10) had an attrition rate (5.2%) comparable to HSDGs, and considerably lower than the overall GED attrition rate of 8.2%. This finding is consistent with our earlier projections - based on the operational data from the GED Plus Program that were used to develop and evaluate the TTAS model (see White, et al., 2004).



**Figure 1.** Relationship between the Tier Two Attrition Screen qualification status and 6-month attrition among non-high school diploma graduate Regular Army accessions ( $n = 8,593$ ). The overall attrition rate in this sample was 8.2%. The dotted horizontal line shows the observed 6-month attrition rate of 5.6% for high school diploma graduate (Tier I) accessions during this time period.



**Figure 2.** Relationship between the Tier Two Attrition Screen deciles and 6-month attrition among non-high school diploma graduate accessions ( $n = 8,593$ ). The black box on the graph highlights those TTAS scores that qualify under the current TTAS standard (top 50%). The dotted horizontal line shows the observed 6-month attrition rate of 5.6% for high school diploma graduate (Tier I) accessions during this time period.

We also examined the relationship between TTAS scores and 9-month attrition. This relationship ( $r = -.10$ ,  $p < .05$ ) is similar to the findings for 6-month attrition. Again, we found that those scoring within the top 30% of the TTAS distribution (i.e., deciles 8-10) had an attrition rate (7.8%) comparable to that of our HSDG comparison sample (7.5%). The overall NHSDG attrition rate at 9 months was 11.4%.

The TTAS measure is working as expected, despite the relatively low 6-month attrition rate in this operational sample (8%) compared with a much higher rate (18%) in the TTAS model development sample from FY00-FY03. Such a low level of attrition places statistical constraints on the magnitude of the validity coefficient that can be obtained in this validation sample, and the validity of TTAS may increase as the attrition criterion matures beyond the period of Initial Entry Training.

### 3.2 Utility of the TTAS Measure for Recruiting Market Expansion

The potential utility to the Army from TTAS, or any screening device, is simply the reduction in operating costs (and/or the dollar-valued gain in output) due to the program, minus any increased costs associated with the screening process. The TTAS program can achieve cost savings while maintaining quality, by opening the door for the Army to assess thousands of high quality NHSDG to meet manpower needs, rather than achieving the desired operating strength through further increases in the Tier 1 recruiting mission. We used data from the Army Military-Civilian Cost System (AMCOS) to estimate differences in the marginal recruiting costs of NHSDG and Tier 1 (HSDG) in the current recruiting market. Our analysis indicated that the marginal recruiting costs were approximately \$10,000 less per NHSDG accession, as

compared with Tier 1. Projecting 10,000 TTAS-qualified NHSDG accessions (through FY07) yields a potential savings of \$100M (i.e., 10,000 personnel\*\$10,000 per accession) from the TTAS program, without risking significant increases in IET attrition, as compared with the alternative policy of expanding the Tier 1 mission.

### 3.3 Future Research Directions

These initial operational findings with GED credential holders indicate that TTAS can be effectively used for identifying NHSDG who are more similar to HSDG with respect to attrition. ARI plans to continue validating the TTAS measure as the sample sizes grow and the attrition criteria mature. It will be especially important to continue tracking the performance of TTAS to determine how well the current findings hold up as the attrition criterion matures to 1 year and beyond. In addition, we plan to evaluate the validity of TTAS for other education credential groups (e.g., National Guard Youth Challenge, Home Study, Job Corps) when adequate numbers of accessions from these groups become available.

These positive findings demonstrate the value and viability of combining multiple indicators of adaptability into a single personnel assessment measure. The Army can build on this general approach by enhancing TTAS with additional adaptability indicators. This is one of ARI's goals for future research. In addition, this general approach could be applied to other groups in an effort to find new recruiting market expansion opportunities for motivated youth that historically have had limited opportunity for enlisting in the Army (e.g., lower aptitude recruits in Tier 1). As part of the TTAS program, the Army is planning to test a sample of 5,000 Tier 1 applicants on AIM to provide a basis for investigating possible expanded applications of AIM and TTAS for Tier 1 recruits.

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