

Research Report 1401

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Defining and Assessing Tank Commander Excellence

Scott E. Graham and Barbara A. Black

ARI Field Unit at Fort Knox, Kentucky
Training Research Laboratory

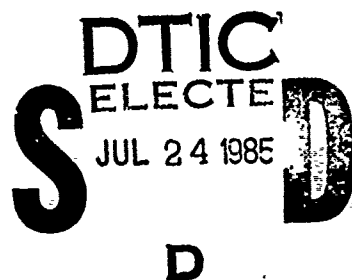


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A comprehensive Tank Commander (TC) task list was rated both for importance to mission success and frequency of failure. Attributable Risk scores were then computed to select tasks for a test of TC excellence. The task analysis also included a ranking of task categories and a critical incident analysis. A Task by Testing Method matrix is provided which describes various feasible testing procedures for each of the selected tasks within the top ranked categories. Twelve Behaviorally Anchored Rating Scales (BARS) are also presented with a discussion of the development process. (Continued)															

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These BARS are to be used to rate soft skills such as problem solving, training skills and achievement orientation. *Additional keywords:*

Army training; job analysis; performance tests; test and evaluation.



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Research Report 1401

Defining and Assessing Tank Commander Excellence

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FOREWORD

The U.S. Army Research Institute Fort Knox Field Unit is dedicated to the innovative development and evaluation of training in the Armor community. As part of the Army-wide effort to cultivate excellence in the ranks, this research paves the way for strengthening one of the key elements in the combined arms forces, the tank commander (TC). TC excellence is not only discussed in terms of a set of most critical hard skills, but is also defined by a variety of leadership skills including communication and achievement orientation.

While such soft skills have long been known to be crucial, this paper presents a vehicle to systematically assess them by way of Behaviorally Anchored Rating Scales (BARS). In addition, various feasible testing methods are described for measuring hard combat skills such as target engagement, maintenance, and NBC. The procedures presented can be used at the institutional level or can be adapted by units to diagnose particular strengths and weaknesses. Taken together, the Task by Testing Method matrix along with the BARS provide the framework for a much needed criterion of TC proficiency and in extension, TC excellence.



EDGAR M. JOHNSON
Technical Director

DEFINING AND ASSESSING TANK COMMANDER EXCELLENCE

EXECUTIVE SUMMARY

Requirement:

To identify the tasks and skills which are most relevant to Tank Commander (TC) excellence and to provide a framework for the evaluation of these skills.

Procedure:

Based on a review of previous TC task selection procedures, a new comprehensive TC task list was developed. Subject Matter Experts (SMEs) rated each of the tasks as to both their importance to mission success and frequency of failure. An Attributable Risk score was computed from these ratings and was used to select specific tasks for a test of TC performance. The 23 task categories were also ranked for their relevance to TC proficiency.

A critical incident analysis was then performed in which the M1 experienced SMEs described the behaviors or characteristics of "excellent" TCs which differentiated them from TCs who were "above average." Their categorized responses for the most part identified soft skills, e.g., ability to train, communicate, and lead.

Findings:

The top six ranked task categories were Target Engagement, Maintenance, NBC, Tactics, Land Navigation, and Communication. Within each of these categories, the four or five tasks with the highest Attributable Risk were included as part of a Task by Testing Method Matrix. For each of the identified tasks, a variety of feasible testing procedures using paper and pencil, visual slides, videotapes and discs, and training devices, as well as actual equipment, were presented. One technique is recommended for each task on the basis of estimated validity, availability, and ease of administration. An alternate task list was also developed in which tasks were selected from standard criticality ratings.

Following from the categories identified in the critical incident analysis, 12 Behaviorally Anchored Rating Scales (BARS) were developed. A description of the development process and the scales are included along with administration instructions. These BARS include training skills, supply accountability, and use of time and are to be used to assess TCs' soft skills. Additional data are also provided on who should rate the E-6 TC and the Platoon Sergeant and Platoon Leader as a TC.

Utilization of Findings:

These results have been given to the Armor school as part of a project to develop a series of Tank Commander Certification Tests. In addition, the results are being used by ARI as the basis of TC proficiency tests which will evaluate modifications being made in the BNCCC instruction. The recommended testing techniques can also be used by individual units to diagnose particular strengths and weaknesses.

