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Soldier Performance Research Project: Armor Field and SIMNET Tests

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The Phase II Armor Soldier Performance Research Project (SPRP) evaluated the effects of mental ability on the collective performance of armor crews in a high combat realism field exercise and a platoon tactical exercise in the Simulation Networking (SIMNET) system. One hundred twenty M1 tank commanders and drivers were formed into reconstituted tank crews as part of a third day of the war scenario. The TCs and drivers were paired as a function of four mental category groups as determined by the Armed Forces Qualification Test (AFQT). The results of the Field and SIMNET tests showed combat effectiveness to be clearly related to the mental ability of both the TC and driver. Differences in performance as a function of mental ability were not only found for the overall performance measures, but for pre-combat, command and control, communications, call for fire, grid coordinate determination, and encoding/decoding tasks. Analyses of the field test speed/accuracy composite showed that crews with CAT IV TCs performed at 67% of crews with CAT I&II TCs. Regressions analyses

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demonstrated that the mental categories of both the TC and driver were related to crew performance, with TC and driver AFQT scores accounting for 19% of the test variance. Skills Qualification Test (SQT) scores were also highly correlated with performance on the Armor SPRP tests. Together, AFQT and SQT predicted 30% of the SPRP variance. The Armor SPRP tests, taken together, demonstrated roughly a 25% difference between the combat effectiveness of CAT I&II and CAT IV crews. Given that the United States is investing $2.5 million with each tank it gives an Armor crew, a 25% decrement in performance is costly. The cumulative effects of mental category are even more dramatic when the SPRP findings are considered as combat multipliers. Consider the cumulative effects of the performance of CAT IV crewmen. Relative to the performance of CAT I&II crewmen, CAT IVs boresighted at 45%, hit targets at 73% (Phase I), performed with a speed of 81%, effectively called for fire at 67%, and reported accurate grid coordinates at 55%. Furthermore, combat leaders will have greater confidence in quality cirews, which will facilitate the execution of bold decisive actions. Given that combat is a series of battles in which these tasks must be performed over and over, the cumulative effects of mental ability will substantially impact combat effectiveness. Higher quality soldiers equate to higher enemy attrition and higher unit survival.

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Training Simulation

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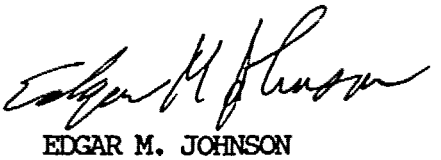
FOREWORD

The Armor portion of the Soldier Performance Research Project (SPRP) is an excellent demonstration of how different Army agencies can work together to solve Army problems. In March 1988, the Commanding General, U.S. Army Training and Doctrine Command (TRADOC), directed the U.S. Army Armor Center (USAARMC) to develop and execute research that would assess the impact of mental ability on collective Armor combat performance. The results were to be used to support the TRADOC distribution of quality program. To accomplish this task, the Office of Chief of Armor formed a Joint Working Group with representatives from the U.S. Army Armor School (USAARMS), the Test and Experimentation Command (TEXCOM), Armor and Engineer Board (ARENBD), and the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI). As can be seen, the combined expertise of these organizations resulted in a strong piece of research and a strong report.

The ARI Fort Knox Field Unit's SPRP assistance was provided as Technical Advisory Service to USAARMC. The results of the research were briefed to the Assistant Commandant, USAARMS, and were provided to the TRADOC Deputy Chief of Staff for Resource Management in May 1989. In addition, the Operational Test and Evaluation Agency (OTEA), the TRADOC Analysis Command (TRAC)--Forts Leavenworth and Monroe, and the TRADOC Cohort Task Force are using the methodology and results. While this report demonstrates the Fort Knox Field Unit's ongoing assistance to the Armor Center, it also well represents ARI's research efforts to identify the skill requirements and determinants of effective combat performance.



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LTC Royce Simpson, Test Director

CPT Mark Troutman, Chief Test Officer

CPT Ralph Obermeier, SIMNET Test OIC

SOLDIER PERFORMANCE RESEARCH PROJECT: ARMOR FIELD AND SIMNET TESTS

EXECUTIVE SUMMARY

Requirement:

The Commanding General, U.S. Army Training and Doctrine Command (TRADOC), wants to ensure that soldiers have the necessary skills and abilities to maximize the capabilities of the high-tech weapon systems being developed and fielded, and in particular, the $2.5 million M1 tank. As part of the Soldier Performance Research Project (SPRP), the Armor portion was conducted in two phases to provide a rigorous assessment of the cognitive skill requirements of first- and second-term armor crewmen. The Phase I Armor SPRP demonstrated the effects of initial-entry training (Graham, 1989). The results showed that mental category IV soldiers performed at 73% of the level of category I & II soldiers in simulated tank gunnery.

The Phase II Armor SPRP, reported here, focused on command, control, and communication (C^3) performance and tested the collective combat skills of reconstituted tank crews selected from U.S. Armor units. Specifically, the purpose of the research was to evaluate the effects of mental ability on the performance of armor crews in both a high combat realism field exercise and a platoon tactical exercise in the Simulation Networking (SIMNET) system.

Procedure:

The SPRP tested 120 19K (M1) Tank Commanders (TC) and 120 19K drivers from five Continental U.S. (CONUS) divisions. Test surrogates were used for the gunners and loaders. TCs and drivers were systematically paired as a function of four mental category groups as determined by the Armed Forces Qualification Test (AFQT); the four groups were I&II combined, IIIA, IIIB, and IV. The primary experimental design for the field and SIMNET tests was a 4 x 4 factorial design with factors of TC and driver mental category (I&II, IIIA, IIIB, and IV). The soldiers were selected by name from the five CONUS units using specific selection criteria.

The SPRP field test consisted of a high combat realism single tank tactical exercise, which evaluated the speed and accuracy of each tank crew in combat-related skills. The test was based on a third day of the war scenario in which reconstitution of crews is necessary and was conducted on a 15 kilometer course at Fort Knox, KY. The test began at a Brigade Support Area where the crew was required to prepare its tank for combat, including precombat checks and entering data into the M1 ballistic computer. The crew then proceeded through the course during which they encountered a number of engagements with opposing force troops. Performance measures included the speed and accuracy of command and control (C^2) and combat reporting.

The SIMNET test evaluated the performance of tank crews within the context of platoon tactical gunnery engagements. The tested crew in the SIMNET test served as a wingman to the platoon sergeant. During the test the platoon sergeant and later the platoon leader were killed. The tested crew thereby acquired additional combat responsibilities as the SIMNET test progressed. Similar to the field test, the SIMNET test assessed the speed and accuracy of the crews to shoot, move, and communicate. Included were situations that required the crew to call for and adjust indirect fire and decode grid coordinates.

Findings:

The results of the field and SIMNET tests showed combat effectiveness to be clearly related to the mental ability of both the TC and driver. Differences in performance as a function of mental ability were not only found for the overall performance measures, but also for precombat, C^2, communications, call for fire, grid coordinate determination, and encoding/decoding tasks. Analy-ses of the field test speed/accuracy composite showed that crews with Cat IV TCs performed at 67% of crews with Cat I&II TCs. The results also found little difference between the performance of Cat I&II and Cat IIIA crewmen.

The results also showed that mental ability affects the collective performance of the crew, not just the performance of individual tasks. Correlation and regression analyses demonstrated that the mental categories of both the TC and driver were related to crew performance, with TC and driver AFQT scores accounting for 19% of the test variance. The effects of mental ability for the TC and driver were also found to be additive, i.e., the more smart crewmen in a tank, the better the performance of the tank. The regression analyses also found that the Skills Qualification Test (SQT) scores were highly correlated with performance on the Armor SPRP tests. Together, AFQT and SQT predicted 30% of the SPRP variance.

The Armor SPRP tests, taken together, demonstrated roughly a 25% difference between the combat effectiveness of Cat I&II and Cat IV crews. Given that the United States is investing $2.5 million with each tank it gives an Armor crew, a 25% decrement in performance is costly. The effects of mental ability are even more dramatic when the SPRP results are considered as combat multipliers. Relative to the performance of Cat I&II crewmen, Cat IVs boresighted at 45%, hit targets at 73% (Phase I), performed with a speed of 81%, effectively called for fire at 67%, and reported accurate grid coordinates at 55%. Given that combat is a series of battles in which these tasks must be performed over and over, the cumulative effects of mental ability are substantial.

Utilization of Findings:

The results have been given to the TRADOC, Deputy Chief of Staff for Resource Management, the Office of the Deputy Chief of Staff for Personnel, and the U.S. Army Armor Center. The results are being used to support the TRADOC distribution of quality program and to document the skill requirements of successful armor combat performance.

SOLDIER PERFORMANCE RESEARCH PROJECT: ARMOR FIELD AND SIMNET TESTS

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SOLDIER PERFORMANCE RESEARCH PROJECT: ARMOR FIELD AND SIMNET TESTS

INTRODUCTION

The Armor force with its M1 Abrams tank continues to grow more sophisticated and lethal. Despite the technological advances in hardware, the effectiveness of weapon systems is directly determined by the skills and resourcefulness of the Armor crewmen. Furthermore, the success of Armor tactical operations requires mentally alert soldiers who can seize and hold the initiative on an increasingly complex battlefield. If the Army is to maximize the effectiveness of the Armor force with its $2.5 million tank, the Army must maximize the skills of its Armor crewmen.

The research reported here is part of a larger effort directed by the Commanding General (CG), Training and Doctrine Command (TRADOC), to ensure that the best soldiers are operating and maintaining the high-tech weapon systems in the Army inventory. The goal of the Soldier Performance Research Project (SPRP) is to conduct more rigorous tests and analyses of the cognitive skill requirements of first- and second-term soldiers. The SPRP results will be used to help determine the Army's aggregate recruiting quality needs and the TRADOC distribution of quality requirements.

The crux of the SPRP was to determine whether soldiers with high mental abilities do, in fact, perform better on combat tasks than soldiers with lower mental abilities. The main consideration is that soldiers with higher mental abilities cost more to recruit than do soldiers with lower mental abilities. The additional costs are due to a number of factors, including enlistment bonuses and the Army college fund.

The critical question is whether it is cost-effective to recruit smarter, albeit more costly, soldiers. If there is little difference in performance as a function of mental ability, the Army would be better off spending its limited funds on other programs. On the other hand, if combat performance and weapon system effectiveness are significantly enhanced by high ability soldiers, recruiting quality soldiers could be the most cost-effective strategy.

The question is difficult because soldiers, in the present case 19K M1 tank crewmen, are required to perform hundreds of tasks under a variety of conditions. Clearly, mental ability is not going to be related to performance of all tasks all of the time. To cover as many Armor tasks as possible, the Armor portion of the SPRP included two phases. The two phases sampled various aspects of the armor crewman task domain and tested soldiers at different points in their enlisted careers. The first phase examined the impact of soldier quality on the gunnery performance of soldiers enrolled in Armor One Station Unit Training (OSUT) (Graham, 1989).

The second phase, reported here, tested the collective combat skills of reconstituted tank crews using first- and second-term soldiers from U.S. Armor units. Two separate tests were administered including a high combat realism

Field exercise and a platoon tactical exercise in the Simulation Networking (SIMNET) system.

Assessing Mental Ability

All soldiers enlisting in the Armed Services are given a standardized paper-and-pencil test, the Armed Services Vocational Aptitude Battery (ASVAB). The ASVAB contains ten cognitive subtests which are combined to form a number of composites. One composite, the Armed Forces Qualification Test (AFQT), is used by the Army to classify soldiers into mental categories. The General Technical (GT) composite score can also be used to determine mental category. The specific categories used in the SPRP are I & II combined, IIIA, IIIB, and IV. As a note, the Army cannot, by law, enlist category V's nor more than 20% category IV's in an accession year. Table 1 shows the breakdown of mental categories by AFQT percentiles, GT scores, and estimated reading levels.

Table 1

Mental Categories as Determined by ASVAB Composite Scores

Mental Category	AFQT Percentile	GT Score	Reading Grade Level
I	93-100	129-155	12.7-12.9
II	65-92	110-128	10.6-12.6
IIIA	50-64	100-109	9.3-10.5
IIIB	31-49	90-99	8.1-9.2
IV	10-30	75-89	6.6-8.0
V	1-9	52-74	3.4-6.5

Mental Ability and Armor Performance

In the past decade, various research efforts have examined the relationship between mental ability and Armor performance. For the most part, soldier quality has consistently correlated with the performance of tasks other than live-fire gunnery. The live-fire gunnery results have, however, ranged from very strong relationships to no relationship.

Live-fire gunnery performance. Eaton, Bessemer, and Kristiansen (1979) identified several ASVAB measures which correlated with driving and gunnery performance of OSUT soldiers. These relationships did not, however, cross-

validate to soldiers in Table of Organization and Equipment (TO&E) units in Europe. In particular, none of their predictors correlated with live-fire Table VIII performance fired at Grafenwoehr, FRG.

Wallace (1982), in a study commonly referred to as the Gideon report, analyzed the firing results from the 1981 Canadian Army Trophy (CAT) competition in Grafenwoehr, FRG. He correlated the AFQT scores of TCs on the American team with their crew's live-fire gunnery scores and obtained a correlation of .74. He concluded that the TCs mental ability was a strong predictor of crew performance, to such an extent that it apparently could compensate for low mental abilities of gunners. The results were, however, based on an extremely small sample (N=13).

The U.S. Military Academy (USMA), West Point, produced a report by Scribner, Smith, Baldwin, and Phillips (1984) that showed mental category to be highly related to live-fire gunnery performance on Table VIII fired at Grafenwoehr. Based on their analysis of 1131 M1 and M60 series crews, they estimated that category I TCs and gunners performed approximately 20% above category IV pairs with the M1 tank and 75% above category IV pairs with the M60 series tank. They interpreted these data as showing that the operation of the M1 fire control system in a fully operational mode helped to equalize the negative effects of lower mental abilities. They suggested, however, that when the ... was required to fight in a degraded operational mode, the effects of AFQT would likely be even greater than the difference between the M1 and M60 series tanks.

The Scribner, et al. (1984) paper has stirred some controversy, largely because other researchers have failed to find such a relationship between mental ability and live-fire tank gunnery performance. Subsequent to the USMA report, for example, the Office Chief of Armor (OCOA) analyzed the FY85 and FY87 Table VIII firing data from Grafenwoehr and found no correlation between performance and AFQT (Cisco, 1985; Leet, 1987). In the latter case, the data were sent to the USMA for assistance in analysis. Hoffman (1989) analyzed FY87 Grafenwoehr Table VIII firing data and found only very small correlations between ASVAB scores and Table VIII performance.

More importantly, Hoffman's (1989) examination of the Grafenwoehr Table VIII data base revealed a number of psychometrically disturbing relationships among the live-fire scores. Day scores (VIIIA) were not related to night scores (VIIIB), i.e., had a zero correlation. First target hit rates were not related to second target hit rates. Performance on offensive engagements was not related to performance on defensive engagements.

Hoffman (1989) attributes theses findings, in part, to the distribution of Grafenwoehr Table VIII scores being truncated at both ends. At the top end, there are a number of crews that receive the maximum number of points (1000). At the lower end, the effects of the GO/NO GO standard are apparent, as there is a sharp drop in the frequency of scores at the passing criterion (700). Furthermore, the Grafenwoehr Table VIII data base is contaminated in that crews can re-fire one or more engagements for which the database does not distinguish re-fired engagements from first run engagements. For example, one crew may score 750 on their first and only run, while another crew may re-fire

three of the ten engagements three times and result in a score of 850. Under these conditions, it is impossible to determine which crew was superior.

In light of Hoffman's (1989) research, it is not surprising that past analyses have typically found no relationship between Table VIII and mental quality. Tank Table VIII may very well be a critical link in the Armor training and evaluation process. This does not mean, however, that Grafenwoher Table VIII data are appropriate criteria for individual difference analyses or training effectiveness analyses. The psychometric properties of the data suggest otherwise.

The positive relationship reported by Scribner et al. (1984) reflected a special Table VIII testing situation. The live-fire scores resulted from a newly built Table VIII range on which none of the crews had previously fired. The new Table VIII also included revised scoring procedures and tougher standards that produced greater variability in the scoring.

Simulated gunnery performance. High-fidelity tank gunnery simulators such as the Institutional-Conduct of Fire Trainer (I-COFT) have begun to be used as alternatives to live-fire testing. TC and gunner controls on the M1 I-COFT are virtually identical to those in the actual tank, making the I-COFT analogous to flight simulators used in military and commercial training. While not a complete substitute, device-mediated I-COFT tests offer certain advantages over other hands-on performance tests. These include standardized administration and scoring, and the capability of inexpensively building longer tests with varied target conditions. Research evaluating the reliability of testing on the Unit-Conduct of Fire Trainer (U-COFT) has found test-retest reliability coefficients which exceed .80 (Graham, 1986).

In Phase I of the Armor SPRP, Graham (1989) used an I-COFT test to evaluate the effects of mental ability on the M1 gunnery performance of 19K OSUT soldiers. Five hundred forty-seven OSUT soldiers were given a 35 engagement tank gunnery test on the I-COFT which included offensive and defensive engagements fired in normal and degraded operational modes. Soldiers with higher mental ability were faster and more accurate on the I-COFT test than were soldiers with lower mental ability. Specifically, mental category I & II soldiers hit 14% more targets than category IV soldiers and fired two seconds faster.

The effects of mental ability were relatively the same for both the normal and degraded mode exercises which suggests the same basic skills underlie normal and degraded mode performance. The test scores were also used as parameter estimates in a soldier performance model based upon Lanchester-type combat attrition models. Analyses based on the soldier performance model indicated category IV soldiers performed at 73% of the level of category I & II soldiers. At $2.5 million per M1 tank, the analyses showed that category IV gunners required an additional $938,000 worth of tanks to make them equal to category I & II.

Command and control (C^2) performance. Several research efforts have found a relationship between mental quality and non-gunnery Armor performance. Tziner and Eden (1985) manipulated the composition of three-man Israeli tank

crews by high and low mental ability and motivation. Following two months of intensive activity, unit commanders completed subjective performance rankings of eight subordinate crews. The results showed an additive effect of mental ability, i.e., the more high ability soldiers in the crew, the better the performance.

Perhaps more interesting was the interaction among the ability levels of the three crew positions. Crews composed of three high ability soldiers were ranked more effective than expected, while crews composed of three low ability soldiers were ranked less effective than expected. Based on this result, Tziner and Eden suggested the most effective crew combinations would be a majority of high-low-low crews with the rest being high-high-high. This allocation strategy avoids the disproportionate low productivity of the low-low-low ability condition, while leaving some of the highs for the most productive high-high-high ability crews.

Black and Mitchell (1986) found a strong relationship between AFQT and performance on an M1 computer panel test. They constructed a general abilities composite from scores on three tests: entering data into a simulated M1 computer panel, executing the M1 computer self-test, and tracking. The general abilities composite correlated .49 with AFQT for the 123 M1 gunners drawn from five battalions. Their data also showed that while mental category I to IIIA personnel comprised only 66% of the total sample, those soldiers accounted for about 90% of the scoring on each of the three tests. Furthermore, while the category IV personnel made up 20% of the sample, they contributed less than 4% scoring on each of the three tests.

Graham (1987) also found mental ability to be related to the command, control, and communication (C^3) performance of M1 TCs during single tank tactical exercises on the Simulation and Combined Arms Trainer (SIMCAT). The TCs were split into high and low ability groups based on their GT score. Significant differences in performance as a function of GT were found on numerous task measures including: accuracy of combat reports, number and accuracy of fire commands, decoding and plotting minefield coordinates, and the calling and adjusting of indirect fire. Regression analyses showed that the effects of mental ability greatly outweighed the effects of experience. This latter finding is consistent with similar analyses reported in Scribner et al. (1984).