DEFINING AND ASSESSING TANK COMMANDER EXCELLENCE

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DEFINING AND ASSESSING TANK COMMANDER EXCELLENCE

The U.S. Army like many other organizations is striving for excellence. This is often accomplished by enhancing the quality of performance in key positions. Given the technological complexity and lethality of the Army's modern weapon systems, it is essential that the Army identify skillful and motivated individuals who can succeed in using these weapons to their greatest possible effect. In particular, considerable emphasis has been placed on selecting and training the best possible tank commanders (TCs) for the state-of-the-art M1 tank system. This paper describes a framework for the definition and evaluation of TC excellence. While the focus is on the M1 TC, results presented here should also apply to describing TC performance parameters on other tanks as well.

TCs are required to perform a wide variety of duties. Foremost, they must be skillful fighters of their high-technology weapon system. The future battlefield will be an environment filled with smoke and NBC elements where electronic countermeasures create confusion and impair communication. TCs must possess the offensive and defensive skills and knowledges necessary to survive and to direct the enormous firepower at their command.

The TC's responsibilities as a leader are as important as his job knowledge. Each TC is the first line supervisor of his crew and is responsible for their performance. He must be capable of training up his crew's weaknesses and exploiting their strengths. In addition, the TC is responsible for the performance of his tank and must ensure proper maintenance. Excellent TCs know their tanks and by anticipating problems can virtually guarantee their tanks' hardware effectiveness.

Despite the hundreds of tasks required of the TC, tactically the E-6 TC's role is narrowly defined; he serves as a wingman to either the platoon sergeant or platoon leader. At the beginning of battle, his responsibility is to cover the platoon flanks and assigned fields of observation and fire. The combined arms strategy supports the close combat heavy force with artillery and air support directed by FIST teams and with engineers who handle munitions and clear minefields. As the battle continues, however, the resilience of a unit is likely to become a function of how well skilled TCs can perform these critical engineer and field artillery tasks as well. This diversity of skills broadens the question as to what constitutes TC excellence.

TASK ANALYSIS

TC Task List Review

The first step for developing a test of TC excellence requires that the duties and responsibilities of the TC be clearly defined. A comprehensive task list or inventory which represents the various job aspects of the TC should be developed. This task list serves as the basis for establishing evaluation criteria. In addition, task lists such as this are used for developing and/or improving training programs.

Over the past several decades a variety of task lists have been developed for tank commanders. The lists reflect different orientations and goals, changes in equipment and procedures, as well as broader Army policy changes. Earlier task lists, for example, included job knowledge requirements, whereas later lists primarily included performance based tasks.

Despite these changes, the basic responsibilities and abilities required of the tank commander have remained fairly constant.

Baker (1958) performed the first comprehensive study of the job requirements of the four tank crewmen and his procedure exemplifies a thorough task analysis technique. He constructed a preliminary list by reviewing all literature pertaining to tank crewmen including field manuals, programs of instruction (POI), U.S. Army Armor school literature, and existing task analyses. He then interviewed and/or observed the work of 300 experienced crewman from six armor battalions in the United States and Europe. The initial list was modified by omitting any activity which was reported by 40% or less of the crewmen interviewed. "Experts," i.e., combat-experienced staff officers in the Armor school, then reviewed each item for appropriateness and accuracy. The final criterion list of the duties, responsibilities and activities of the TC and other crewman resulted from group conferences in which conflicting points were resolved.

The analysis yielded eight "duties" or broad categories of tasks. Within each duty were lists of operations, knowledge factors, and responsibilities. All total for the TC, there were 79 operations, 91 knowledge factors, and 67 responsibilities. The duties were as follows.

1. The TC commands and controls light or medium tank and tank crew.
2. The TC prepares, instructs, and disseminates training materials and information to crew members.
3. The TC applies basic methods for collecting and reporting combat information, and applies and supervises troop counterintelligence measures.
4. The TC establishes, maintains and is responsible for all communications within his tank and other elements of the platoon.
5. The TC commands light or medium tank in all armor combat missions.
6. The TC commands and supervises all firing of tank weapons.
7. The TC conducts and is responsible for all required inspections of the tank, the tank crew, and armor material both in garrison and in the field.
8. The TC supervises and assists in the performance of crew maintenance on the light or medium tank and their onvehicle material (OVM).

As noted before, TC duties have changed little in the past 25 years.

An even more complete task inventory was prepared by HumRRO (1973, McCluskey, Jacobs & Cleary, 1974). They listed 534 tasks for TCs. Table 1 lists the 31 categories used in this task inventory along with the number of TC tasks within each category. As can be seen, the task categories are quite diverse. In addition, their analysis gave a four point criticality rating for each of the tasks.

Table 1

Tasks Categories Developed by HumRRO (1973)

<u>Category</u>	<u>Number of Tasks</u>
First aid	34
Personal hygiene	16
Land navigation	32
CBR (NBC)	22
Physical conditioning	6
Military instruction & training	13
Dismounted drill & inspections	12
Code of conduct, survival, escape & evasion	12
Intelligence & counterintelligence	18
Personal affairs & motivation	10
Communications	23
Cover, concealment & camouflage	16
General maintenance	21
Pistols	7
Rifles	16
Grenade launcher M203	13
Machine guns	56
Leadership	15
Wheeled vehicles	17
Tracked vehicles	42
Obstacles, boobytraps & mine warfare	18
Tactics	37
Administration, supply, mess	11
Radar, early warning and night-vision-devices	14
Hand grenades	7
Demolitions	5
Recon, security, & patrols	14
Antitank weapons	8
Fire request & adjustment	11
Operations & intelligence staff duties	1
Ammunition	7

Black and Kraemer (1981) presented a task analysis for tank commanders on the XM1 tank. Their list included 184 tasks in 40 categories. The purpose of their analysis was to compare the task performance requirements of the XM1 to analogous tasks on the then current main battle tank, the M60A1. From this comparability analysis, they identified potential sources of training problems. Of particular interest, each task was categorized as primarily requiring either psychomotor skills or cognitive (mental) skills.

The purpose of the task analysis dictates the nature and level of detail of a task inventory. A task in one inventory may be considered one element of a task in another. This accounts for some of the discrepancy in the number of TC tasks in the different inventories. The Black and Kraemer task list, for example, contained tasks which were mostly hardware oriented, i.e.,

involving gunnery and tank equipment. The tasks were also quite detailed. For example, ten separate tasks were listed under "Operate the commander's weapon station".

The Directorate of Training and Doctrine (DOTD) within the Armor School maintains a list of common and shared tasks for the training of MOS 19K10-40 (DOTD, 1983). The 462 tasks in this list are a composite of tasks from the appropriate soldier's manuals. While this list is predominated by combat oriented tasks or "hard skills," personnel and training management tasks are included as well.

The Army Research Institute (ARI) is currently involved in a research project which delineates the duties and responsibilities of NCOs in terms of 18 general Job Performance Dimensions (JPDs) (Haythorne, 1984). These include Evaluating Information and Making Decisions, Training/Teaching/Instructing for the Conduct of Tactical Operations, Counseling/Motivating/Encouraging Others, Promoting and Maintaining Esprit and Morale, and Communicating. These JPD's mostly represent what are referred to as "soft skills." These skills involve leadership and motivation as opposed to putting "steel-on-target". While the ability to successfully operate his weapon station is certainly critical, an excellent TC should be able to demonstrate mastery of both hard and soft skills to accomplish combat missions.

Task Selection Techniques

Since it would be very costly and unnecessary to test every item on any task list, some task selection technique must be used. One way would be to randomly sample tasks from the task list. If the list validly represents the domain of the TC's job, a random sample of the tasks should do the same. Brennan (1981) discusses some statistical procedures for domain-referenced testing.

Task selection techniques other than random sampling are available which are more compatible with the Army's Systems Approach to Training. The U.S. Army Training and Doctrine Command (TRADOC) in TRADOC Pamphlet 350-30 states that tasks which are most critical to the successful accomplishment of a unit's mission should be selected for training. Determining the criticality of a task is not, however, clear cut. TRADOC Pamphlet 351-4 outlines a 4 factor model for task selection which includes (1) the percentage of soldiers in the MOS who perform the task, (2) the probable consequence of inadequate performance, (3) the task learning difficulty, and (4) the task delay tolerance.

A similar technique for assessing criticality has been used by McCallum, Simpson, and Goldberg (1983). Their technique measured three criticality factors: (1) frequency across collective tasks, (2) the availability of task assistance, and (3) the consequence of inadequate performance. More recently, TRADOC Reg 350-7 (1984) has advocated the rating of (1) the importance of a task to mission accomplishment and (2) the importance of a task to survivability.

Boldovici, Harris, Osborn & Heinecke (1977) have shown that the marginally acceptable inter-rater reliability for criticality ratings can be improved by using a paired-comparison task selection technique. This type of

analysis does, however, become unwieldy when a large number of tasks must be compared. Other researchers (Drucker, Hoffman, O'Brien & Bessemer, 1983) have shown that ratings of task criticality can be affected by context, and that the inclusion of a mission context can increase the validity of the criticality ratings. Wheaton, Fingerman & Boycan (1978) provide a discussion of item sampling strategies and underscore the point that the purpose of the testing must drive the selection of the sampling technique.