Purpose of Armor SPRP: Phase II

The Phase I Armor SPRP demonstrated the effects of mental category on the individual gunnery performance of soldiers enrolled in initial-entry training. Phase II was designed to examine the effects of mental category on the collective performance of first- and second-term Armor crewman with the emphasis on C^3 performance. Specifically, the purpose of the research is to:

1. Evaluate the effects of mental category on the performance of armor crews in a high combat realism single tank tactical Field exercise.

2. Evaluate the effects of mental category on the performance of armor crews in a SIMNET platoon tactical exercise.

3. Examine the relationship between SPRP performance and existing predictors and measures of Armor performance.

METHOD

Participants

The SPRP tested 120 19K Tank Commanders and 120 19K drivers from five Continental U.S. (CONUS) divisions. Of the TCs, 46 were Sergeants (SGT), 71 were Staff Sergeants (SSG), and 3 were Sergeants First Class (SFC). Five of the drivers had the rank of Private First Class (PFC), 110 of Specialist (SPC), and 5 of SGT. Approximately 130 support personnel were required to construct and execute the Armor SPRP Field and SIMNET tests.

Design

The SPRP Field and SIMNET tests were designed to assess the impact of tank crewman mental category on the collective performance of the four man M1 tank crew. Four mental categories groups were used: I & II combined, IIIA, IIIB, and IV. Two crew positions were examined in the current research, the TC and driver. Test surrogates were used in the other two crew positions as gunners and loaders. The loader and gunner surrogates simplified the design by reducing the number of mental category combinations, i.e. 4^2 rather than 4^4. The TC and driver were selected as the tested crew positions because they represent first- and second-term soldiers.

The primary experimental design for the Field and SIMNET Tests was a randomized 4 X 4 factorial design with between subjects factors of TC mental category (I&II, IIIA, IIIB, and IV) and driver mental category (I&II, IIIA, IIIB, and IV). The level of measurement was the performance of the tank crew.

Soldier Selection Procedures

Unit rosters were obtained in advance from the five supporting Forces Command (FORSCOM) units which indicated, for the majority of cases, the soldiers current duty positions. These rosters were merged with the Enlisted Master File (EMF) and sorted by mental category. The soldiers were then selected, by name, from each of the five units. In cases where the selected soldiers could not participate, subsequent, by name, selections were made. Four of the divisions provided 25 TC/driver pairs with the fifth unit providing 20 TC/driver pairs.

Selection rules were established to ensure the counterbalanced assignment of soldiers. First, an attempt was made to select an equal number of TCs and drivers from each of the mental categories from each division. Second, TCs were selected such that the ranks of SSG and SGT were maintained at a 2:1 ratio. Third, TCs and drivers were paired in such a way as to systematically fill the 16-cell (4 X 4) design. The result was that no one unit provided a disproportionate number of crews to any cell. This procedure was adopted as an attempt to counterbalance the effects of unit training. Fourth, for

logistical reasons, TCs were paired with drivers from the same division, with the restriction that they could not be from the same tank crew.

FIELD TEST

Description

The SPRP Field test consisted of a high combat realism single tank tactical exercise which evaluated the speed and accuracy of the tank crew performance. The scenario was developed in the context of the third day of the war, when reconstitution of tank crews was necessary. The course extended approximately 15 kilometers primarily within the Wilcox Range area of Fort Knox, KY. While the course and its events appeared continuous to the tested crew, it was constructed as a series of stations. A brief description of each station is presented below. For a more complete description of the stations and test procedures, refer to Appendix A, extracts from the Armor and Engineer Board's Test Design Plan (Cowles and Troutman, 1989).

Station 1. Brigade Support Area (BSA)- The first station replicated, as nearly as possible, a BSA deep within a combat environment. The tactical station covered several acres and included organizational maintenance assets, refueling trucks, a small arms repair tent, and was protected by concertina wire and armed guards. At the BSA the TC was given an operations order (Appendix B) and told to prepare his M1 tank for combat. The crew was required to conduct preventive maintenance checks and services (PMCS), upload vehicle stores, refuel, boresight the main gun, and enter data into the ballistic computer.

Station 2. Surprise Engagement with Disabled T-72 and T-72 in Overwatch - At a designated point on the course road, the loader (a test surrogate) identified two mock Soviet tanks at approximately 1600 meters, one disabled and one in overwatch with its main gun pointed in the direction of the tested tank. The tank crew was required to engage the most dangerous target first, execute acceptable combat driving, and send a spot report on the radio which included the grid coordinates of the enemy vehicles. Throughout the test, the tested tank and OPFOR vehicles fired blank Hoffman charges. The OPFOR vehicles simulated being hit by using smoke grenades.

Station 3. Antitank Guided Missile (ATGM) Ambush in a Minefield - As the tank entered a cleared lane in a friendly minefield, it was engaged by an ATGM from a partially concealed BMP. The station was designed to increase cognitive workload by requiring the crew to attend to the minefield and the ATGM attack simultaneously. The TC was required to direct the driver through the minefield, issue a fire command, and continue to evaluate the situation until the engagement was resolved.

Station 4. Meeting Engagement with Enemy Stragglers - Loader Killed - At this station, the tank crew acquired three enemy soldiers at approximately 40 meters who engaged the tank with automatic rifle fire. The crew had to direct machine gun fire on the enemy soldiers. During the engagement the loader was killed, which was simulated by squirting arterial blood from a tube attached

to the surrogate's neck. The crew then had to evacuate the loader's body, reconfigure as a three-man crew, and issue a proper casualty report to higher headquarters.

Station 5. Military Police (MP) Traffic Control Point (TCP) - As the tank approached the TCP, the crew had to recognize the MP as friendly, issue a proper challenge, and identify the tank's correct location on the map.

Station 6. Meeting Engagement with T-72 and BMP at Short Range - The TC had to engage multiple targets from a three-man crew configuration. The scenario was scripted such that the tank did not receive a first round hit on the initial target. The TC needed to recognize that the T-72 had not been killed, and re-engage. As with each of the engagements, the TC had to send a spot report including the grid coordinates of the destroyed targets.

Station 7. Automatic Weapons Ambush - TC and Gunner Killed - The tank was ambushed with automatic weapons fire by an enemy infantry squad. The gunner (test surrogate) pulled the TC's commo cord and held a card up which indicated he had been killed. The driver then became the only surviving crew member and, on his own initiative, had to move the tank out of the kill zone, determine crew status, and submit a report indicating casualties and the vehicle location.

Station 8. End of Course - As the driver proceeded to the release point, he was stopped by test controllers and asked to show his location on the map. The crew was then taken to a debriefing tent where each of the stations was discussed.

Tasks

Each event in the Field test was patterned after the Tank Tactical Tables in FM 17-12-1. The task lists for each station and the scoring criteria checklists were based on the scoresheets for: (a) the tactical tables in FM 17-12-1, (b) The Tank Crew Gunnery Skills Test (TCGST) contained in FM 17-12-1, and (c) the tank platoon Standard Operating Procedures (SOP) handbook, which was given to each tank commander on the night prior to his Field test. The task lists for each station and the scoring criteria were approved by the Weapons Department and the Command and Staff Department, U.S. Army Armor School (USAARMS), Fort Knox, KY. Table 2 shows the stations and the representative tasks for each.

Table 2

Field Test Stations with Representative Tasks

Station	Representative tasks
1. Brigade Support Area	Use technical manual for PMCS Prepare weapon stations Troubleshoot induced malfunctions Enter/check data in ballistic computer Boresight main gun Refuel Brief crew Rehearse crew drills Decode and plot minefield coordinates
2. Surprise Engagement with Disabled T-72 and T-72 in Overwatch	Engage most dangerous target Issue proper fire command Execute combat driving Submit spot report Determine grid coordinate of targets
3. Antitank Guided Missile (ATGM) Ambush in Minefield	Direct driver through minefield Issue proper fire command Execute combat driving Submit spot report Determine grid coordinate of targets
4. Meeting Engagement with Enemy Stragglers: Loader Killed	Issue proper fire command Execute combat driving Reconfigure as a three-man crew Submit spot report Determine grid coordinate of targets Submit casualty report
5. Military Police Traffic Control Point	Recognize MP as friendly Issue correct challenge Identify location on map Evacuate dead crewman
6. Meeting Engagement with T-72 and BMP at Short Range	Issue proper fire command Engage target from three-man crew Issue subsequent fire command Submit spot report Determine grid coordinate of targets

Table 2 continued

Station	Representative tasks
7. Automatic Weapons Ambush: TC and Gunner Killed	Execute combat driving Submit spot report Determine grid coordinate of targets Submit casualty report
8. End of Course	Issue correct challenge Identify mission Identify location on map

Task Clusters and Task Cluster Composites

The Field test scoring checklist is included as Appendix C. As can be seen, the checklist contains 125 Yes/No items which correspond to the tasks at each station. For those tasks with subtasks, all subtasks had to have been completed to receive an overall 'YES'. The exception was for those subtasks that included an -OR-, in which case only one of the subtasks had to have been completed to get an overall 'YES'. The Yes/No items were categorized into 18 task clusters by analysts from the Armor School. The cluster codes are also included in Appendix C. Table 3 lists the 18 task clusters along with the cluster codes and a brief description of each.

Table 3

Field Test Task Clusters with Description

Task Cluster	Code	Description
1. Uses TM (-10) for PMCS	DASH10	Uses Technical Manual for preoperational checks
2. Preparation of Weapon Stations	PWS	Prepares, inspects, and tests weapons and sights
3. Troubleshooting	TS	Identifies/corrects induced malfunctions in turret
4. Enter/Check Ballistic Computer Data	BC	Conducts computer self-test, indexes proper values into computer

Table 3 continued

Task Cluster	Code	Description
5. Boresighting Main Gun	BORE	Boresights main gun to Armor standard (+/- .3 mils)
6. Vehicle Load	LOAD	Ensures correct load of ammo, fuel, oil, water, and food
7. Issuing Proper Fire Commands	FC	Gives complete doctrinally correct fire command
8. Target Engagement Procedures	TEP	Demonstrates proper target engagement procedures other than fire commands, e.g., engaging most dangerous target
9. Decoding and Plotting Map Coordinates	PLOT	Correctly decodes and plots friendly minefield coordinates
10. Directing Tank through Minefield	DIRECT	Directs driver through minefield while being engaged by ATGM
11. Submits Spot Report without Cue	SPOTREP	Submits spot report after each engagement
12. Accuracy of Spotrep	SPOTACC	Issues doctrinally accurate spot reports
13. Submits Casualty Report without Cue	CASREP	Submits casualty report when appropriate
14. Accuracy of Casualty Report	CASACC	Issues doctrinally accurate casualty reports
15. Troop Leading Procedures	TLP	Briefs crew on mission, conducts crew drills
16. Security	SEC	Uses proper challenges and passwords
17. Position Location	PL	Reports grid coordinates within 300 meters of actual location
18. Combat Driving	CD	Provides stable platform for firing, evades missiles as appropriate

The primary performance measure for the Field test was Field Total Test score which was the mean of the 18 task clusters, i.e., each of the clusters was equally weighted. Three task composites were also calculated by taking the mean of the clusters selected for each composite. The task cluster composites are shown in Table 4.

Table 4

Field Test Task Cluster Composites

Task Cluster Composite	Task Clusters
Precombat Composite	Uses TM (-10) for PMCS Preparation of Weapon Stations Troubleshooting Enter/Check Ballistic Computer Data Boresighting Main Gun Vehicle Load
Command and Control Composite	Issuing Proper Fire Commands Target Engagement Procedures Decoding and Plotting Map Coordinates Directing Tank through Minefield
Communications Composite	Submits Spot Report without Cue Accuracy of Spot Report Submits Casualty Report without Cue Accuracy of Casualty Report

Field Test Scoring Procedures

Multiple data collectors located across the Field test course recorded performance data on feeder checklists which were later compiled onto the scoring checklist (Appendix C). The majority of the data was recorded by data collectors located in vans located at the top of Wilcox Range at Observation Post (OP) Alpha. Much of the data resulted from the monitoring of the tank's intercom on which the four tank crewmen talk to each other. This was accomplished by hooking up a jump radio to the intercom system which broadcast the intercom traffic to OP Alpha. The jump radio allowed OP Alpha to score most of the command and control tasks, e.g., issuing fire commands and directing the tank through the minefield. OP Alpha personnel also served as the unit to which the crew sent all reports, thereby enabling them to score the radio reports.

The intercom was also monitored by back-up data collectors on the course, including soldiers in the enemy vehicles. An audio tape recording of the radio and intercom transmissions was made at OP Alpha. The tapes were used to

verify the accuracy of the data and to add any information that might have been missed. Other data collectors included hidden observers at the minefield, the MP at the traffic control point, and to a very limited extent, the loader and gunner surrogates.

Data collection at the BSA was supervised by the NCO in charge (NCOIC) who checked, for example, the accuracy of the boresight, data entered into the ballistic computer, weapon status, and vehicle load levels. These checks were non-obtrusive and were made after the crew was prepared to pull out of the BSA. Refer to the Test Design Plan (Appendix A) for more complete details concerning the data collection.

Administration Procedures

Six M1 tanks were used daily in the Field test for which 12 surrogates were trained for the loader and gunner positions. The surrogate gunners were M1 TCs with the rank of SGT or SSG from Fort Knox. The loaders were M1 tank crewmen with the ranks of PFC and SPC. The surrogates and data collectors rehearsed the Field test for two weeks prior to the start of the testing so that they could perform consistently during the test runs. In an effort to promote consistency, visual cues were set up along the course to cue the precise times the surrogates were to perform certain tasks, such as acquiring an Opposing Force (OPFOR) vehicle. The testing was conducted from 15 March to 15 April 1989 with eight to nine tank crews being tested on most days.

The soldiers arrived at Fort Knox in groups of 16 and were taken to the Mt. Eden base camp where they were bivouacked for the night. The soldiers were given a short briefing describing the combat scenario and a copy of the unit SOP to study. In the morning the TCs and drivers were paired. The crews were taken to the BSA one at a time at one hour intervals where they were introduced to their loader and driver. At this juncture, the tested crews were not aware that the loader and gunner were surrogates. The crew had 90 minutes in the BSA to complete the precombat preparations.

Following the BSA, the tested tank was escorted to a checkpoint where the crew test fired its weapons and an evaluator checked the decoded and plotted minefield coordinates. Throughout the test, response times were recorded including time to give fire commands and spot reports. The course timing began when the tank reached a predetermined point in the road where the surrogate loader identified the two T-72s and ended when the tank reached the end of the course.

Following each engagement, OP Alpha gave the crews several minutes to call in a report. If the crew did not, OP Alpha cued the crews by saying something like, "What's going on? We hear gunfire." The communication tasks attempted to independently measure the crews propensity to report and the accuracy of their reports.

At the end of the course, the crews were briefed as to what should have been done along the course. The crews were then taken to a barracks near the center of post to await the SIMNET test. The move prevented the soldiers that had completed the Field test from talking to incoming soldiers.

SIMNET TEST

The SIMNET test was designed to test the performance of tank crews within the context of platoon tactical gunnery engagements. The SIMNET system was used in lieu of a separate platoon-level field test because of cost constraints.

SIMNET Description

The SIMNET system at Fort Knox contains a local area network of combat simulators which was largely designed as a part-task tactical trainer for armor and mechanized infantry units. Each M1 tank simulator consists of a separate module with space for the four tank crewmen. The crew views computer-generated images in the tank sights and vision blocks, as well as senses computer-generated sounds and vibrations. SIMNET can support free play force-on-force tactical scenarios, in such a way that opposing sides each see their own side as friendly, e.g., M1s, and the opposite side as OPFOR, e.g., T-72s.

The SIMNET modules are equipped with intercoms and radios to support communications within and between simulators. Weapon systems and their effects are simulated such that simulators can kill or be killed. Logistic and maintenance functions are also represented such that a simulator can break down or run out of fuel or ammunition. Fire support is controlled from microcomputer stations collocated with a simulated Tactical Operations Center (TOC). Data collection capabilities include a Data Logger which maintains a computer record of activities that occur during a SIMNET exercise and a Plan View Display (PVD) which provides a graphic map display of activities. For a more complete description of the SIMNET capabilities and potential training applications, refer to the SIMNET Users' Guide (U.S. Army Armor Center, 1989).

Test Description

The SIMNET test was similar to the Field Test in a number of respects, primarily in that it assessed the speed and accuracy of a tank crew to move, shoot, and communicate. The tested crew in the SIMNET test served as a wingman to the platoon sergeant in a platoon tactical exercise, rather than as a single tank in the Field test's single tank tactical exercise. Like the Field test, the SIMNET test employed surrogate gunners and loaders. The SIMNET surrogates were different soldiers than those in the Field test. The SIMNET test took approximately one hour to run. Because only a few of the soldiers had prior SIMNET experience, the soldiers were given considerable SIMNET training prior to the testing. A brief description of the training and of the SIMNET events are provided below.

SIMNET training. The SIMNET training was organized into four sections. First, the crews received a 20 minute classroom orientation which familiarized the crewmen with the simulator controls, what friendly and OPFOR vehicles looked like, unique SIMNET terrain characteristics, and differences between SIMNET and the actual tank. The soldiers were also trained how to use the SIMNET map for navigation and how to use the SIMNET communications system.

Each crew was then taken through a 40 minute familiarization course during which the crews received hands-on experience with the simulators. During this phase, the instructors coached the crews through the course and encouraged the crews to ask questions. The crews maneuvered cross-country, engaged targets and were briefed on the effect of running into the river or of hitting another tank.

A 60 minute formal training period followed during which the instructor provided limited assistance. The formal training phase began with the crew occupying a battle position, from which they identified friendly and OPFOR vehicles, sent spot reports to the platoon leader, and called for and adjusted indirect fire. The crew then received a new mission which required them to navigate to several new positions, report everything observed, and engage all OPFOR vehicles.

The crew was then tested on a 30 minute certification course in which they were required to demonstrate proficiency in the areas of navigation, vehicle identification, and use of the SIMNET communication systems. Those crews who failed to meet the criteria were given additional training and retested until they qualified.

There has been some controversy among SIMNET users as to how much SIMNET familiarization training is necessary prior to tactical training. The three hour SPRP training program (including breaks) was developed and conducted to ensure that the crews possessed the level of SIMNET expertise to execute the SPRP exercise as part of a platoon. That is, the SIMNET test did not require the tank to navigate cross-country on its own or to lead a platoon in tactical operations. More training would undoubtedly be required for those types of exercises. While not formally evaluated, the SPRP SIMNET training was judged to be sufficient for the present situation.

Event 1. Prior to the test, the crew was given an operations order which is included at Appendix D. The tested tank served as a wingman to the platoon sergeant. Event 1 consisted of a tactical road march in which the crew had to execute various platoon formations and action drills.

Event 2. The platoon formation crossed the line of departure and encountered a bridge. The TC was asked to send a spot report which included the coordinates of the bridge.

Event 3. The platoon had a meeting engagement with an enemy tank platoon. The tested tank had to give a contact report, conduct a movement by bounds, engage the enemy tank platoon, and send a spot report.

Event 4. The platoon was attacked by an ATGM from a BMP. During the attack the PSG's tank was destroyed. The tested tank was required to issue a contact report, conduct a contact drill, engage, and report. Platoon movement resumed with the tested tank then serving as the platoon sergeant.

Event 5. The crew had to react to an ATGM ambush by issuing a contact report and fire command. As per unit SOP, the PSG (now the tested tank) had to send all reports to higher headquarters.

Event 6. The crew had to react to indirect fire and report.