The selection of tasks for training and the selection of tasks for a broad test of TC excellence have somewhat different goals. In either case one is interested in tasks with high criticality. For testing excellence, however, it is important that the tasks selected yield some variability in performance across TCs. For example, a task may be very critical to mission accomplishment in that it is performed often and the consequences of poor performance are disastrous. Such a task would be a prime candidate for training and would likely be selected by any of the discussed criticality techniques. It is possible, however, that all TCs could learn to perform this task, and sustain this performance. Because all TCs would perform well on the task, it would be a poor choice for inclusion on a test designed to discriminate TCs' abilities. A better task would be one with high criticality and also high variability in performance.

Johnson, Jones, & Kennedy (1983) have introduced an Attributable Risk selection technique which is capable of selecting tasks for which performance is variable. This technique has soldiers rate the importance of a task to the overall success or failure of a mission and also to rate how frequently the task is performed inadequately. The label "Attributable Risk" is drawn from an epidemiological model which asks how much of a given disease is attributable to a given risk factor. In the current context, the question is how much is mission success attributed to the adequate performance of a particular task. Again, this Attributable Risk technique identifies tasks which are highly critical to mission success and which also have relatively high failure rates.

One of the early considerations in this project was that not every tank commander who can perform the most critical gunnery tasks should be considered excellent. We felt that an excellent TC possesses some intangible leadership qualities or set of soft skills which may not be adequately reflected in the criticality ratings. As already seen, the task lists to a large extent address hard skills. This imbalance in number may bias the rater or interpreter of the ratings to overvalue hard skills and conversely undervalue soft skills. Objectively assessing soft skills has unfortunately been quite difficult.

Development of the Current TC Task List

A comprehensive task list was constructed from a variety of older lists. Included were the current DOTD task list, as well as those previously discussed by Baker (1958), McCluskey et al., (1974), and Black and Kraemer (1981), and the non-MOS specific Job Performance Dimensions currently being developed by ARI. In addition tasks were drawn from Warnick, O'Brien, Kraemer, Healy and Campbell (1974), Tank Crew Drills, the Battalion Training Management System (BTMS) and a report by Drucker, Hannaman, Melching and O'Brien (in review) which discusses TC decision-making tasks.

An initial list containing 1128 tasks was assembled by including all of the tasks except exact or near exact duplicates. These tasks were organized into 23 categories following those of DOTD with the exception that all small weapons tasks were categorized together. Also, tasks involving the M1 and/or gunnery were categorized as either Target Engagement/Main Gun, Commander's Weapon Station, Target Acquisition or Machineguns.

This list was then pared roughly in half by an Armor officer Subject Matter Expert. He eliminated items which dealt with equipment no longer in the inventory or which were essentially duplicates despite different wordings. A final list of 271 tasks (Appendix A) was then prepared by combining the remaining tasks topically. For example, Install a Hasty Minefield and Remove a Hasty Minefield were combined into Install and Remove a Hasty Minefield. While these may be considered separate tasks with different training procedures and requirements, compromising some detail was necessary to get a task list of manageable length.

The main purpose for constructing this task list was to guarantee a broad scope of the duties and responsibilities of an M1 tank commander. As is often the case in job analyses, a task list developed for one purpose, e.g., selection, may not have the necessary specificity for another, e.g., the development of training requirements. This task list might nevertheless be appropriate for a variety of other projects.

Attributable Risk Analysis

Participants. The task list was rated by four officers and seven NCOs who had M1 experience. This included instructors from the Armor school in the Platoon Tactics, Advanced Tactics and Weapons departments, as well as two members of the M1 New Equipment Training Team (NETT). The raters also included three officers who had either served or who were serving as commanders of M1 tank companies. Requiring M1 experience was a limiting factor in the number of available Subject Matter Experts (SMEs).

Procedure. The participants were given a questionnaire which contained four parts. The fourth part involving a Critical Incident analysis will be discussed in a later section of the paper.

The instructions to the participants said that ARI was trying to develop a test for TC proficiency which would be able to discriminate good TCs from not-so-good TCs. In particular, the test was being developed to identify "excellent" TCs. In Part I of the questionnaire, they were asked to rate each of the 271 tasks as to its Importance to the "global" mission of the Tank Commander. Global mission was explained to include both combat and garrison missions. The written instructions and the graphic scales used in the questionnaire are included as Appendix A.

Part II had the soldiers rank order the 23 task categories. The verbal instructions discussed test construction procedures and suggested that the rank orderings might be thought of as a way of determining weights for the task categories.

This was followed by Part III which had the participants again rate the task list, but this time for Frequency of Failure. Johnson et al. (1983) have suggested that there is a reluctance in the Army to admit that soldiers cannot perform their required tasks. To guarantee variability in their ratings, Johnson et al. used very small Frequency of Failure scale values. Their lowest two scale anchors were 2% and 4% failure rates which ensured some differentiation in the ratings, even when performance was thought to be near perfect.