Event 7. The crew assumed a hasty battle position and engaged a reinforced rifle company as part of the platoon. The platoon leader issued a depth fire command to which the tank had to engage the last tank first and work forward. The platoon then engaged a second offensive formation, during which the platoon leader's tank was destroyed and the wingman took a mobility kill. The tested crew had to consolidate, reorganize, and report.

Event 8. The company commander instructed the tank to call indirect fire on any future targets they might encounter. Upon acquisition of four BMPs, the crew had to contact the Fire Support Team (FIST) and call and adjust indirect fire. After firing for effect on the BMPs, the tested tank observed a missile coming straight into the driver's vision blocks and was destroyed.

Event 9. The TC was taken from the M1 module and tested on radio authentication challenges and the ability to correctly encode and decode grid coordinates using the CEOI. Originally, the authentication and encoding/-decoding testing was to take place during the run, but the pilot test revealed that these procedures added too much time to the run. Instead, the TCs were required to write their responses on paper after event 8.

Tasks

The events in the SIMNET test were patterned after events in the tactical tables portion of FM 17-12-1 and after situational training exercises in ARTEP 17-237-10 MTP. The task lists and scoring criteria were based on these documents, plus the unit SOP that was given to each soldier. As with the Field test, the task lists and scoring criteria were approved by the Weapons Department and the Command and Staff Department, U.S. Army Armor School. Table 5 shows the SIMNET events along with representative tasks for each.

Table 5

SIMNET Test Events with Representative Tasks

Event	Representative tasks
1. Crew joins platoon as wingman	Maintain proper position in formations- Column, Vee, Herringbone Take overwatch position Respond to air attack Send report with grid coordinates

Table 5 continued

Event	Representative tasks
2. Cross line of departure and encounter bridge	Execute combat driving Maintain overwatch Send report with grid coordinates
3. Meeting engagement with enemy tank platoon	Give contact report Conduct action drill Issue fire command Move by bounds Submit spot report
4. Enemy ATGM attacks formation: Platoon Sergeant killed	Give contact report Conduct action drill Issue fire command Execute combat driving Submit Situation report
5. Reaction to ATGM ambush	Give contact report Execute combat driving Issue fire command Submit spot report
6. React to indirect fire	Submit report Give coordinates of fire
7. Engagements from hasty battle position: Platoon leader killed, Wingman loses mobility	Respond to platoon fire command Issue fire commands Respond to second offensive attack Submit situation report Give grid coordinates
8. Request and adjust indirect fire	Contact FIST Request fire Determine Observer/Target (OT) line Adjust fire Fire for effect
9. Encode/Decode grid coordinates	Give correct authentication challenge Encode/decode grid coordinates

Task Clusters

The SIMNET test scoring checklist is included as Appendix E. Similar to the field test, the SIMNET checklist contained 123 Yes/No items. The SIMNET items were categorized into 11 task clusters, the codes of which are included in Appendix E. Table 6 lists the 11 SIMNET task clusters with a brief description of each.

Table 6

SIMNET Task Clusters

Task Cluster	Code	Description
1. Issues Proper Fire Commands	FC	Gives complete doctrinally correct fire command
2. Target Engagement Procedures	TEP	Demonstrates proper target engagement procedures, e.g., scans proper sector, distribution of fire
3. Submits Combat Reports without Cue	CR	Submits reports after each engagement
4. Accuracy of Spotrep	REPACC	Gives doctrinally accurate combat reports
5. Radio Communications	RC	Uses proper radio procedures, e.g. correct call signs, authentications
6. Contact Reports	CON	Issues complete contact reports
7. Call for Fire Procedures	CFF	Includes correct elements when calling for fire
8. Call for Fire Accuracy	CFFACC	Destroys target after no more than five adjustments
9. Encoding/Decoding	ENC	Correctly encodes and decodes grid coordinates using CEOI
10. Position Location	PL	Reports correct grid coordinates and cardinal directions, maintains proper gun tube orientation
11. Combat Driving	CD	Maintains position in formations, evades missiles

Like the field test, the primary performance measure for the SIMNET test was SIMNET Total Test score which was the mean of the 11 task clusters. Also like the field test, three task composites were calculated. The C^2 Composite contained task clusters one and two, the Commo Composite contained task clusters three through six, and the Call for Fire Composite contained task clusters seven and eight.

SIMNET Test Scoring Procedures

The SIMNET data were gathered from several sources. As with the field test, the majority of data came from the monitoring of the tank intercom and from the radio transmissions to higher headquarters. A data collector, located at the SIMNET test Tactical Operations Center (TOC), recorded responses based on crew communications. Also, located at the TOC was the Plan View Display (PVD) which displayed a birds-eye-view of the battlefield, including the location of all elements, firer-target pairings, and the orientation of hulls and turrets. A second data collector gathered performance data from the PVD.

A third control device at the TOC called a shadow box contained four visual displays which paralleled the tested driver's three vision blocks and the tested TC's center vision block. A third data collector was able to record performance data based on what the crew was viewing. Following the runs, the SIMNET Datalogger was used to analyze certain aspects of the crew's performance. For example, a plot was made of the platoons movement which showed whether the tested tank maintained the proper position in the various formations. Data from the four sources were compiled onto the SIMNET scoring checklist (Appendix E) by the authors. Because the pace of the SIMNET test was largely determined by the speed of the platoon leader, a test surrogate, a total SIMNET time was not collected.

Administration Procedures

The SIMNET training and testing were organized by groups of three crews in four hour blocks. Three crews were simultaneously trained while another three crews were being tested one crew at a time. The three crews who completed the field test in the morning were given the SIMNET training that afternoon and then tested the following morning. The remainder of the crews were trained and tested the day following the field test. For scheduling ease, the crews were tested on the Field and SIMNET tests in the same order. The order had, however, been counterbalanced with respect to the mental category groups.

Training Background Questionnaire

A training background questionnaire (Appendix F) was administered to the soldiers prior to the SIMNET test. The questionnaire was designed to collect information about the soldier's background and recent unit training experiences. The first section collected information on the soldier's current status, e.g., duty position, and formal training experiences, e.g., amount of simulator training and whether the soldier had attended the Basic Noncommissioned Officers Course.

The second section asked for information regarding the soldier's unit training participated in during the last year. The training events listed were those thought to relate to the tasks and events that would be encountered during the Field and SIMNET tests. Soldiers were asked to indicate whether they had participated in an event, their M1 duty position during that event and the length of time since the event.

An algorithm was created to quantify the recent unit training experiences. For each event the soldier had participated in, the relevancy of M1 duty position was evaluated. For example, TCs had to have served as TCs and drivers as drivers for the event to be counted as relevant. For each relevant event, the amount of time since the event was recoded as follows: 1 month or less equalled 5; 2 to 3 months equalled 4; 4 to 6 months equalled 3; 7 to 9 months equalled 2; 10 to 12 months equalled 1; and 13 months and above equalled zero. A recent training metric was then calculated for each soldier by summing the relevancy/recency scores.

Following the SIMNET test, the soldiers were asked to write what they liked and disliked about the SPRP Field and SIMNET tests.

RESULTS

Field Test

Total Score. Performance on the SPRP field test was highly related to the mental categories of the crewmen. Table 7 shows the mean field test Total Score for the TC and driver mental category groups. The mean Total Score for the TC groups is also shown relative to the performance of mental category I & II TCs. Recall that the field test Total Score resulted from an equal weighting of the 18 task clusters. The means for the field and SIMNET task clusters by mental category groups are included as Appendix G.

An Analysis of Variance (ANOVA) revealed that the main effect for TCs was significant, $F(3,116) = 5.27$, $p<.002$, while the main effect for drivers approached significance $F(3,104) = 2.35$, $p<.08$. A Newman-Keuls post hoc test indicated that Cat I&II and IIIA TCs were more accurate than Cat IIIB and IVs ($p<.05$).

Table 7 shows that Cat I&II and IIIA TCs performed virtually at the same level and that Cat IV TCs performed at only 81% of the level of Cat I&II TCs. The performance of crews as a function of the driver's mental ability is somewhat less straightforward. Nevertheless, the crews with Cat I&II drivers had the highest scores while the crews with Cat IV drivers had the lowest scores. As a reminder, the experimental design systematically paired the TCs and drivers by mental categories. This means, for example, that the mean score for Cat I&II drivers is from crews with nearly equal numbers of Cat I&II, IIIA, IIIB, and IV TCs.

Table 7

Field Test Total Scores by Mental Category Groups

	Mental Category			
	I&II	IIIA	IIIB	IV
TC	.53 (n=32)	.52 (n=27)	.46 (n=32)	.43 (n=29)
Driver	.52 (n=32)	.47 (n=28)	.50 (n=30)	.45 (n=30)
Relative to Cat I&II TCs	100%	98%	87%	81%

As reflected in table 7, the effects of TC mental ability had a larger influence on field test performance than did driver mental ability. This is to be expected since the TC is primarily responsible for the performance of the tank and crew. In addition, the majority of the field test tasks directly assessed what the TC said and did. The effects of the TC and driver mental ability were, however, found to be additive. The higher the mental category of either crewman, the better the performance tended to be. The ANOVA substantiated the additive effect by finding a zero interaction between TC and driver mental ability, $F(9,104)=.30$, $p<.98$. No significant interactions of TC and driver mental ability were found in any of the SPRP analyses.

Table 8 shows the mean field test performance of the 16 TC/driver mental category combinations relative to the performance of Cat I&II/Cat I&II crews. As can be seen, Cat IV/Cat IV crews performed at 72% of the Cat I&II/Cat I&II crews.

Table 8

Relative Field Test Score by TC and Driver Mental Category Groups

TC Mental Category	Driver Mental Category I&II	IIIA	IIIB	IV
I&II	100% (n=9)	89% (n=6)	93% (n=9)	86% (n=8)
IIIA	95% (n=8)	93% (n=7)	93% (n=6)	82% (n=6)
IIIB	89% (n=8)	77% (n=7)	81% (n=9)	79% (n=8)
IV	81% (n=7)	70% (n=8)	86% (n=6)	72% (n=8)

Task Cluster Composites. The same pattern of mental category effects was found for the three field test task cluster composites. Table 9 shows the means for the Precombat Composite. An ANOVA showed that performance varied as a function of the TC mental category, $F(3,104) = 3.07$, $p<.03$. No significant main effect was found for driver mental category nor an interaction.

Table 9

Field Test Precombat Composite by Mental Category Groups

	Mental Category I&II	IIIA	IIIB	IV
TC	.53	.48	.46	.37
Driver	.47	.46	.48	.45
Relative to Cat I&II TCs	100%	90%	87%	70%

The Precombat composite assessed the crew's ability to prepare the M1 tank for combat. The composite contained a number of tasks which generally would be thought to correlate with mental ability, e.g., relatively complex procedural tasks, troubleshooting, and working with the ballistic computers. The TC was the key individual in the conduct and supervision of these tasks, so it is not surprising that the driver's mental ability did not discriminate performance.

The M1 tank with its computerized fire control system is simpler to operate than previous tanks, given that the system is properly initialized and maintained. If, however, bad values are entered into the ballistic computer or the main gun is improperly boresighted, the M1 fire control system will calculate incorrect ballistic solutions. A fired round will then miss the target even when the gunner has a perfect sight picture and all other procedures are performed correctly. Table 9 shows that Cat IV TCs performed at 70% the level of Cat I&II TCs on this highly critical set of tasks. For boresighting alone, (refer to Appendix G), Cat IVs correctly boresighted to the Armor standard only 45% as often as Cat I&IIs.

Performance on the C^2 Composite is shown in Table 10. An ANOVA found performance to vary as a function of driver mental ability, $F(3,104) = 2.92$, $p<.04$. Differences by TC mental ability approached significance, $F(3,104) = 2.54$, $p<.06$. The C^2 Composite assessed the crews ability to engage targets, excluding gunnery per se. The C^2 Composite also measured the crews ability to negotiate battlefield obstacles and to decode and plot map coordinates. Of particular interest was the task cluster "Directing Tank through Minefield", because the cluster measured performance under increased cognitive load. Recall that the TC had to direct the tank thrcugh the minefield while being engaged by an ATGM. The task cluster (refer to Appendix G) shows that Cat IV TCs performed at 75% of the level of Cat I&II and IIIA TCs.

Table 10

Field Test C^2 Composite by Mental Category Groups

	Mental Category			
	I&II	IIIA	IIIB	IV
TC	.47	.48	.39	.36
Driver	.49	.38	.45	.36
Relative to Cat I&II TCs	100%	102%	83%	76%

Table 11 shows the performance on the Commo Composite. An ANOVA found significant differences for both the TC's mental ability, $F(3,104) = 3.24$, $p<.03$, and driver's mental ability, $F(3,104) = 2.86$, $p<.04$. It is important to note that crews with Cat IV drivers performed poorly on the C^2 and Commo composites, even though the tasks more directly assessed TC performance. These findings suggest that Cat IV crewmen have a general deleterious effect on crew performance.

Table 11

Field Test Commo Composite by Mental Category Groups

	Mental Category			
	I&II	IIIA	IIIB	IV
TC	.50	.56	.45	.45
Driver	.55	.44	.50	.46
Relative to Cat I&II TCs	100%	112%	90%	90%

Performance times. Performance speed was collected in addition to accuracy. Table 12 shows the time to complete a fire command and spot report by mental category for the TCs. Neither of the measures yielded statistically significant differences. For fire commands which measured the number of seconds from when a target was acquired until the TC said "cease fire", $F(3,113) = 0.69$, $p<.56$. For the spot reports which measured the number of seconds from report initiation until the TC said "continuing mission", $F(3,113) = 0.44$, $p<.73$.

These events may have been too loosely defined or controlled to have found reliable time differences. The fire command times ranged from 16 to 105 seconds, with many exceeding one minute. Other events, e.g., misfiring of Hoffman devices, likely added error to these measures. Also, more cautious crews may have searched longer for targets before sending the spot report. The point is that speed differences in combat may actually exist as a function of mental ability, but that the field test fire command and spot report times may not have been sensitive enough to detect them.

Table 12

Fire Command and Spot Report Times (secs) by TC Mental Category Groups

	TC Mental Category			
	I&II	IIIA	IIIB	IV
Fire Commands	32.9	34.5	37.2	33.1
Spot Reports	78.6	90.5	93.2	92.5

A more stable measure of combat response time was the Total Time to complete the SPRP course. In the operations order, the crews were instructed to engage all targets encountered, but to get to the release point as quickly as possible. The Total Time measure did not include the 90 minutes in the BSA, but was measured from when the first target was acquired until the end of course. Table 13 shows the Total Time in minutes as a function of TC and driver mental category. Interestingly, Total Time was significant for TC mental category, $F(3,90) = 3.11$, $p<.03$, but not for driver mental category, $F(3,90) = 0.57$, $p<.71$. These findings suggest that Total Time was more of a measure of C^3 factors rather than how fast the driver drove the course. Because of instrumentation problems, Total Time scores were only obtained from 106 of the 120 crews.

Table 13

Total Time of Field Test (in minutes) by Mental Category Groups

	Mental Category			
	I&II	IIIA	IIIB	IV
TC	36.6	38.8	40.0	45.3
Driver	41.7	40.4	38.1	39.7
Relative to Cat I&II TCs	100%	94%	91%	81%

Speed/Accuracy Composite. A more comprehensive measure of combat effectiveness than either speed or accuracy alone combines speed and accuracy together. Combat models such as JANUS and CORMO are used to predict battlefield success based on speed and accuracy data. Plans are underway for the TRADOC Analysis Command (TRAC) to use the SPRP data in these types of combat models. A simpler approach for combining speed and accuracy is to calculate the number of task clusters correctly performed per minute, i.e., the field test Total Score divided by Total Time.

Figure 1 shows the field test Speed/Accuracy Composite for the TC mental category groups. An ANOVA revealed significant differences for TCs, $F(3,90) = 5.02$, $p<.003$, but not for drivers, $F(3,90) = 0.83$, $p<.48$. The speed/accuracy results even more dramatically show that crews with Cat I&II and Cat IIIA TCs perform equivalently and that there is a sharp drop in the performance of crews with Cat IV TCs.

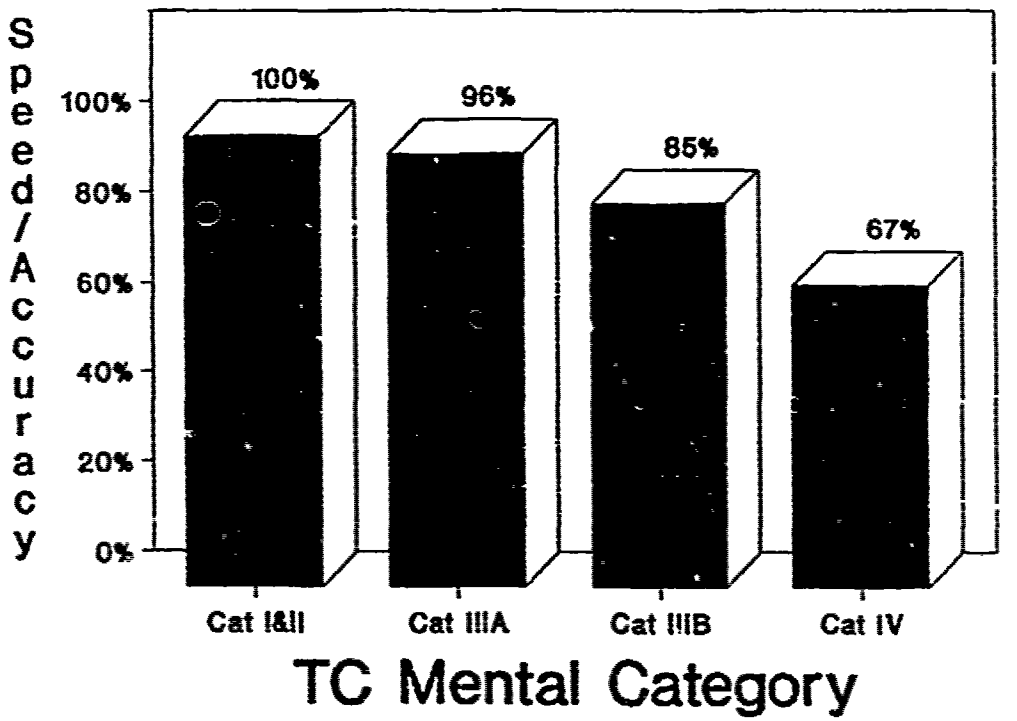

Figure 1. Field test Speed/Accuracy Composite for TC mental category groups.

Grid deviation errors. During the SPRP field test, there were five instances in which TCs were required to give grid coordinates. Four of the cases required the TC to identify the location of enemy targets as part of spot reports. The fifth instance was when the MP at the traffic control point asked the TC to give the grid of their current location. Table 14 gives the mean grid deviation errors in meters for the four mental category groups of TC. An ANOVA found the differences to be significant, $F(3,104) = 2.91$, $p<.04$.

An examination of the frequency distribution of the grid deviation errors found the errors tailed off at around 5000 meters, with several extreme scores beyond 5000, e.g., 18000 meters. The deviation errors that exceeded 5000 meters were set to 5000 for this analysis, the rationale being that the extreme scores were from a different distribution of errors.

Table 14

Field Test Grid Deviation Errors (in meters) by TC Mental Category Groups

	Mental Category			
	I&II	IIIA	IIIB	IV
TC	736	1044	830	1339
Relative to Cat I&II TCs	100%	70%	82%	55%

The data show that Cat IV TCs made considerably greater grid deviation errors than the other TCs. Furthermore, the overall magnitude of the errors, nearly one kilometer on average, suggests tankers have trouble determining accurate grid coordinates. The magnitude is somewhat understandable considering that the TCs were estimating target locations up to 1600 meters away. On the other hand, they were using grid maps. The likely addition of a Position Navigation (POSNAV) system as part of the M1 Block II modifications should reduce the size of errors, particularly those of the TC's own location. The ability for a TC to locate his position on a map will, however, remain critical, no matter what navigational aids are added.

SIMNET Test

The results of the SIMNET test generally reflect the same pattern as the field test. The magnitude of differences between mental category groups were not, however, as large as found in the field test. Table 15 shows the mean SIMNET test Total Scores for TCs and drivers by mental category. Like the field test, an ANOVA found significant differences for the TCs, $F(3,104) = 3.72$, $p<.02$, and that the main effect for driver mental category approached significance, $F(3,104) = 2.32$, $p<.08$. A Newman-Keuls post-hoc test found the Cat IV TCs to be lower than other three groups. The additive effects of crew mental ability again were indicated by a lack of an interaction between TC and driver mental ability, $F(9,104) = .77$, $p<.64$.

Table 15

SIMNET Test Total Scores by Mental Category Groups

	Mental Category			
	I&II	IIIA	IIIB	IV
TC	.61 (n=32)	.59 (n=27)	.58 (n=32)	.53 (n=29)
Driver	.62 (n=32)	.56 (n=28)	.57 (n=30)	.56 (n=30)
Relative to Cat I&II TCs	100%	97%	95%	87%

Task cluster composites. Table 16 shows the mean values for the SIMNET C^2 Composite by mental category. Neither the TC, $F(3,104) = 1.24$, $p<.29$, nor the driver, $F(3,104) = .19$, $p<.91$, main effects approached significance.

Table 16

SIMNET C^2 Composite Scores by Mental Category Groups

	Mental Category			
	I&II	IIIA	IIIB	IV
TC	.45	.49	.51	.45
Driver	.48	.48	.48	.45
Relative to Cat I&II TCs	100%	109%	113%	100%

The SIMNET Commo Composite is shown in Table 17. Again no significant differences were found for either TC mental category, $F(3,104) = 1.04$, $p<.38$, or driver mental category, $F(3,104) = 1.99$, $p<.12$.

Table 17

SIMNET Commo Composite Scores by Mental Category Groups

	Mental Category			
	I&II	IIIA	IIIB	IV
TC	.64	.64	.64	.59
Driver	.66	.59	.62	.63
Relative to Cat I&II TCs	100%	100%	100%	92%

The Call For Fire Composites means are shown in Table 18. An ANOVA revealed a significant main effect for TC mental category, $F(3,104) = 4.45$, $p<.006$, but not for driver mental category, $F(3,104) = .97$, $p<.42$.

Table 18

SIMNET Call For Fire Composite Scores by Mental Category Groups

	Mental Category			
	I&II	IIIA	IIIB	IV
TC	.87	.81	.65	.72
Driver	.81	.72	.80	.71
Relative to Cat I&II TCs	100%	93%	75%	83%

An examination of the task cluster scores in Appendix G shows that the most soldiers were nearly perfect in their call for fire procedures as the overall mean was .94. The big discriminator in call for fire was whether the soldier could call for fire accurately enough to destroy the target. Table 19 shows the Call For Fire Accuracy task by mental category for TCs. This task assessed the effectiveness of the call for fire procedures, i.e., whether the

target was destroyed by the adjusted artillery fire. As can be seen, there are large differences in the effectiveness of the call for fire between the upper and lower mental category groups. Appendix G also shows a large difference in encoding and decoding grid coordinates, with Cat IV TCs performing at 42% of Cat I&II TCs.

Table 19

SIMNET Call For Fire Accuracy by Mental Category Groups

	Mental Category			
	I&II	IIIA	IIIB	IV
TC	.77	.70	.34	.52
Relative to Cat I&II TCs	100%	91%	44%	67%

Grid deviation errors. Table 20 shows the SIMNET grid deviation errors. The differences between mental categories were not found to be significant, $F(3,116) = 1.91$, $p<.12$. As was found in the field test, however, Cat IV TC grid deviation errors were greatest.

Table 20

SIMNET Test Grid Deviation Errors (in meters) by TC Mental Category Groups

	Mental Category			
	I&II	IIIA	IIIB	IV
TC	954	914	894	1142
Relative to Cat I&II TCs	100%	104%	107%	84%

Effect Size Analyses

A major recurring question regarding quality accessions concerns the performance on Cat IVs relative to Cat I - IIIs. The following analyses

compared the performance of Cat IV TCs to the others on the principal Field and SIMNET scores. While the intent is to view the field and SIMNET tests as separate tests, a Field and SIMNET Combined total was computed for the remaining analyses. The Field and SIMNET Combined score is simply the mean of the two tests' total scores.

Table 21

TC Effect Sizes for Field and SIMNET measures

Measure	Cat I-III (n=91)	Cat IV (n=29)	Cat IV s.d.	Effect Size
Field Test:				
Total Score	.50	.43	.10	.73**
Precombat Composite	.49	.37	.20	.59**
C^2 Composite	.44	.36	.19	.46*
Commo Composite	.50	.45	.14	.32
Speed/Accuracy Composite	.25	.18	.07	.93**
SIMNET Test:				
Total Score	.59	.53	.10	.69**
C^2 Composite	.48	.45	.16	.20
Commo Composite	.64	.59	.13	.34
Call For Fire Composite	.77	.72	.29	.19
Field and SIMNET Combined	.55	.48	.08	.88**

*p < .05 **p< .01

In an effort to help integrate research finding, proponents of meta-analysis , e.g., Glass (1977), have urged researchers to report means and standard deviations. From these it is possible to compute effect size which

reflects the magnitude of the difference between groups in terms of standard deviation units. An effect size of 1.0 is generally considered a large effect (Cohen, 1977). Table 21 shows the means for Cat I - III and IVs, the standard deviation for Cat IVs, and the effect size for the principal measures. The means and standard deviations shown in the table have been rounded. The significance values are based on independent group t-tests.

The effect size analyses show that the differences between Cat I-III and Cat IV TCs is approximately .7 standard deviation units for both the field and SIMNET tests and approximately .9 standard deviation units for the speed/accuracy composite and the Field and SIMNET Combined score.

Correlational Analyses

Table 22 shows the correlations between AFQT, i.e., the score used to define mental category, and SPRP unit performance after the effects of unit differences have been statistically removed. The notion here is that overall differences in unit performance minimize the relationship between individual performance and mental category. For example, lower mental category soldiers from a particularly well trained unit may perform better than the higher mental category soldiers from a lesser trained unit. Within units, however, mental ability may be a strong predictor of performance.

Analyses of SPRP performance by unit (division) found fairly large differences, with the means of the five units on the field test ranging from .57 to .44 and on the SIMNET test ranging from .54 to .63. Unit differences were covaried in the correlational analyses by calculating the zero-order correlations for each unit, transforming the values from r to Z_r, and then calculating a weighted mean.

Table 22

Correlations between TC and Driver AFQT and SPRP Performance after Covarying Unit Membership

(N = 120)	Field Test Total	SIMNET Test	Field & SIMNET Combined
TC AFQT	.44**	.27*	.45**
Driver AFQT	.18	.23*	.28**

*p < .05 **p< .01

The correlations further confirm that both the TC's and driver's mental ability contribute to the performance on the field and SIMNET test. Correlation were also computed between SPRP performance measures, Skill Qualification Test (SQT) scores, and the Recent Training metric derived from responses on

the training background questionnaire. These are shown in Table 23. The SQT is an MOS-specific paper & pencil test used to determine whether soldiers have developed and/or are maintaining relevant job knowledge and skills for each skill level.

Table 23

Correlation matrix of SPRP performance measures, AFQT, SQT, and Recent Training Metric

(N=120)	Field Total	SIMNET Total	Field/ SIMNET	TC AFQT	DVR AFQT	TC SQT	DVR SQT	TC Tng	DVR Tng
Field	1.0	.28**	.82**	.34**	.17	.34**	.26**	.10	.13
SIMNET		1.0	.79**	.27**	.20*	.37**	.14	.19*	.00
Field/SIMNET			1.0	.38**	.23**	.44**	.26**	.18	.08
TC AFQT				1.0	.02	.51**	.03	.03	.05
DVR AFQT					1.0	.00	.46**	.05	.05
TC SQT						1.0	.03	.03	.00
DVR SQT							1.0	.10	.27**
TC Tng Metric								1.0	.01
DVR Tng Metric									1.0

*p < .05 **p< .01

The correlation matrix in table 23 yields no real surprises relationships. It is interesting to note that SQT scores do correlate moderately high with the SPRP tests, particularly for the TCs. This substantial relationship adds additional credibility to the SQT test as being a valid measure of job knowledge and skills, at least for 19K. The correlation between SPRP and SQT should probably be even higher except that some TCs scores were from the skill level 2 test while others were from the skill level 3 test. SQT scores between skill levels, while undoubtedly correlated, have not specifically been standardized.

Also note that the correlation between the Field test and SIMNET test was moderate at best. This result is not that surprising since one-third of the task clusters on the field test assessed precombat tasks which were not tested on the SIMNET test. Conversely, nearly one-third of the SIMNET task clusters assessed call for fire and encoding/decoding which were not tested on the

field test. The field and SIMNET tests were designed to complement each other by covering different parts of the domain of 19K tank crewman tasks. That the correlations of AFQT and SQT with the Field/SIMNET Combined score were higher than with the separate tests further supports this notion. By definition, the Field/SIMNET Combined score was more reliable than the separate tests because the combined test was twice as long. On the other hand, SIMNET testing is not a proven methodology. The Field/SIMNET Combined score was, however, used as the criterion in the regression analyses.

Regression Analyses

A series of multiple regression analyses were conducted to estimate the separate and collective contributions of other variables in predicting SPRP performance. Again, the criterion variable used was the Field/SIMNET Combined score. Three sets of predictors were used: TC and driver AFQT, TC and driver SQT, and unit membership. Unit membership was defined by four dummy variables that were constructed to represent the five units. Table 24 shows the multiple correlations between the separate predictor sets and the Field/SIMNET Combined score.

Table 24

Multiple Correlations between Individual Predictor Sets and Field/SIMNET Combined Score

	Criterion: Field/SIMNET Combined Score	
Predictor Sets	Multiple R	Multiple R^2
SQT (TC and Driver)	.51*	.26*
AFQT (TC and Driver)	.43*	.19*
Unit Membership	.41*	.16*

*$p < .001$

The correlations shown in table 24 are quite large. The multiple R^2 represents the percent of the variance on the Field and SIMNET tests which was accounted for by each of the predictor sets. Therefore 19% of the SPRP variance could be explained by the AFQT scores of the TC and driver. Also, TC and driver SQT was even a better predictor than AFQT. The SQT tests were taken by soldiers in the previous 12 months. By contrast, the mean time in service for the TCs was 11 years, which means the AFQT scores were obtained 11 years before. Taken together, the results speak to the stability and longitudinal predictive validity of the ASVAB. The predictor sets were then combined using multiple regression techniques, with the results shown in table 25.

Table 25

Results of Multiple Regression Analyses Predicting Field/SIMNET Combined Score

	Criterion: Field/SIMNET Combined Score	
Predictor Sets	Multiple R	Multiple R^2
SQT & AFQT	.55*	.30*
SQT, AFQT & UNIT MEMBERSHIP	.66*	.44*

*$p < .0001$

Taken together SQT and AFQT were very strong predictors of Armor performance, as measured by the SPRP field and SIMNET tests. The two predictor sets accounted for 30% of the criterion variance. Adding unit membership increased the accounted variance to 44% which is extremely high. Unit membership is not, however, a true predictor as there was no a priori way of identifying unit performance differences. That 44% of the test variance was accounted for by three predictor sets does, however, suggest that the SPRP testing was psychometrically sound.

Analyses were also completed comparing the performance of TCs and drivers who had received traditional high school diplomas (87% of the TCs) to those who had passed the General Education Development (GED) test; no differences were found in either the Field or SIMNET tests.

Soldier Evaluation of Testing

Following the SIMNET testing, the soldiers were asked to provide written comments about both the Field and SIMNET tests, including both good and bad points for each test. An overall positive impression was indicated by 85% of the soldiers for the field test and 93% of the soldiers for the SIMNET test. For the field test, 8% were neutral, 3% were generally negative, with 4% no comment. For the SIMNET test, 3% were neutral with 4% being negative.

The majority of the positive comments concerning the field test described how beneficial the test had been for training. The soldiers said the test clearly displayed how combat ready or how unprepared for combat they were at this particular time. Some mentioned that the SPRP field test was the best training they had ever had, even better than that received at the National Training Center (NTC). Realism was the second most often mentioned positive aspect. Specifically, the soldiers cited the simulated death of the loader as creating a very stressful combat situation. The soldiers also felt that the OPFOR provided for realistic engagements, with others saying that the test was well thought out and prepared.

The majority of the negative comments said the field test should have required cross-country maneuvers, rather than the staying on gravel roads. Regarding this point, the decision was made to keep the course on the gravel to help standardization, i.e., so the test would be the same for all crews. Had the test been designed so the tanks went off the road, the Kentucky spring rains would have created havoc. Other negative comments addressed equipment problems such as communication problems and tanks in need of maintenance. Those comments occurred most frequently with the first few groups, after which most of the maintenance problems were eliminated.

The positive comments for SIMNET overwhelmingly mentioned that it would be great to incorporate its use into regular training. The soldiers thought that everyone should have the opportunity to train on SIMNET and that they would like to have the opportunity again. A good portion also felt that the SIMNET testing was very realistic and afforded many engagement opportunities that could not be done in the field. The negative comments most often addressed the general weaknesses in the SIMNET system. Differences in combat driving and problems with depth perception were mentioned most frequently.

DISCUSSION

The Armor SPRP test results consistently demonstrate that tank crew effectiveness is influenced by the mental ability of the crewman. Differences in performance as a function of mental ability were not only found for the overall performance measures, but for the precombat, C^2, communications, call for fire, grid coordinate determination, and encoding/decoding tasks as well. Analyses of the field test speed/accuracy composite showed that crews with Cat IV TCs performed at 67% of crews with Cat I&II TCs. The results also found little difference between the performance of Cat I&II and Cat IIIA crewmen.

The results also clearly show that mental ability of the crewmen affects the collective performance of the crew, not just the performance of individual tasks. The correlation and regression analyses showed that the mental categories of both the TC and driver were related to crew performance, with TC and driver AFQT scores accounting for 19% of the test variance. The effects of mental ability for the TC and driver were also found to be additive, i.e., the more smart crewmen in a tank, the better the performance of the tank. The mental category of the driver was found to influence crew effectiveness even though the majority of the tasks directly assessed the actions of the TC. A possible explanation is that TCs with high ability crewmen can distribute responsibility, have more confidence in their crew's competence, and therefore can better concentrate on their own job.

The Phase II Armor SPRP tests demonstrated mental ability to be related to the C^2 performance of first-term (drivers) and second-term (TCs) soldiers. The Phase I Armor SPRP test showed mental ability to be related to simulated tank gunnery performance of soldiers during initial-entry training (Graham, 1989). Phase I analyses based on a Lanchester-type combat-attrition model indicated Cat IV soldiers performed at 73% of the level of Cat I&II soldiers. Taken together, the Phase I & II Armor SPRP tests have demonstrated mental ability effects over most of the domain of Armor tasks. Furthermore, the SPRP

results are consistent with previous research that links mental ability and armor performance.

While the results show consistent effects of mental ability, the utility of enlisting more costly quality soldiers could still be questioned. At the heart of the issue is the question of whether additional training can eliminate mental ability differences. The goal of Army training is to get all soldiers to perform to a set of standards. In theory, this approach is designed to eliminate the effects of individual differences. In practice, training is often structured to prepare a unit to perform well at an upcoming training exercise, e.g. Table VIII or NTC. Unit leaders are often able to identify and eliminate individual performance deficiencies for these training exercises through additional training or other safeguards. For example, the unit master gunner's job is to ensure that all tanks are correctly boresighted before gunnery. If a crew cannot boresight, the master gunner will do it. In combat, however, units will not have time to check up on the weaker crews. If a crew cannot keep their tank boresighted, they will be killed or disabled.

The field test found a 30% difference between Cat I&II and Cat IV TCs' ability to prepare the tank for combat. If these tasks are not correctly performed, the technological advantages of the M1 tank are nullified. Plans are underway to place additional electronic equipment on the tank as part of the Block II and III mods, e.g., the Position Navigation (POSNAV) system, the Commander's Independent Thermal Viewer (CITV), and the InterVehicular Information System (IVIS). Based on the field test results, it is reasonable to expect that the new equipment will enhance higher mental ability crews performance more than lower mental ability crews. The result would be even bigger mental ability effects.

The modern battlefield will be dynamic and rife with uncertainty. AirLand Battle doctrine recognizes this and stresses the exploitation of the fluid battlefield. To do so, the Army needs soldiers who are resourceful and who can respond quickly to changing situations. Given a basic definition of mental ability as the ability to adapt to novel situations, AirLand Battle success is predicated on having quality soldiers who can respond to the dynamic battlefield, take on additional responsibilities, and make good decisions. While these points largely apply to leaders, enlisted armor crewmen will quickly be required to take on leadership responsibilities soon after combat begins. After the first day of battle, units will be reconstituted. Some TCs will then become platoon leaders; gunners, loaders, and drivers will become TCs. The difference between being able to continue the battle and chaotic defeat will depend on how well the soldiers can handle the stress and take on the new responsibilities.

The SPRF test simulated stressful combat conditions using a third day of the war scenario. Crews were flown in, given an unfamiliar unit SOP which they had to quickly learn, made part of a reconstituted crew, and given a tank in need of maintenance. Throughout the field and SIMNET tests the crews encountered uncertainty, including the hideous simulated death of a crewman and platoon members. The results - roughly a 25% difference between Cat I&II and Cat IV crews. Given that the United States is investing $2.5 million with each tank it gives an Armor crew, a 25% decrement in performance is costly.

By comparison, the cost of recruiting and retaining quality soldiers to obtain maximum weapon system effectiveness may be small.

The cumulative effects of mental category are even more dramatic when the SPRP findings are considered as combat multipliers. Consider the cumulative effects of the performance of Cat IV crewmen. Relative to the performance of Cat I&II crewmen, Cat IVs boresighted at 45%, hit targets at 73% (Phase I), performed with a speed of 81%, effectively called for fire at 67%, and reported accurate grid coordinates at 55%. Furthermore, combat leaders will have greater confidence in quality crews, which will facilitate the execution of bold decisive actions. Given that combat is a series of battles in which these tasks must be performed over and over, the cumulative effects of mental ability will substantially impact combat effectiveness. Higher quality soldiers equate to higher enemy attrition and higher unit survival.

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APPENDIX A

EXTRACTS FROM ARMOR AND ENGINEER BOARD'S SPRP TEST DESIGN PLAN

CHAPTER 1. INTRODUCTION

1.1 PURPOSE

The purpose of this test is to support a larger U.S. Army Training and Doctrine Command (TRADOC) effort linking recruit characteristics, such as mental aptitude or education level, to job performance and unit readiness. TRADOC and Department of the Army (DA) will use the data from this and other efforts to answer inquiries from Congress as part of the Soldier Performance Research Project (SPRP).

1.2 BACKGROUND

1.2.1 Department of Defense (DOD) developed a multitrack approach to support the Annual Report to Congress on joint service efforts to link enlistment standards to job performance. As a portion of this approach, Deputy Chief of Staff Personnel (DCSPER) tasked TRADOC to take the lead, with Rand Corporation and U.S. Army Research Institute (ARI). A meeting at TRADOC on 17 March 1988 with representatives from Office, Chief of Armor (OCOA), U.S. Army Armor Center (USAARMC), DCSPER, Headquarters TRADOC, Rand Corporation, and the other TRADOC centers and schools resulted in an initial tasking message to the USAARMC on 23 March 1988. On 4 May 1988, USAARMC personnel, including Test and Experimentation Command (TEXCOM) Armor and Engineer Board (ARENBD) briefed a test concept at TRADOC. This test concept consisted of a field test, a survey, a unit conduct-of-fire (U-COFT) trainer test, and a Simulation Network (SIMNET) test. In a 12 June 1988 message to MG Tait from BG Stroup, TRADOC tasked the Armor Center to conduct the field and SIMNET test

1.2.2 The TRADOC approved field and SIMNET tests require large numbers of Forces Command (FORSCOM) personnel; however, FORSCOM support could not be obtained in time to allow the originally envisioned September-October 1988 test date. This resulted in an 8-9 September 1988 meeting at TRADOC to determine the fate of these tests. TRADOC directed that these tests would be conducted in the March-May 1989 timeframe.

1.2.3 The recruit characteristics chosen for examination are those of the Soldier Quality (SQ) Program as outlined in TRADOC Pamphlet 601-1, 15 April 1988. The SQ Program is the system proponents use to justify the percentages of recruits in Armed Forces Qualification Test (AFQT) categories needed in their accession military occupational specialties (MOS) each year. Since 1982, Congress has been closely examining recruiting command's budget in comparison with the Army's recruiting successes, and has repeatedly asked why the Army needs to recruit so many high-quality soldiers as measured by SQ Program criteria. This test will play a key part in the overall TRADOC study in providing a rigorous test and supporting analysis of the

cognitive skills required to support the distribution of quality requirements.

1.3 DESCRIPTION OF THE FIELD AND SIMNET TESTS

The two tests approved by TRADOC, the field test and the SIMNET test, will examine individual tank crews as an indicator of force readiness. To accomplish this, tank commanders (TC) and drivers will be selected for testing based on specified mental categories (AFQT score ranges). The remainder of the tested crew, the gunners and loaders, will be test surrogates assisting in the evaluation of the TCs and drivers. In the field test, seven events will evaluate the ability of the TC and driver to react to situations they are expected to encounter on a modern battlefield. The field test stations at which these events will occur will have data collectors who will time the responses and determine if the crews respond correctly. The SIMNET test will contain eight distinct situations that will test the ability of the TC and driver to act as part of a section and platoon, as well as to perform crew and individual tasks. SIMNET data collectors will monitor communications and video terminals to watch for responses.

1.4 CRITICAL TEST ISSUE

1.4.1 ISSUE

How does the mental category of the tank commander and driver affect the performance of a tank crew in combat critical tasks?

1.4.2 CRITERION

None. This issue is investigative in nature.

1.5 SCOPE AND TACTICAL CONTEXT

1.5.1 SCOPE

The ARENBD Advanced Technology Research Division (ATRD) at Fort Knox, Kentucky, will conduct the test. The test will involve 120 crews who will complete both the field and SIMNET tests. Analysis of test results will be performed by the U.S. Army Armor School (USAARMS). A joint working group consisting of representatives from the Armor School and ARI, under the head of OCOA, will write the report in the American Psychological Association format. The test report is due by 30 June 1989. The test is due to begin 16 March and end on 14 April 1989.

1.5.2 TACTICAL CONTEXT

The doctrine for the conduct of this test can be found in FM 17-12-1, FM 17-15, FM 17-19-2K, FM 71-1, FM 71-2, FM 100-2-1, FM 21-3, ARTEP 17-237-10-MTP, TM 9-2350-255-10, STP 17-19K1-SM, STP 17-19K24, STP 21-1, and ARTEP MTP 12-12-E. This test will be based completely upon the crews' tactical performance, except for entrance and exit questionnaires. This test will use opposing forces (OPFOR) to support tactical situations.

1.5.3 PILOT TEST

The field pilot test is due to begin 9 March 1989. The SIMNET pilot test will be conducted on 9 March 1989. These tests will be conducted to ensure that the methodology and data collection, reduction, and analysis plans are adequate. Since the personnel acting as TC and driver in the pilot test will be part of the test directorate, data from these pilot tests will not be included as part of the test analysis.

1.5.4 TEST INCIDENT REPORTS

Test incident reports (TIR) will be completed in accordance with Army Materiel Command (AMC) Regulation 70-13. TIRs will be completed by the test officer and summarized for inclusion in the test report.

1.5.5 SAFETY

As only fielded Army materiel and established doctrine will be used in this test, no test specific safety release should be required. However, this document will be reviewed by the TRADOC safety office which will make the final determination on whether or not a safety release is required. A standard safety briefing will be administered to all test participants, OPFOR, and data collectors prior to test initiation.

1.5.6 TEST LIMITATIONS

Due to large sample size and the highly controlled structure of the tactical situations, test limitations should be minimized. The only extraneous variables that could cause concern are those of training variation levels among test participants and weather conditions (field test only). However, since only M1-qualified soldiers (MOS 19K) will participate in the test and a uniform cross section of soldiers from various mental categories will be taken from every sampled unit, training variations from unit to unit should not present a significant problem.

CHAPTER 2. TEST DESIGN SUMMARY

2.1 TEST CONDITIONS

2.1.1 FACTORS AND CONDITIONS

2.1.1.1 Test Variables and Tabulation of Independent Variables.

a. Test Variables.

DEPENDENT VARIABLES	INDEPENDENT VARIABLES	EXTRANEOUS VARIABLES
Type of Tactical Response	Tank Commander (TC) Mental Category	Weather
Time of Tactical Response	Driver Mental Category	Training

Note: Weather is an extraneous variable for the field test phase only.

b. Tabulation of Independent Variables.

VARIABLES	CONDITION (QUANTITY)	TREATMENT
TC Mental Category	Systematically Varied (28)	4 Categories
Driver Mental Category	Systematically Varied (28)	4 Categories

2.1.2 EVENTS

2.1.2.1 Crew Selection. OCOA will complete a by-name selection and coordination of 240 test participants from four FORSCOM posts. OCOA will be assisted by ARI and ARENBD in this task. This selection process will minimize the effects of training, rank, and experience on the test outcome.

2.1.2.2 Pre-test Events. The field test officer will conduct a pilot field test. Four crews will completely negotiate the course. The SIMNET test officer will conduct a one day pilot test during which four crews will complete the SIMNET phase. These pilot tests will exercise data collection, reduction, and analysis to ensure data gathering, handling, and reduction methods are adequate.

2.1.2.3 Operational Field Test The field test will test 120 M1 TCs and 120 drivers (MOS 19K). Test surrogates will act as loaders and gunners at the seven predetermined test stations. These stations will present the crews with realistic, tactical

problems and will test the appropriateness and timeliness of their responses. The test will be run during daylight hours in a non-nuclear, biological, and chemical (NBC) environment. The tank's hatches will be in the full-open position.

2.1.2.4 Operational SIMNET Test. The same TCs and drivers paired in the field test will crew a SIMNET M1 simulator with loader and gunner surrogates. The crew, performing as one of the tanks of a tank platoon, will be evaluated on the appropriateness and timeliness of their responses in eight tactical situations.

2.2 DATA REQUIREMENTS

See appendix B and chapter 3.

2.3 DATA HANDLING

2.3.1 TYPES OF DATA

Field test data will consist of demographic, audio recordings, and objective crew performance data. The SIMNET test data will include computer video and audio records, in addition to objective crew performance data.

2.3.2 DATA COLLECTION

2.3.2.1 Demographic and previous training questionnaires will be completed by test subjects.

2.3.2.2 The primary measures of performance are outlined below:

a. Tactical response will be measured in accordance with task performance measures outlined in FM 17-12-1, FM 17-15, FM 17-19-2K, FM 71-1, FM 71-2, and FM 100-2-1, FM 21-3, STP 21-1-SMCT, STP 17-19K1-SM, STP 17-19K24-SM-TG, ARTEP 17-237-10-MTP, and the Armor School Tank Platoon SOP, which the test officer will provide to the soldiers prior to the test.

b. The time it takes to complete certain tactical responses will be recorded.

2.3.2.3 Data collectors and test surrogate crewmembers, who are members of the test directorate assigned to aid data collection and scenario development, will complete data collection forms and checklists. Data will be extracted from intercom and radio communication, and feeder checklists filled out by evaluators. Evaluators will consist of hidden evaluators along the field test course, surrogates in the tanks, OPFOR, and control personnel (Military Police) who are part of the problem play. During the SIMNET test, comput. video and audio records will be available to corroborate the checklists.

2.3.2.4 Data collection forms will address the appropriateness of responses.

2.3.2.5 Time of responses will be available from data collection forms. Accuracy will be within ± 1 second.

2.3.3 DATA REDUCTION AND ANALYSIS

2.3.3.1 Information from the data collection forms, data reduction forms, and questionnaires will be entered in a computer for storage, editing, sorting, and eventual analysis for the test report. The USAARMC analysis team will be responsible for the analysis of this data. The test report will be written by ARI and USAARMS and delivered to HQ TRADOC no later than 26 May 1989.

2.3.3.2 Audio tapes of radio and intercom voice transmissions will be used to corroborate manual data collection forms.

2.3.3.3 Computer records of SIMNET trials will be used to corroborate manual data collection forms, where possible.

2.3.4 SUMMARY OF ANALYSIS PLAN

2.3.4.1 Analyses. Analyses will include determining response coefficients for measures of effectiveness, using linear regression techniques, based on variation in mental category. The primary techniques will be analysis of variance (ANOVA), multivariate regression analysis, and correlational techniques using demographic predictors and variance of mental category. Differences among these populations will be reported for the following areas of interest:

a. Percent of correct responses.

b. Percent of response time difference.

c. Accuracy of distance estimation.

2.3.4.2 Form of Data Presentation.

a. Data will be presented in tabular and graphic format. Data will be presented so that individual tank combat effectiveness is readily apparent.

b. Audio tapes will be retained by ARENBD and made available for two years after publication of the test report.

CHAPTER 3. TEST DETAILS

3.1 TC AND DRIVER SELECTION

3.1.1 OBJECTIVE

The objective of the TC and driver selection method outlined below is to minimize the effects of prior training, rank, and experience variables on test outcome.

3.1.2 METHOD

3.1.2.1 The test factor around which the test is constructed is soldier mental category. Soldiers will be sorted by mental category according to aptitude test scores taken from tests prior to induction. Based on these tests, the potential recruits are placed in five broad categories. The lower the category number, the greater the probability of the recruit's success in training. Mental categories I and II contain the top 35 percent of the scores; IIIa the next 14 percent, IIIb the next 15 percent, and IV and V the bottom 30 percent. This test examines performance according to two factors, TC mental category and driver mental category (see figure 3-1). The test design is a two-way ANOVA design. The overall design is a 4 by 4 table with TC mental category on one axis and driver mental category on the other axis. There are seven crews (i.e., one crew equals one TC and driver) within each of the 16 cells in the table which means there are seven TCs and seven drivers represented within each cell. In order to keep the test design counterbalanced across the factors of mental category, all selections of personnel will be in equal numbers across the four mental categories of the TC and driver. Within each of the four mental categories, 28 personnel will be chosen. This yields a total of 112 TCs and another 112 drivers who will be active participants in this test. To ensure the 112 minimum is achieved 120 of each will be obtained in the event an active player is not able to complete the test for whatever reason.

3.1.2.2 Since each battalion has specific unit training experience that could influence the design, all selections will be made with regard to battalions. This means that an equal sample of mental categories are drawn from each battalion. Therefore, block selections will be made within a battalion and as much as possible, there will be equal representation from each battalion.

3.1.2.3 Block selections will be counterbalanced throughout the design so that (in the case of TCs) no one mental category cell has more E5s or more E6s than other cells.

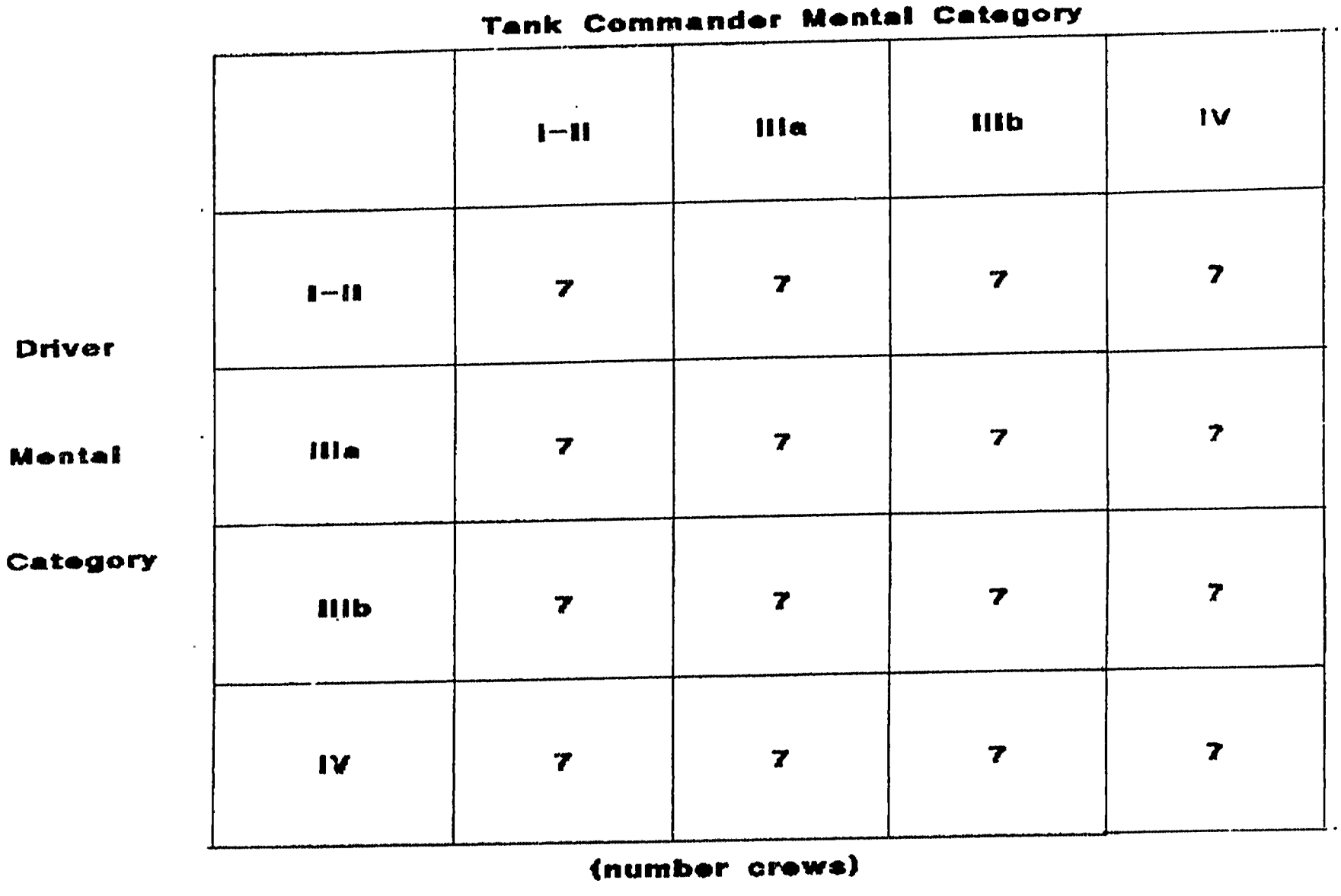

Figure 3–1. Test design matrix

3.1.2.4 When selecting the E5 and E6 TCs from the final distribution, it is important that individual cells be counterbalanced throughout the 16-cell matrix. For example, if there are 80 E6 TCs and 32 E5 TCs (based on the previous conditions), then the ideal individual cell ratio would be five E6s to two E5s balanced across the four mental categories. The final ratio is dependent on the overall distribution available from the units.

3.2 PILOT TEST

3.2.1 OBJECTIVE

The objective of the pilot test is to verify that the data monitoring systems are functioning and to exercise test control organization to identify problems in data collection training, data collection methods, and test directorate coordination.

3.2.2 METHOD

3.2.2.1 **Field Test.** After a three day train-up and thorough reconnaissance of the test course by the evaluators and surrogate personnel, a full-up rehearsal will be held. The test course will be run approximately 30 times, with the evaluators and surrogates examining the evaluation sites along the course from both the location of the vehicles and location of evaluators at each station. A major objective of this rehearsal period will be to ensure that surrogate personnel can provide consistent, uniform responses throughout the tests. Without this consistent performance, the operational test results, especially early in the test period, will not be comparable. After this rehearsal, four vehicles crewed by test directorate personnel (from the SIMNET test) with evaluators in place will negotiate the entire course to run a final check of test timing, test control, and evaluation organization. This will, in effect, test the course set-up.

3.2.2.2 **SIMNET Test.** The pilot test will last one day. Four tank crews will complete SIMNET testing to ensure that control concepts are adequate for the operational test phase.

3.2.3 DATA REQUIRED

See Table 3-1.

3.2.4 DATA REDUCTION AND ANALYSIS

Problems will be analyzed to determine any adverse effects on the test procedures and to identify corrective actions required before the record test starts. Scoring and time data will be examined to determine if information obtained is adequate

for analysis. The sample data collected will be analyzed to ensure it will answer the test issue. Since pilot test subjects are not drawn according to the procedures in paragraph 3.1, pilot test data will not be used in the test report. When all problems have been corrected, the operational test will begin.

TABLE 3-1. Pilot Test

Data No.	Data Description			Data Collection Form
	Data Items	Accuracy	Source	
1	Adequacy of evaluator and surrogate training	Finding	Test directorate	Test officer's logbook
2	Adequacy of operational performance methodology	Finding	Test directorate	Test officer's logbook
3	Adequacy of supporting instrumentation	Finding	Test directorate	Test officer's logbook
4	Adequacy of the number of data col. ors	Finding	Test directorate	Test officer's logbook
5	Adequacy of the locations of data collectors	Finding	Test directorate	Test officer's logbook
6	Adequacy of accuracy in completing data collection forms	Finding	Test directorate	Test officer's logbook
7	Adequacy of number of data reducers	Finding	Test directorate	Test officer's logbook
8	Adequacy of questionnaire administration	Finding	Test directorate	Test officer's logbook
9	Adequacy of test site location	Finding	Test directorate	Test officer's logbook
10	Adequacy of test communication network	Finding	Test directorate	Test officer's logbook
11	Adequacy of support vehicles	Finding	Test directorate	Test officer's logbook

TABLE 3-1. Pilot Test

Data No.	Data Description: Data Items	Accuracy	Source	Data Collection Form
12	Adequacy of safety considerations and control	Finding	Test directorate	Test officer's logbook
13	Adequacy of automatic data processing equipment	Finding	Test directorate	Test officer's logbook
14	Adequacy of analytical procedures	Finding	Test directorate	Test officer's logbook
15	Adequacy of operations security	Finding	Test directorate	Test officer's logbook
16	Adequacy of maintenance support	Finding	Test directorate	Test officer's logbook

3.3 OPERATIONAL PERFORMANCE

3.3.1 ISSUE AND CRITERION

3.3.1.1 Issue. Does the mental category of the tank commander and driver affect the performance of a tank crew in combat critical tasks?

3.3.1.2 Criterion. None. This issue is investigative in nature.

3.3.2 METHOD

This test will involve 112 M1 tank crews encountering simulated combat critical crew task situations. The tank commanders' and drivers' reactions to these tactical situations will be evaluated. The gunners and loaders will be test surrogates who will assist in developing the test scenarios and serve as data collectors and evaluators.

3.3.2.1 Field Test Events.

a. Station 1--Brigade Support Area (BSA). This station will be a tactical station which will replicate, as closely as possible, a portion of a brigade support area (BSA) in a combat situation. The crewmembers will meet for the first time and be told to prepare an M1 tank for combat. The TC will be given the mission of taking the tank forward to a battalion currently in contact. The tank will require ammunition upload, refueling, preventive maintenance checks and services (PMCS), and prepare-to-fire checks. There will be four induced faults in the vehicle that the TC will have to find and correct. In addition, the TC, will have to assist the gunner in preparing his station. The TC will be required to conduct communications checks, enter a radio net, post an overlay, and review his orders with the crew. As driven by the operations order, the scenario will require that the time in the BSA is approximately two hours. The TC will be given a start time at which he must leave the BSA.

b. Station 2--Surprise Engagement with Disabled T-72 and T-72 in Overwatch. At a designated point in the road, the loader (a test surrogate) will identify two tanks at about 1,200 meters; one in overwatch with a field of fire covering the course road, and the other with a crew working on it, representing an obviously disabled vehicle. The time from the loader identifying the targets until the TC commands "GUNNER--CEASE FIRE" will be recorded. The TC should lay the main gun on the overwatch tank (most dangerous target as the other tank is obviously disabled and the tank crew is dismounted) and give proper fire commands for the engagement. When the first T-72 is engaged, it will give a visual signature that it has been hit. The crew should then engage the second T-72. The second T-72 will give an indication of having been hit after the first round is fired, and its crew evacuates the vehicle and runs into the woods. The driver during this time should turn the frontal armor toward the targets if the terrain permits. The TC should engage both crews with his machine gun. The TC should then report the action to his higher headquarters (simulated by the test directorate) giving a correct location, and should direct his crew to assume a battlecarry posture with SABOT loaded.

c. Station 3--Antitank Guided Missile (ATGM) Ambush in Minefield. The TC must have correctly located the minefield (a friendly family of scatterable mines [FASCAM] minefield from previous action) from the overlay he was given at Station 1, BSA. The TC should direct the driver to a cleared and marked lane through the minefield and control the driver's progress through it. As the tank reaches a point approximately one-third of the way through the minefield, it is engaged by an ATGM from a partially concealed vehicle approximately 1,500-2,000 meters to the direct front. The gunner will acquire the ATGM blast and alert the TC, who should immediately issue a fire command against

the OPFOR vehicle. The TC should then direct the driver to move forward rapidly out of danger while firing at the OPFOR vehicle with the main gun and/or TC's machine gun. The gunner will continue to engage until the TC determines the target is destroyed. In another possible solution to the situation, the TC could direct the driver to move backward rapidly, activating vehicle smoke. The TC should then engage the target using thermal sights until it is destroyed. Both the time to issue the fire command and the time it takes to pass through the minefield will be timed. The TC should then direct the proper battlecarry posture (SABOT) and submit a correct report. There is more than one correct solution in this situation.

d. Station 4--Meeting Engagement with Enemy Stragglers - Loader Killed. At this station, the TC will acquire three enemy soldiers at approximately 40 meters about the same time the enemy soldiers open fire on the tank with automatic rifle fire. The loader is killed. The TC will engage the enemy with the coax machine gun or his machine gun, or direct the gunner to engage the enemy with the coax machine gun. The TC must check the loader and determine him to be dead (the loader will have props to make his death appear convincing). The TC should submit a correct report to his higher headquarters and request instructions. He will be told to leave the loader by the side of the road, that he will be picked up a short time later. The TC, gunner, and driver should then evacuate the loader to the side of the trail, and set the tank for operation in a three-man crew configuration and proceed.

e. Station 5--Military Police Traffic Control Point (TCP). As the tank approaches the traffic control point (TCP), the TC should recognize the TCP as friendly military police (MPs). The TC will stop the tank, and the MP will check the TC's navigation. The TC will then proceed, according to the MP's directions, toward the correct location.

f. Station 6--Meeting Engagement with T-72 and Infantry Fighting Vehicle (BMP) at Short Range. A T-72 leading a BMP will appear heading the opposite way along the route of the tank at short range (under 500 meters). This engagement will be conducted in a three-man crew configuration. As soon as the TC acquires the T-72 he should lay the main gun, announce "ON THE WAY", and fire. After the first round is fired, there will be no indication that the target has been hit. The TC must reengage the T-72. After the second round is fired, a hit-indication will occur, destroying the T-72. The TC must then engage the BMP as the BMP unmasks from behind the T-72. The BMP will be destroyed on the first round. The TC should then direct the correct battlecarry posture (SABOT) and submit a correct report of the action.

g. Station 7--Automatic Weapons Ambush: TC and Gunner Killed. A close range (100 meters) automatic weapons ambush will occur in which the TC is immediately killed and the loader (formerly the gunner) is able to communicate the fact that the TC is dead, and he has been hit and is losing consciousness. At this point, the driver, under his own initiative, must move the tank out of the kill zone, determine crew status, submit a report giving vehicle location, and report casualties. The driver will be directed to proceed. He will be stopped at the end of the lane (a short time later) by controllers. He should then correctly identify his unit, mission, and determine his location. At this point, the crew will be taken to a debriefing area where each of the stations will be discussed with them.

3.3.2.2 SIMNET Test Events.

a. Event 1. Prior to the SIMNET test, each soldier will receive a three hour familiarization on the SIMNET system. The TC will receive an order and enter a platoon radio net. The crew will then operate as part of a tank platoon during a tactical road march. The TC should properly supervise the positions of the tank during movement and short halts. At the direction of the platoon leader, the platoon will assume a wedge formation. The tank must move tactically as the wingman for the platoon sergeant (PSG). When told, the crew should properly execute an action drill by orienting the main gun in the proper direction and maintaining movement, orientation, and position. Shortly thereafter, the tank will be required to perform an air attack drill. The TC should issue a proper fire command. The TC will be asked by the PSG to correctly encode the platoon's location, which he must do correctly.

b. Event 2. The platoon formation will cross the line of departure (LD) and encounter a bridge. The TC should direct the driver across the bridge. The TC is then requested to encode the location of the bridge.

c. Event 3. The platoon will conduct a meeting engagement with an enemy tank platoon. The PSG will acquire the targets, direct a contact drill, and ask the TC to issue a contact report. The tank should then use proper engagement priorities. When all enemy tanks have been destroyed, the friendly platoon will resume movement; during which execution of section formations and drills will be evaluated.

d. Event 4. The platoon will be attacked by helicopters. During the attack, the PSG's tank is destroyed. The tank should engage the helicopter, issue a contact report, execute a contact drill, and conduct an air attack drill. The platoon will resume movement with the tank now assuming the PSG position in the platoon. The execution of platoon formations and drills will be evaluated.

e. Event 5. The crew will react to an ATGM ambush. The TC must issue the contact report and fire command (both timed). The tank should take evasive action (TC and driver responsibility) and engage the enemy until the enemy is destroyed. The TC should submit a spot report (SPOTREP).

f. Event 6. The crew will react to indirect fire by rapidly proceeding through the area and giving a correct report to include correct location. There will be no simulated chemical attack.

g. Event 7. The crew must assume a hasty fighting position and engage a reinforced motorized rifle company (MRC) as part of the platoon. The platoon leader will issue a platoon fire command. As a part of the platoon, the crew will unmask from a hill top and engage the MRC. The MRC will be in platoon columns approximately 2,500 meters in front of the fighting position. As the MRC is taken under fire, it will return fire and move into a company line to assault the fighting position. All the enemy tanks will be destroyed. The friendly platoon leader will be killed and his tank destroyed. The other friendly tank will have a mobility failure (shears a sprocket) in a partially exposed position. The three surviving BMPs from the MRC will take effective cover approximately 1,500 meters to the front of the fighting position. The test crew will be aboard the only undamaged tank remaining in the platoon. The TC should enter the company radio net and report. The TC should request instructions and when received, properly decode and plot coordinates of friendly adjacent units.

h. Event 8. The crew will be attacked by BMPs which neither they nor the other surviving tank can take under effective direct fire. The TC should then call for and adjust indirect fire. End of Exercise.

3.3.2.3 Control Concepts. All of the test subjects will start with the field test. After one day at the field test site, the test subjects will complete the field test and proceed to the SIMNET test [illegible] following day. At the field test site, tank crews will [illegible]t and be assigned to test vehicles at station 1. After being given an initial briefing and operations order, test vehicles will be controlled by test directorate personnel on the ground (part of the tactical scenario) and by test directorate personnel acting as higher headquarters on a command radio frequency. Prior to the field test portion beginning each morning, the test officer will make a personal reconnaissance of the test course. He will ensure that visibility is adequate at stations 2 and 3 for target engagements at those stations. If visibility is not adequate, the test will proceed with stations 2 and 3 omitted until visibility improves and they can be reincluded. The test officer will also reconnoiter the course to determine if weather or terrain conditions render navigation or

trafficability of the course impossible. If it is impossible for Mls to traverse the course, the test officer will delay test start until conditions improve. If nightfall precludes testing of all the crews so delayed, the test officer will send them on to the SIMNET test and attempt to return them to the field test following the completion of the SIMNET test the following day. At the SIMNET facility, after the initial training and briefing, test directorate personnel will control the scenario by acting as the higher headquarters and other platoon members.

3.3.2.4 Data Collection Concepts. For each field test station, data collectors will evaluate the crews' responses for both time and appropriateness, from a remote site on a non-interference basis. Data collectors will have a radio that will allow them to hear crew communication over the intercom. In addition, the test surrogates aboard the vehicle will provide crew performance evaluation, as will OPFOR and other test personnel who are part of the problems (MPs at station 5).

3.3.3 DATA REQUIRED

3.3.3.1 See Table 3.2 for field test.

3.3.3.2 See Table 3.3 for SIMNET test.

TABLE 3-2. Field Test Data Requirements

Data No.	Data Description			Data Collection Form
	Data Items	Accuracy	Source	
1.1	PMCS, preparation to fire checks conducted, faults found (includes supervising computer self-test)	Finding	Data Collector	D-1
1.2	Radio procedures correct	Finding	Data Collector	D-1
1.3	Correct battlecarry ammunition loaded	Finding	Data Collector	D-1
1.4	Time to complete station 1	± 10 seconds	Data Collector	D-1

TABLE 3-2. Field Test Data Requirements

Data No.	Data Description			Data Collection Form
	Data Items	Accuracy	Source	
4.4	Prepare to fight as three-man crew	Finding	Data Collector	D-4
4.5	Correct SPOTREP submitted	Finding	Data Collector	D-4
5.1	Recognize friendly TCP	Finding	Data Collector	D-5
5.2	TC issues correct challenge	Finding	Data Collector	D-5
5.3	TC reports correct location, parent unit, route, and hostile actions	Finding	Data Collector	D-5
6.1	TC uses correct engagement techniques	Finding	Data Collector	D-6
6.2	Time of engagement	$\pm$ 1 second	Data Collector	D-6
6.3	Correct SPOTREP submitted	Finding	Data Collector	D-6
6.4	Correct battlecarry ammunition loaded	Finding	Data Collector	D-6
7.1	React to automatic weapons fire by running out of kill zone	Finding	Data Collector	D-7
7.2	Correct reports	Finding	Data Collector	D-7

TABLE 3-2. Field Test Data Requirements

Data No.	Data Description			Data Collection Form
	Data Items	Accuracy	Source	
2.1	TC uses correct engagement sequence	Finding	Data Collector	D-2
2.2	TC uses correct fire commands	Finding	Data Collector	D-2
2.3	Driver takes evasive action	Finding	Data Collector	D-2
2.4	Engagement time	± 1 second	Data Collector	D-2
2.5	Correct SPOTREP submitted	Finding	Data Collector	D-2
3.1	Minefield coordinates correctly decoded	± 10 meters	Data Collector	D-3
3.2	Tank correctly negotiates minefield	Finding	Data Collector	D-3
3.3	React to ATGM attack	Finding	Data Collector	D-3
3.4	Time to issue fire command	± 1 second	Data Collector	D-3
3.5	Time to pass through minefield	± 1 second	Data Collector	D-3
3.6	Correct SPOTREP submitted	Finding	Data Collector	D-3
4.1	Reaction to small arms fire	Finding	Data Collector	D-4
4.2	Time to engage troops	± 1 second	Data Collector	D-4
4.3	Reaction to casualty	Finding	Data Collector	D-4

TABLE 3-3. SIMNET Test Data Requirements

Data No.	Data Description: Data Items	Accuracy	Source	Data Collection Form
S6.1	React to indirect fire	Finding	Data Collector	D-8
S6.2	Submit correct SPOTREP	Finding	Data Collector	D-8
S7.1	Engage enemy formation hasty battle position	Finding	Data Collector	D-8
S7.2	Correctly enters radio net	Finding	Data Collector	D-8
S7.3	Submit correct SPOTREP	Finding	Data Collector	D-8
S8.1	Correctly decode coordinates	Finding	Data Collector	D-8
S8.2	Submit correct call for fire and adjust indirect fire	Finding	Data Collector	D-8

3.3.4 DATA REDUCTION AND ANALYSIS

Data identified in paragraph 3.2.3 will be collected and used to answer the issues and criteria in paragraph 3.3.1.1 above. An analysis of variance (ANOVA) will be applied to differences in responses between tank commander mental categories and driver mental categories. Multivariate regression analysis will be used to examine response differences resulting from the interaction of independent variables. Several correlational analyses will examine other likely demographic predictors (civilian schooling level, rank, years of experience, etc.) or mixes of demographic predictors which may complement or be substituted for mental category as a predictor of performance. The dependent variables will be the types of tactical responses and time of tactical responses. The USAARMC evaluation team, consisting of Directorate of Evaluation and Standardization (DOES) assisted by Directorate of Training and Doctrine Development (DOTD), USAARMS, ARI, and OCOA will be responsible for the analysis effort.

TABLE 3-3. SIMNET Test Data Requirements

Data No.	Data Description			Data Collection Form
	Data Items	Accuracy	Source	
S1.1	Correctly enters radio net	Finding	Data Collector	D-8
S1.2	Correct movement during road march	Finding	Data Collector	D-8
S1.3	Executes section tactical formations/ drills	Finding	Data Collector	D-8
S2.1	Negotiates bridge	Finding	Data Collector	D-8
S2.2	Encodes coordinates	± 100 meters	Data Collector	D-8
S3.1	Issue correct fire command as part of platoon engaging enemy tanks	Finding	Data Collector	D-8
S3.2	Issue correct reports	Finding	Data Collector	D-8
S3.3	Correct movement techniques used	Finding	Data Collector	D-8
S4.1	Properly conduct contact and air attack drills in response to air attack	Finding	Data Collector	D-8
S4.2	Correct movement techniques used	Finding	Data Collector	D-8
S5.1	React to ATGM/BMP ambush submitted	Finding	Data Collector	D-8
S5.2	Submit correct SPOTREP	Finding	Data Collector	D-8

3.4 SAFETY

Any accidents will be reported. If the accident resulted from an inherently hazardous test design, it will be corrected. Potential safety hazards will be eliminated during the pilot test. Any serious incident that occurs will be reported on a TIR through TEXCOM to TRADOC and to Test and Evaluation Command (TECOM).

APPENDIX B

FIELD TEST OPERATION: ORDER

1. Situation.

   a. Enemy forces.

   - Hostilities broke out in area seven days ago
   - OPFOR forces made major river crossing over the Ohio River using bridges in the city of Louisville.
   - OPFOR forces pushed as far south as the Salt River before friendly forces counterattacked.
   - Major OPFOR forces operating in the area are the 119th and 120th Guards Motorized Rifle Regiment of the 45th Guards Motorized Rifle Division.
   - Majority of equipment used is T72 and BMP 1
   - Enemy forces at estimated 80% strength. Morale is high.
   - OPFOR forces have not used chemicals. They are not expected to use them in the near future.

   b. Friendly forces.

   - 52nd Mechanized Infantry Division defends in sector along front line of troops (FLOT) shown.
   - (1-14 Armor) (2-14 Cavalry) occupies sector as shown. Unit is badly in need of replacements.
   - Counterattack yesterday to reestablish FLOT left many enemy stragglers, vehicles and personnel in the brigade rear. Reports continue of engagements with OPFOR squads and vehicles in the brigade rear.
   - OPFOR forces have local air superiority. Numerous reports of OPFOR fast movers and helicopters in the Brigade rear.
   - Brigade commander has directed that BSA form and prepare individual tank crews as quickly as possible. Send them forward as individual crews to link up with units.

2. Mission.

Depart the BSA no later than _____ and arrive at the brigade release point, grid 054064 no later than _____ (D+ two hours) to join parent unit. Destroy and report any enemy resistance encountered enroute.

3. Execution.

a. Your unit is (A/1-14 Armor) (A/2-14 Cavalry). You will be the D24, second platoon.

b. Your gunner and loader started work on the tank two hours ago. They have completed the automotive PMCS per my instructions and the maintenance team has corrected all deadline faults.

c. You are to complete the prep to fire checks per table 2-2 in the dash ten manual and the pre combat inspection checklist in the tank platoon SOP issued to you last night. You have ninety minutes to complete these requirements.

d. At the end of ninety minutes, or if you wish to report sooner, I will lead an inspection team through your vehicle to ensure you are ready to depart the BSA.

e. Once you depart the BSA, move along route red (Brigade Main Supply Route) to reach the release point. The First Sergeant will meet you there to take you to your unit.

f. Destroy and report any enemy resistance enroute. Use report formats found in Annex F of your SOP. Send your reports to (Company) (Troop) Net Control Station.

g. Your first priority is to join your unit.

h. Fires, No artillery or air support is available.

i. The air threat is high. The brigade commander has directed all tank crews to travel in the full open mode with air guards up.

j. White smoke from OPFOR vehicles indicates a kill. Ensure that all engagements end with a confirmed kill.

4. Service/Support.

a. Services.

- Maintenance and recovery. If you become mired or your vehicle breaks down, attempt to fix or recover it using crew assets. Contact your unit for vehicle recovery or maintenance support. The contact team will come to your location.

- POW's, casualties, vicinity grid 0298. There is an M.P. Checkpoint. Handle POW's IAW 5 S's.

- Medevac. If there is an actual injury, contact your unit using FLASH precedence over the company frequency. Render immediate first aid. The NCS will arrange for air or ground medevac.

b. Support.

- Ammunition, fuel, POL products and troop stores are available in the BSA to bring your vehicle up to SOP standards.
- Main gun ammunition available in the BSA or loaded in your vehicle is M833 SABOT and M456A2 HEAT.
- Resupply available with company LOGPAC upon arrival.
- Chemical equipment will be issued at your gaining unit.

5. Signal.

- Current CEOI is in effect.
- Challenge/Password is _____
- Contact your company NCS after I have inspected you.
- Contact your company NCS once you have reached Check point six.

6. Safety.

- Speed limit on the Main supply route is 15 MPH. Under no circumstances will you violate it.
- Speed limit on the hill at grid 025005 is 5 MPH.
- Brigade rear is a heavily dudded area. Do not handle any suspected duds. Mark and report any suspected duds. Treat all suspected duds as real.
- Wheeled vehicles may be traveling to the MSR. Stop and allow them to pass.
- TC will ensure that crew members do not stand in front of Hoffman devices when working on the tank.
- TC will ensure that crew does not fire Hoffman charges within 100 meters of dismounted personnel in line of fire.
- Ground guide vehicles in the BSA. Speed limit is 5 MPH.
- TC will have a rear ground guide when backing up in troop areas.
- Troops on the tank in motion will wear a CVC.
- Rollover procedures. If your tank begins to roll over, pull all crew members inside and hold on to inside of vehicle. Do not attempt to jump clear of a tank which is beginning roll.
- This is not a gunnery range, it is a maneuver area, but remember your main mission to reach your R.P. On time!

APPENDIX C

FIELD TEST SCORING CHECKLIST WITH TASK CLUSTERS AND TASK CLUSTER COMPOSITES

Soldier Performance Research Project
Field Test

Crew number: __ __ ___

TC ID number: __ __ ___

Driver ID number: __ __ ___

Date: ___ ___ ___

Order: ___

Surrogate Gunner: _____

Surrogate Loader: _____

CODES: Task Cluster/Task Cluster Composite

Station 1 (A)
Brigade Support Area

1. TC told hull PRECOM completed and he will move out in two hours

FA1 TC uses table 2-2 in -10 DASH10/PRECOM _____

FA2 TC prepares Cal .50 for action PWS/PRECOM _____
- FA2a TC securely mounts Cal .50 ____
- FA2b "GO" gauge fits ____
- FA2c "NO-GO" does not fit ____
- FA2d Dry fires ____
- FA2e Loads ammo into ready box ____

FA3 TC test fires small arms weapons PWS/PRECOM _____
- FA3a Test fires Cal .50 ____
- FA3b M240 coax ____
- FA3c M240 loader's weapon ____

FA4 TC ensures loader checks loader's weapon PWS/PRECOM _____
- FA4a Weapon securely mounted ____
- FA4b Pintle mount serviceable ____
- FA4c Skate moves freely ____
- FA4d Locks keep weapon from moving ____

FA5 TC ensures loader checks breech operations PWS/PRECOM _____
- FA5a Binding ____
- FA5b Wear, nicks etc. ____

FA6 TC ensures loader checks for oil, gas ports and breech circuit test PWS/PRECOM _____
- FA6a Replenisher oil filled ____
- FA6b Gas ports cleaned ____
- FA6c Breech circuit test ____

FA7 TC checks commander's panel PWS/PRECOM _____
- FA7a Panel lights ____
- FA7b Panel controls ____

FA8 TC checks commander's power control handle PWS/PRECOM _____
- FA8a Aux power "on" OR starts eng ____
- FA8b Fire control to normal ____
- FA8c Handles not traverse/elevate ____
- FA8d TC trigger not fire ____

FA9 TC inspects and adjusts GPS extension PWS/PRECOM _____

FA10 TC inspects commander's weapon station PWS/PRECOM _____

FA10a Power traverses 360° ____

FA10b Manual traverses 360° ____

FA10c Elevates/depressed Cal .50 ____

FA11 TC ensures gunner inspects coax PWS/PRECOM _____

FA11a Mounted seurely ____

FA11b Electric solonoid operates ____

FA11c Manual trigger fires ____

FA11d Spent case-can secure ____

FA12 Troubleshoots TIS OR gets Org Maint TS/PRECOM _____

a. Uses -10 ____

or b. Calls Org. Maint ____

FA13 TC places CB22 to on position TS/PRECOM _____

FA14 TC replaces burned out circuit breaker TS/PRECOM _____

FA15 TC supervises computer self-test TS/PRECOM _____

FA16 TC detects malfunction in crosswind sensor TS/PRECOM _____

FA17 TC reconnects crosswind or calls Org. Main TS/PRECOM _____

a. Uses -10 ____

or b. Calls Org. Maint ____

FA18 TC ensures gunner checks GPS and mounting PWS/PRECOM _____

FA18a GPS functional check ____

FA18b Mounting/focus of GAS ____

FA19 TC checks loader's ammunition LOAD/PRECOM _____

3. Enter/checks data in ballistic computer

FA20 Ammunition temperature BC/PRECOM _____

FA21 Barometric temperature BC/PRECOM _____

FA22 Air temperature BC/PRECOM _____

FA23 Main gun boresighted within tolerance BORE/PRECOM _____
(+/- .3 mil)

FA24 Computer indicates range to boresight BC/PRECOM _____

FA25 Battlesight range for sabot is 1,200 meters BC/PRECOM _____

FA26 Ammunition correction factors for sabot BC/PRECOM _____
FA26a elevation ____
FA26b deflection ____

FA27 Battlesight range for HEAT is 900 meters BC/PRECOM _____

FA28 HEAT computer correction factors BC/PRECOM _____
FA28a elevation ____
FA28b deflection ____

4. TC briefs crew

FA29 TC briefed crew on mission TLP _____

FA30 TC briefed crew on call sign/challenge/pass SEC _____
FA30a Call sign ____
FA30b Challenge and Password ____

FA31 TC inspects crewmembers for equipment TLP _____

FA32 TC conducts crew drill rehearsals TLP _____

FA33 Vehicle fuel tanks are full LOAD/PRECOM _____

FA34 Assures ammo is full LOAD/PRECOM _____
FA34a Maingun ____
FA34b Cal .50 ____
FA34c 7.62 ____

FA35 Vehicle POL loaded according to SOP LOAD/PRECOM _____
FA35a Engine oil ____
FA35b Transmission oil ____
FA35c Hydraulic (turboshaft) oil ____
FA35d One can GAA ____

FA36 Vehicle loaded with troop stores per SOP LOAD/PRECOM _____
FA36a Ten gallons water ____
FA36b MRE's ____

FATT Time to prepare: _____ (90 min. limit)

FA37 Minefield plotted on map PLOT _____

FA38 Correctly decoded coordinates PLOT _____

FA39 Plot matches decoded coordinates PLOT _____

Station 2 (B)
Surprise Engagement with Disabled T72 and T72 in Overwatch

1. Loader acquires targets

FB2 TC lays on most dangerous target TE/C^2 _____

FB3 Issues proper fire command FC/C^2 _____

- FB3a Gunner ____
- FB3b Sabot (or Battlesight) ____
- FB3c Two tanks ____
- FB3d Right tank ____
- FB3e Waits for "Up" & "Identified" ____
- FB3f Fire and adjust ____

FB5 Drives at constant speed or seeks hull-down CD _____

- FB5a Drives at a constant speed -OR- ____
- FB5b Turns off the road ____
- FB5c Seeks hull down or turns front slope
- FB5d Stops tank smoothly ____

FBFC Time to "Cease fire": _____

FB6 Submits report without being cued SPOTREP/COMMO _____

FB7 Correct call sign SPOTACC/COMMO _____

FB8 Type of report: "Spotrep" SPOTACC/COMMO _____

FB9 What happened: "Destroyed two T72s" SPOTACC COMMO _____

FB10 Grid: (+/- 200 meters) PL _____

FB11 Correct "Time" SPOTACC/COMMO _____

FB12 What you are doing: "Continuing Mission" SPOTACC/COMMO _____

FB13 TC directs Battlecarry Sabot FC/C^2 _____

FBSR Time to send report: _____ _____

FBD Deviation from actual grid coordinates: _____

FBTT Total station time: _____

Station 3 (C)
ATGM Ambush in Minefield

1. Tank enters minefield

FC1	TC directs driver to use cleared lane	DIRECT/C^2	_____
FC2	TC directs driver through minefield or dismounts loader	DIRECT/C^2	_____
FC3	Vehicle visibly stays in cleared lane	CD	_____
FC4	TC directs driver to speed up or backup and engage smoke	DIRECT/C^2	_____
FC5	Driver protects tank after ATGM is launched a. Backup, pop smoke, avoid mines -OR- ____ b. Speeds up, clear mines, and jukes ____	CD	_____
FC6	Issues proper fire command	FC/C^2	_____
FC6a	Gunner		____
FC6b	Sabot (or Battlesight)		____
FC6c	PC (or BMP)		____
FC6d	Waits for "Up" & "Identified"		____
FC6e	Fire		____
FC6f	Fire HEAT		____
FCFC	Time for engagement: _____		
FC8	TC directs "Reload Sabot"	FC/C^2	_____
FC9	Submits report without being cued	SPOTREP/COMMO	_____
FC10	Correct call sign	SPOTACC/COMMO	_____
FC11	Type of report: "Spotrep"	SPOTACC/COMMO	_____
FC12	What happened: "Destroyed 1 BMP"	SPOTACC/COMMO	_____
FC13	Grid: (+/- 200 meters)	PL	_____
FC14	Correct "Time"	SPOTACC/COMMO	_____
FC15	What you are doing: "Cont. Mission"	SPOTACC/COMMO	_____
FCSR	Time to send report: _____		
FCD1	Deviation from actual grid coordinates: _____		
FCTT	Total station time: _____		

Station 4 (D)
Meeting Engagement with Enemy Stragglers: Loader Killed

1. Loader acquires troops

FD1	Issues proper fire command		FC/C^2 _____
FD1a	Coax	_____	
FD1b	Troops	_____	
FD1c	Fire and Adjust	_____	
FD1d	Caliber .50	_____	
FDFC	Time for engagement: _____		
FD3	Driver positions tank appropriately		CD _____
FD3a	Pulls tank off road -OR-	_____	
FD3b	Seeks hull-down	_____	
FD3c	Front slope	_____	
FD3d	Smooth stop	_____	
FD3e	Continues through	_____	

2. Three-man crew configuration

FD5	TC moves gunner to loader's position		TE/C^2 _____
FD6	TC prepares weapon station		TE/C^2 _____
FD6a	Gun select to "Main"	_____	
FD6b	GPS on 10X	_____	
FD6c	Ammo select on Sabot	_____	
FD7	TC orders "Battlecarry Sabot"		FC/C^2 _____
FD8	TC rehearses crew drills		TLP _____
FD9	Submits report without being cued		SPOTREP/COMMO _____
FD10	Correct call sign		SPOTACC/COMMO _____
FD11	Type of report: "Spotrep"		SPOTACC/COMMO _____
FD12	What happened: "Destroyed"		SPOTACC/COMMO _____
FD13	Grid: (+/- 200 meters)		PL _____
FD14	Correct "Time"		SPOTACC/COMMO _____
FD15	What you are doing: "Continuing Mission"		SPOTACC/COMMO _____
FDSR	Time to send report: _____		

FDD1 Deviation from actual grid coordinates: _____

FD16 Submits Casualty report witout being cued — CASREP/COMMO _____

FD17 Personnel battle loss report — CASACC/COMMO _____

FD18 Identifies correct battle roster number — CASACC/COMMO _____

FD19 Correct "Date/Time" — CASACC/COMMO _____

FD23 "4A" — CATACC/COMMO _____

FD24 "Left at location" — CASACC/COMMO _____

SPOTACC Time to send report: _____

FDD2 Deviation from actual grid coordinates: _____

FDTT Total station time: _____

Station 5 (E)
Military Police TCP

FE1	Recognizes MP as friendly	SEC _____
FE2	Challenges MP with correct challenge	SEC _____
FE3	Identifies parent unit correctly	SEC _____
FE4	Identifies correct grid (+/- 200 meters)	PL _____
FED	Deviation from actual grid coordinates: _____	
FE5	Identifies route on map correctly	PL _____
FE6	Informs MP about hostile action	SEC _____
FE8	Crew evacuates dead loader	TE/C^2 _____
FE8a	Traverses turret to 9 o'clock	____
FE8b	Elevates gun to max position	____
FE8c	Shuts off engine	____
FE8d	Driver exits vehicle	____
FE8e	Driver moves to loader hatch	____
FE8f	TC assists in lifting body	____
FE8g	Seats loader on turret	____
FE8h	Place loader on front slope	____
FE8i	Place loader on ground	____
FE8j	Covers loader's body	____
FE9	Takes correct turns in route to Station 6	PL _____

Station 6 (F)
Meeting Engagement with T72 and BMP at Short Range

1. Loader acquires tank and BMP

FF1	Issues proper fire command		FC/C^2 _____
	FF1a Battlesight	_____	
	FF1b Tank	_____	
	FF1c Waits for "Up"	_____	
	FF1d On the way	_____	
FF3	Driver protects tank		CD _____
	FF3a Front slope towards OPFOR	_____	
	FF3b Stops	_____	
FF4	Driver announces "Miss"		TE/C^2 _____
FF5	TC announces "On The Way"		FC/C^2 _____
FF6	TC or Driver announces "Target"		TE/C^2 _____
FFFC1	Time for engagement: _____		
FF7	TC engages BMP		FC/C^2 _____
	FF7a On the way	_____	
	FF7b Load HEAT	_____	
FF8	TC or Driver announces "Target"		TE/C^2 _____
FFFC2	Time for engagement: _____		
FF9	TC engages troops with CAL .50		TE/C^2 _____
FF10	Issues fire command		FC/C^2 _____
	FF10a Caliber .50	_____	
	FF10b On the way	_____	
	FF10c Cease fire	_____	
FFFC3	Time for engagement: _____		
FF11	TC orders "Battlecarry Sabot"		FC/C^2 _____
FB12	Submits report without being cued		SPOTREP/COMMO _____
FF13	Correct call sign		SPOTACC/COMMO _____
FF14	Type of report: "Spotrep"		SPOTACC/COMMO _____
FF15	What happened: "Destroyed T72 and PC"		SPOTACC/COMMO _____

FF16	Grid: (+/- 200 meters)	PL _____
FF17	Correct "Time"	SPOTACC/COMMO _____
FF18	What you are doing: "Continuing Mission"	SPOTACC/COMMO _____
FFSR	Time to send report: _____	
FFD	Deviation from actual grid coordinates: _____	
FFTT	Total station time: _____	

Station 7 (G)
Automatic Weapons Ambush:
TC and Gunner Killed

1. Ambush

FG1	Driver protects tank	CD	_____
FG1a	Speeds up out of kill zone -OR-		____
FG1b	Driver activates smoke		____
FG1c	Driver occupies turret		____
FG1d	Engages OPFOR with automatic weapon		____
FG2	Driver checks on TC and gunner	CC/C^2	_____
FG3	Driver submits report without being cued	SPOTREP/COMMO	_____
FGT1	Time for engagement: _____		
FG4	Correct call sign	RC/COMMO	_____
FG5	Proper unit ID	SEC	_____
FG6	Type of report: "Spotrep"	SPOTACC/COMMO	_____
FG7	What happened: "Four to Six/Infantry Ambush"	SPOTACC/COMMO	_____
FG8	Grid: (+/- 200 meters)	PL	_____
FG9	Correct "Time"	SPOTACC/COMMO	_____
FG10	What you are doing: "Continuing mission"	SPOTACC/COMMO	_____
FGD1	Deviation from actual grid coordinates: _____		
FG11	Submits Casualty report witout being cued	CASACC/COMMO	_____
FG12	Identifies TC as casualty	CASACC/COMMO	_____
FG13	Identifies gunner as casualty	CASACC/COMMO	_____
FGTT	Total station time: _____		

Station 8 (H)

FH1	Driver challenges with correct challenge	SEC _____
FH2	Driver correctly states his mission	SEC _____
FH3	Driver correctly identifies his unit	SEC _____
FH4	Driver locates his position	PL _____
FHD	Deviation from actual grid coordinates: _____	
FHTT	Total station time: _____	
FTT	Total Field Test Time: _____	

APPENDIX D

SIMNET TEST OPERATIONS ORDER

COPY NO.____OF____COPIES
1st PLT, B CO, 1-10 AR
CECILIA, KY (ES952578)

OPORD 01-9

REFERENCE: SIMNET MAP. 1:50,000

Time Zone Used Throughout Order: SIERRA

TASK ORGANIZATION: NA

1. SITUATION

a. Enemy Forces

1. Overview. Elements of the 39th MRD have succeded in crossing the OHIO RIVER in the vicinity of BRANDENBURG (ET7205). 1-11 AR has been able to repel their initial attack. The enemy is currently in hasty defensive positions preparing for their next attack. Enemy units are believed to be at 60% strength. He has not used any chemical weapons as of yet and it is believed he will not use any in the future.

2. Composition and Disposition. A MRB is currently located in the vicinity of MAUCKPORT (ES867733) preparing for a deliberate attack. There are enemy stragglers behind friendly lines from their initial attack that have not been destroyed yet. Enemy activity is very likely during any movement behind the FEBA. They are equipped with T-72s and BMPs. They have artillery in support of their attack.

3. Probable Course of Action. Enemy will conduct a deliberate attack south towards FT KNOX as soon as he regroups his forces.

b. Friendly Forces

1) 2nd PLT B Co is conducting a movement to contact on our right to occupy BP1.

(2) 3rd PLT B Co is also conducting a movement to contact on our left to occupy BP1.

(3) C Co, 1-10 AR will follow behind use to occupy BP2.

(4) 1-10 AR conducts a movement to contact, occupies BP10, and relieves 1-11 AR.

c. Attachments and Detachments NA

2. MISSION 1st PLT, B Co will conduct a movement to contact along Axis BLOOD and occupy BP1 as soon as possible.

3. EXECUTION

a. Intent. We need to get to BP1 as soon as possible so we can relieve 1-11 AR. We need to destroy any enemy stragglers along Axis BLOOD.

b. Concept of Operation

(1) Maneuver. We will move to and occupy BP1 in three phases.

(a) Phase 1. Move along Route Blue, conduct platoon action drills:

-stagger column
-coil formation
-column
-herringbone
-vee formation
-action left
-air attack

(b) Phase 2. Conduct a movement to contact along Axis BLOOD in a PLT Vee formation.

(c) Phase 3. Occupy BP1

(2) Fires. 1st PLT has priority of fire in B Co. All call for fires must go through the company FIST (BLACK 1). We have no TRPs for this mission; all fire missions must be grid method.

(3) Obstacles. There is one obstacle along Axis BLOOD. We must cross a bridge. Red 1 section will cross first with RED 4 section providing overwatch. Once RED 1 is across, RED 4 bring your section across.

c. Specific Instructions

(1) RED 2

a. Upper left position in vee formation
b. 9 O'clock position in coil
c. Second tank in column formation
d. Far left position in BP1

(2) RED 3

a. Back left position in vee formation
b. 3 O'clock position in coil
c. Last tank in column formation, responsible for rear security
d. Middle right position in BP1
e. Stay with and left of RED 4 during all action drills

(3) PED 4

a. back right position in vee formation
b. 6 O'clock position in coil
c. third tank in column formation
d. middle feft position in BP1
e. report all spotreps, stireps, LD/LC, PLs and any other major event to the Commander (BLACK 6)

d. Coordinating Instructions

(1) MOPP level 0

(2) Do not go to any MOPP level during indriect fire attacks

(3) Air Defense Warning: Yellow

(4) Weapons control Status: Tight

(5) March speed is 30 mph, catch up 35 mph

(6) Vehicle interval distance is 100-150 meters throughtout mission

4. SERVICE SUPPORT

a. We will receive Class I, III, and V in BP1

5. COMMAND AND SIGNAL

a. Command

(1) Succession of Command: RED 4, RED 3, and RED 2

(2) Company Commander will be located with 2nd platoon throughout the mission

b. Signal

(1) Platoon operates on a secure net, no authentications are required

(2) Abreviated call signs are in effect (ie. RED 1, RED 2)

(3) Platoon frequency: 65.00
Company frequency: 67.00

Call Signs:

Company Commander: BLACK 6
Company FIST : BLACK 1

APPENDIX E

SIMNET TEST SCORING CHECKLIST WITH TASK CLUSTERS AND TASK CLUSTER COMPOSITES

Soldier Performance Research Project
SIMNET Test

Crew number: _____

TC ID number: _____

Driver ID number: _____

Date: _____

Order: _____

Surrogate Gunner: _____

Surrogate Loader: _____

CODES: Task Cluster/Task Cluster Composite

Event 1.
Crew Joins Platoon as Wingman

1. Executes platoon formations

SA1	Maintains visual contact with PSG's tank	CD	_____
SA2	Maintains position 100-150 meters from PSG's tank	CD	_____
SA3	Takes up position on opposite side of column from PSG's tank	CD	_____
SA4	Maintains correct gun tube orientation	PL	_____

Ccil

SA7	Driver orients vehicle at 3 o'clock position	CD	_____
SA8	Gun tube orientation	PL	_____

Herringbone

SA9	Driver takes proper position	CD	_____
SA9a	Half left		_____
SA9b	100-150 meters		_____
SA9c	Left of PSG		_____
SA10	Driver pulls tank off route and stops	CD	_____
SA11	TC ensures gun covers the column's rear and tank is within sight of the other tanks	TE/C2	_____

Vee

SA12	Wingman takes proper position	CD	_____
SA12a	Left of PSG's tank		_____
SA12b	100-150 meters		_____
SA13	Wingman maintains overwatch	CD	_____
SA13a	Gun tube		_____
SA13b	Visual contact		_____

2. Action drills

SA14 Driver turns vehicle 90 degrees to left CD _____

SA15 Maintains visual contact with PSG CD _____

SA16 Driver takes proper position CD _____

SA16a Maintains position left of PSG _____
SA16b 100-150 meters from PSG _____

SA17 Gun tube orientation PL _____

3. Air attack

SA18 Makes sudden turns CD _____

SA19 Driver changes speed CD _____

SA20 Maintains proper gun tube orientation PL _____

4. Sends grid coordinates of section

SA21 Driver orients vehicle at 3 o'clock position CD _____

SA22 Gun tube orientation PL _____

SA23 Grid coordinates (+/- 200 meters) PL _____

SARG Time to report grid coordinates: _____

SAD Deviation from actual grid coordinates: _____
Actual _____ Reported _____
a ____ b ____

Event 2.
Platoon Encounters Bridge

SB1 Driver maintains proper position — CD _____

SB1a Wingman position to left of PSG _____
SB1b Maintains visual contact _____
SB1c 100-150 meters _____

SB2 Proper overwatch — CD _____

SB2a Proper gun tube orientation _____
SB2b Visual contact _____

Bridgerep

SB3 Sends Spot Report without cue — CR/COMMO _____

SB4 Grid coordinates (+/- 200 meters) — PL _____

SB5 Activity "Crossing bridge" — CRACC/COMMO _____

SB6 Continuing mission — CRACC/COMMO _____

SBSR Time to complete report: _____

SBD Deviation from actual grid coordinates: _____
Actual _____ Reported _____
a _____ b _____

Event 3.
Three T72s are Observed

SC1	"Contact"	CON/COMMO	_____
SC2	"Three tanks"	CON/COMMO	_____
SC3	"WEST"	PL	_____
SCCON	Time to issue contact report:		_____
2.	Action drill		
SC4	Driver turns own tank toward enemy tank	CD	_____
SC5	Driver maintains proper position	CD	_____
	SC5a Maintains constant speed _____		
	SC5b Comes on line with rest of platoon _____		
SC6	Issues proper fire commands	FC/C2	_____
	SC6a "Gunner" _____		
	SC6b "Sabot" _____		
	SC6c "Three tanks" _____		
	SC6d "Left tank first" _____		
	SC6e "Fire" _____		
SC7	Wingman bounds, maintains proper position	CD	_____
	SC7a Bounds when directed _____		
	SC7b Maintains visual contact _____		
	SC7c 100-150 meters from PSG _____		
	SC7d Stays to left PSG _____		
SC8	Engages until all tanks are destroyed	TE/C2	_____
SCSR	Time to initiate report:		_____
SC9	Sends report to platoon leader w/o cue	CR/COMMO	_____
SC14	Identifies SPOTREP	CRACC/COMMO	_____
SC15	Correct Call sign (red 3)	RC/COMMO	_____
SC10	Destroyed three T72s	CRACC/COMMO	_____
SC11	Number of rounds fired	CRACC/COMMO	_____
SC12	Driver maintains proper position	CD	_____
	SC12a Position left of PSG _____		
	SC12b Visual contact _____		
	SC12c 100-150 meters _____		
SC13	Gun tube orientation	PL	_____

Event 4.
Enemy ATGM Attacks Formation

1. Contact report

SD1	"Contact"	CON/COMMO	_____
SD2	"North"	PL	_____
SD3	"BMP"	CON/COMMO	_____
SDCON	Time to issue contact report:		_____

2. Action Front

SD4	Driver turns tank 45 degrees from attacking aircraft	CD	_____
SD5	Issues proper fire command	FC/C2	_____
SD5a	"Gunner"	_____	
SD5b	"Sabot"	_____	
SD5c	"PC"	_____	
SD5d	"Fire"	_____	
SD5e	"Fire HEAT"	_____	
SDFC	Time for fire command:		_____

3. Submits report

SD6	Correct call signs	RC/COMMO	_____
SD6a	PSGs call sign	_____	
SD6b	Correct CO call sign	_____	
SD7	Type of report: "Sitrep"	CR/COMMO	_____
SD8	Correct DTG	CR/COMMO	_____
SD9	Destroyed enemy BMP	CR/COMMO	_____
SD10	Grid: (+/- 200 meters)	PL	_____
SD11	Line 4 correct	CR/COMMO	_____
SD11a	"line 4; three operational"	_____	
SD11b	"Red 4 destroyed"	_____	
SD11c	"Red 3 assumed Red 4 duties"	_____	
SD12	Line 5: "None"	CR/COMMO	_____

SD13	Line 6: "Red"	CR/COMMO	_____
SD14	Correct ammo status	CR/COMMO	_____
SD15	Correct fuel status	CR/COMMO	_____
SD16	"Continuing mission"	CR/COMMO	_____
SDSR	Time to send report:		_____
SDD	Deviation from actual grid coordinates: Actual _____ Reported _____ a _____ b _____		_____

5. Resumes vee formation

SD17	TC assumes proper position	TE/C2	_____
SD18	TC maintains visual contact	TE/C2	_____
SD19	Proper gun tube orientation	PL	_____

Event 5.
Reaction to ATGM Ambush

1. Contact report

SE1	"Contact"	CON/COMMO	_____
SE2	"Northeast"	PL	_____
SE3	"Missile"	CON/COMMO	_____
SECON	Time to issue contact report:		_____
SE4	Driver takes evasive action	CD	_____
SE4a	Turns front of tank toward missile		_____
SE4b	Erratic left/right		_____
SE5	Issues proper fire command	FC/C2	_____
SE5a	"Gunner"		_____
SE5b	"SABOT"		_____
SE5c	"PC"		_____
SE5d	"Fire"		_____
SE5e	"Fire heat"		_____
SEFC	Time to fire command:		_____

2. Submits report

SE6	Submits report without cue	CR/COMMO	_____
SE7	Correct call signs	RC/COMMO	_____
SE8	Type of report: "Spotrep"	CRACC/COMMO	_____
SE9	What happened: "Destroyed BMP"	CRACC/COMMO	_____
SE10	Grid: (+/- 200 meters)	PL	_____
SE11	Correct "Time"	CRACC/COMMO	_____
SE12	What you are doing: "Cont. Mission"	CRACC/COMMO	_____
SESR	Time to send report:		_____
SED	Deviation from actual grid coordinates:		_____

Actual _____ Reported _____

a _____ b _____

Event 6.
React to Indirect Fire

1. Submits report

SF1	Submits report without cue	CR/COMMO	_____
SF2	Type of report: "Spotrep"	CRACC/COMMO	_____
SF3	What happened: "Observing Indirect Fire"	CRACC/COMMO	_____
SF4	Grid: (+/- 200 meters)	PL	_____
SF5	Correct "Time"	CR/COMMO	_____
SFSR	Time to send report:		_____
SFD	Deviation from actual grid coordinates: Actual _____ Reported _____ a _____ b _____		_____

Event 7.
Engagement From Hasty Battle Position

1. Receives platoon fire command

SG1 Issues proper fire commands FC/C2 _____

SG1a "Gunner" _____
SG1b "Sabot" _____
SG1c "Tanks" _____
SG1d "Rear tank" _____
SG1e "Fire" _____

SG2 Fires at rear tanks first, works forward TE/C2 _____

SGFC1 Time to issue fire command: _____

2. Submits report

SG4 Submits report without cue CR/COMMO _____

SG5 Correct call sign RC/COMMO _____

SG6 Type of report: "Spotrep" CRACC/COMMO _____

SG7 "Engaged (Correct #) Tanks and BMPs" CRACC/COMMO _____

SG8 Grid: (+/- 200 meters) PL _____

SG9 Correct "Time" CRACC/COMMO _____

SG10 What you are doing: "Cont. Mission" CRACC/COMMC _____

SGSR1 Time to send report: _____

SGD1 Deviation from actual grid coordinates: _____
Actual _____ Reported _____
a _____ b _____

3. Second OPFOR formation appears

SG11 Issues proper fire command FC/C2 _____

SG11A "Gunner" _____
SG11B "Sabot" _____
SG11C "Tanks" _____
SG11D "Left tank" _____
SG11E "Fire" _____

SGFC2 Time to issue fire command: _____

SG12	TC engages left tank first	TE/C2	_____
SG13	TC directs fire to move left to right	TE/C2	_____
SG14	Submits report without cue	CR/COMMO	_____
SG15	Correct call sign	RC/COMMO	_____
SG16	Type of report: "Spotrep"	CRACC/COMMO	_____
SG17	"Engaged (correct number)	CRACC/COMMO	_____
SG18	Grid: (+/- 200 meters)	PL	_____
SG19	Correct "Time"	CRACC/COMMO	_____
SG20	What you are doing: "Cont. Mission"	CRACC/COMMO	_____
SGSR2	Time to send report:		_____
SGD2	Deviation from actual grid coordinates: Actual _____ Reported _____ a _____ b _____		_____

5. Platoon consolidates and reorganizes

SG21	Contacts company commander without cue	CR/COMMO	_____
SG22	Type of report: "Sitrep"	CRACC/COMMO	_____
SG23	DTG	CRACC/COMMO	_____
SG24	What happened: "Engaged two enemy company sized-units"	CRACC/COMMO	_____
SG25	Grid: (+/- 200 meters)	PL	_____
SG26	"Line 4d; one/Red 1 destroyed/Red 2 mobility kill/ I have assumed Red 1 duties"	CRACC/COMMO	_____
SG27	"None"	CRACC/COMMO	_____
SG28	"Black"	CRACC/COMMO	_____
SG29	Ammunition "Black" Fuel "Black"	CRACC/COMMO	_____
SG30	Requests instructions	CRACC/COMMO	_____
SGSIT	Time to send report:		_____
SGD3	Deviation from actual grid coordinates: Actual _____ Reported _____ a _____ b _____		_____

Event 8.
Request and Adjust Indirect Fire

Company Commander sends coordinates of other platoons.

SH1	TC contacts company FIST/CO	RC/COMMO	_____
SH2	Request fire mission	CFF	_____
SH10	Identifies himself	CFF	_____
SH3	Sends grid coordinates	CFF	_____
SHD	Deviation from actual grid Actual _____ Reported _____ a _____ b _____	GRID	_____
SH4	Target description	CFF	_____
SH5	TC adjusts fire	CFF	_____
SH6	Gives OT line "Direction: __ mils"	CFF	_____
SH7	Number of corrections		_____
SH8	Requests "Fire for Effect"	CFF	_____
SH9	Destroyed target within 5 adjustments	CFFACC	_____
SHCFF2	Time to fire for effect:		_____

Event 9.
Encoding/Decoding Grid Coordinates

SI1	Correctly authenticates challenge #1	RC/COMMO	_____
SI2	Correctly authenticates challenge #2	RC/COMMO	_____
SI3	Correctly encodes coordinate #1	ENC	_____
SI4	Correctly encodes coordinate #2	ENC	_____
SI5	Correctly encodes coordinate #3	ENC	_____
SI6	Correctly encodes coordinate #4	ENC	_____
SI7	Correctly decodes coordinate #5	ENC	_____
SIT	Time for Event 9		_____

APPENDIX F

TRAINING BACKGROUND QUESTIONNAIRE

TRAINING BACKGROUND QUESTIONNAIRE

PURPOSE: This questionnaire is designed to obtain feedback about your background and recent unit training experiences. This information will assist the U.S. Army Armor Center in our study of combat readiness training. Please print your name in the space provided so that we can link your information to other data we have collected. Your individual information will be coded and grouped with other participant's information for the purposes of this study. Your information and data will be treated confidentially. Your responses will not be identified with you in any way. THANK YOU FOR YOUR COOPERATION.

NAME: _____ UNIT: _____

Crew Number ___ ___ ___ DATE: ___/___/___
day mon yr

Section 1: Background Information.

1. What is your current rank? (circle one).

PVT,E1/E2	PFC	SPC/CPL	SGT	SSG	SFC
1	2	3	4	5	6

2. How long have you held this rank? ___ ___ ___
Months

3. What is your duty position in your unit? (circle one).

LOADER	DRIVER	GUNNER	TANK COMMANDER	PLT/SGT
1	2	3	4	5

OTHER: _____
6 Specify

4. How long have you served in your current duty position?

___ ___ ___
Months

5. How long have you served on an M1 tank (total time)?

___ ___ ___
Months

6. How long have you served in your current battalion?

___ ___ ___
Months

7. Are you enrolled in the Excellence in Armor Program?

Yes	No
1	0

8. Do you have experience in U-COFT?

Yes	No	# of hcurs ___ ___ ___ ___
1	0	

9. Do you have experience in SIMNET?

Yes	No	# of hours ___ ___ ___ ___
1	0	

10. Do you wear glasses?

Yes	No
1	0

11. Have you attended BNCOC?

Yes	No
1	0

If yes, indicate your graduation date: __ __ __ __
Y Y M M

12. Have you attended ANCOC?

Yes	No
1	0

If yes, indicate your graduation date: __ __ __ __
Y Y M M

Section II: Unit Training Experience.

Directions: Please indicate whether you have participated in the following unit training events during the last year. If you have participated in the event, please indicate the primary duty position you occupied on the M1 tank during the event (loader = 1, driver = 2, gunner = 3, TC - 4, other = 5). Also, indicate the number of times the event occurred.

EVENT	PARTICIPATED IN EVENT (Circle one)	M1 DUTY POSITION DURING MOST RECENT EVENT	HOW LONG AGO IN MONTHS
NTC	YES 1 NO 0	_____	_____
REFORGER	YES 1 NO 0	_____	_____
TANK TABLE VII - INTERMEDIATE TRAINING COURSE	YES 1 NO 0	_____	_____
TANK TABLE VIII - INTERMEDIATE QUALIFICATION COURSE	YES 1 NO 0	_____	_____
SECTION GUNNERY - (FOR EXAMPLE TANK TABLE IX OR X)	YES 1 NO 0	_____	_____
PLATOON GUNNERY (FOR EXAMPLE TANK TABLE XI OR XII)	YES 1 NO 0	_____	_____
TANK CREW GUNNERY - SKILLS TEST	YES 1 NO 0	_____	_____

EVENT	PARTICIPATED IN EVENT (Circle one)		M1 DUTY POSITION DURING MOST RECENT EVENT	HOW LONG AGO IN MONTHS
TANK CREW PROFICIENCY COURSE	YES 1	NO 0	_____	_____
CREW REACTION EXERCISES	YES 1	NO 0	_____	_____
SECTION TACTICAL EXERCISES - (FIELD - EXAMPLE TACTICAL TABLE F	YES 1	NO 0	_____	_____
PLATOON TACTICAL EXERCISES - (FIELD - EXAMPLE TACTICAL TABLE I	YES 1	NO 0	_____	_____

APPENDIX G

FIELD AND SIMNET TASK CLUSTERS BY TC AND DRIVER MENTAL CATEGORY GROUPS

SPRP Field Test

Task Clusters	TC Mental Category I&II	IIIa	IIIb	IV	Total
1. Uses TM (-10) for PMCS	.47	.30	.29	.32	.35
2. Preparation of Weapon Stations	.39	.37	.34	.34	.36
3. Troubleshooting	.52	.46	.40	.32	.42
4. Enter/Check Ballistic Computer Data	.69	.62	.60	.57	.62
5. Boresighting Main Gun	.47	.56	.45	.21	.42
6. Vehicle Load	.66	.60	.64	.46	.60
7. Issuing Proper Fire Commands	.24	.22	.10	.13	.17
8. Target Engagement Procedures	.46	.45	.36	.43	.43
9. Decoding and Plotting Map Coordinates	.66	.73	.63	.48	.62
10. Directing Tank through Minefield	.52	.52	.47	.39	.47
11. Submits Spotrep w/out cue	.78	.81	.70	.76	.76
12. Accuracy of Spotrep	.56	.54	.52	.48	.53
13. Issues Casualty Report without cue	.27	.41	.22	.26	.28
14. Accuracy of Casualty Rpt	.39	.49	.35	.31	.38
15. Troop Leading Procedures	.48	.49	.48	.50	.49
16. Security	.76	.74	.76	.76	.76
17. Position Location	.43	.37	.34	.35	.37
18. Combat Driving	.76	.74	.74	.71	.74
TOTAL	.53	.52	.46	.43	
	100%	98%	87%	81%	

SPRP SIMNET Test

Task Clusters	TC Mental Category I&II	IIIa	IIIb	IV	Total
1. Issues Proper Fire Commands	.15	.16	.27	.19	.20
2. Target Engagement Procedures	.74	.81	.75	.70	.75
3. Submits Reports without cue	.69	.70	.68	.62	.68
4. Accuracy of Reports	.47	.44	.44	.42	.44
5. Radio Communications	.80	.73	.78	.74	.76
6. Contact Reports	.62	.70	.64	.60	.64
7. Call For Fire Procedures	.97	.92	.95	.92	.94
8. Call For Fire Accuracy	.77	.70	.34	.52	.58
9. Encoding/Decoding	.74	.51	.39	.31	.49
10. Position Location	.52	.50	.53	.47	.50
11. Combat Driving	.74	.75	.76	.70	.74
TOTAL	.61	.59	.58	.53	
	100%	97%	95%	87%	

SPRP Field Test

Task Clusters	Driver Mental Category I&II	IIIa	IIIb	IV	Total
1. Uses TM (-10) for PMCS	.38	.30	.37	.34	.35
2. Preparation of Weapon Stations	.38	.33	.39	.35	.36
3. Troubleshooting	.46	.42	.48	.34	.42
4. Enter/Check Ballistic Computer Data	.66	.56	.61	.65	.62
5. Boresighting Main Gun	.38	.57	.40	.37	.42
6. Vehicle Load	.60	.59	.60	.59	.60
7. Issuing Proper Fire Commands	.19	.17	.20	.12	.17
8. Target Engagement Procedures	.45	.37	.47	.41	.43
9. Decoding and Plotting Map Coordinates	.75	.57	.63	.50	.62
10. Directing Tank through Minefield	.58	.42	.48	.40	.47
11. Submits Spotrep w/out cue	.79	.71	.79	.76	.76
12. Accuracy of Spotrep	.58	.48	.53	.52	.53
13. Issues Casualty Report without cue	.36	.25	.28	.23	.28
14. Accuracy of Casualty Rpt	.47	.33	.41	.31	.38
15. Troop Leading Procedures	.50	.47	.50	.49	.49
16. Security	.78	.75	.75	.74	.76
17. Position Location	.38	.36	.36	.36	.37
18. Combat Driving	.74	.76	.75	.71	.74
TOTAL	.52	.47	.50	.45	
	100%	90%	96%	86%	

SPRP SIMNET Test

Task Clusters	Driver Mental Category I&II	IIIa	IIIb	IV	Total
1. Issues Proper Fire Commands	.16	.23	.19	.20	.20
2. Target Engagement Procedures	.79	.73	.77	.71	.75
3. Submits Reports without cue	.71	.61	.70	.68	.68
4. Accuracy of Reports	.48	.42	.42	.44	.44
5. Radio Communications	.76	.70	.77	.87	.76
6. Contact Reports	.70	.63	.61	.59	.64
7. Call For Fire Procedures	.97	.92	.95	.92	.94
8. Call For Fire Accuracy	.64	.50	.67	.50	.58
9. Encoding/Decoding	.61	.44	.44	.47	.49
10. Position Location	.55	.49	.49	.48	.50
11. Combat Driving	.77	.75	.75	.68	.74
TOTAL	.62	.56	.57	.56	
	100%	90%	92%	90%	