This potential problem was addressed in the current analysis by the instructions. The instructions pointed out that at one point or another almost every 19K10-30 task has been trained, for example in OSUT, PNCOC or BNCOC. Because of this, it was often assumed that all TCs can readily perform their MOS specific and common tasks. For various reasons, including the difficulty and variety of the tasks, the length of time since instruction and little opportunity to practice, this was not really the case; not every TC in the U.S. Army can on short notice perform every task adequately. The raters were then told that this research was trying to determine, in part, the likelihood that a given task could be performed to the necessary level of proficiency.

The Attributable Risk (AR) value was computed by multiplying the Importance rating (1-5) times the Frequency of Failure rating (1-5). This technique identifies tasks which are both highly critical and which also have a high failure rate. It is further assumed that the best TCs are those individuals who can perform the most frequently failed tasks in addition to the more common and easier tasks.

Results. Appendix A presents the complete task list along with the mean Importance and Frequency of Failure ratings, and the mean Attributable Risk score. Several quick points are necessary. First, while for a given individual, the Attributable Risk score (AR) equals the Importance Rating (Imp) multiplied by the Frequency of Failure Rating (Freq Fail), i.e., $AR_i = IMP_i \times Freq\ Fail_i$, this is not the case for the means, i.e., $\bar{X}_{AR} \neq \bar{X}_{Imp} \times \bar{X}_{Freq\ Fail}$. Multiplying the Imp and Freq Fail means for a given task will not necessarily result in the mean AR. This has been a common confusion.

Also, based on the pooled variance of all of the tasks, a two-tailed t distribution at the .05 level, and $N = 11$, the approximate significant interval between the means for AR is 2.7 and for Imp and Freq Fail is .6. That is, tasks with mean AR values greater than 2.7 are significantly different from one another.

Table 2 shows the top 25 tasks in terms of AR along with the category from which they were drawn. These were used to select tasks for the proficiency test.

Table 2

Tasks Identified as
Having the Highest Attributable Risk

<u>Task</u>	<u>AR</u>	<u>Category</u>
Call for/adjust indirect or aerial fire	13.5	Tactics
Influence subordinates' behaviors by the use of rewards & punishment	13.2	Personnel
Prepare & submit NBC-4 reports	12.9	NBC
Supervise an assault breach of a minefield	12.8	Mines
Report location & lanes through minefields	12.8	Mines
Recognize electronic countermeasures (ECM) & implement electronic counter-countermeasures (ECCM)	12.6	Communications
Critique crew performance	12.6	Personnel
Operate & supervise the personnel decontamination system	12.3	NBC
Select river crossing sites	12.3	Tactics
Troubleshoot fire control system	12.3	Commander's Weapon Station
Troubleshoot engine & transmission	12.2	Maintenance
Implement MOPP & initiate unmasking	12.1	NBC
Plan use of available time	12.1	Personnel
Respond to specific fire control system failures	12.1	CWS
Decide whether or not to break radio listening silence	12.0	Communications
Position, operate, and maintain the automatic chemical agent alarm system	11.9	NBC
Live off the land	11.9	Survival
Boresight main gun	11.8	Target Engagement/ Main Gun
Direct the crossing of a contaminated area	11.6	NBC
Identify "immediate use" intelligence info	11.5	Security
Troubleshoot electrical system	11.3	General Equipment
Estimate distance at night	11.3	Night Vision Devices
Prepare simplified fallout/rainout prediction	11.2	NBC
Analyze and utilize terrain	11.2	Tactics
Plan troop movement and attack	11.2	Tactics

Table 3 lists the tasks rated as most Important to mission success. For the most part there are no real surprises with the list including basic tactical movement, NBC, training and maintenance tasks.

The tasks with the highest Frequency of Failure are shown in Table 4. Clearly this should not be, and is not, the sole criterion for testing or training. These most frequently failed tasks include several which are not often performed by the TC, e.g., Use of demolitions, and also tasks which

require greater intellectual ability, e.g., Preparing NBC-4 Reports and Simplified fallout/rainout predictions. These tasks do, however, point back to one of the basic issues raised in the beginning of the paper. Is an excellent TC a good platoon wingman in a complete battalion with FIST team and engineer support, or is he a TC who demonstrates resilience long into the battle? The most valuable TCs may ultimately be those who can "Supervise an assault breach of a minefield" and "Live off the land".

Table 3
Tasks Rated as Most Important
to Mission Success

<u>Task</u>	<u>Imp</u>	<u>Category</u>
Boresight main gun	4.5	Target Engagement
Call for/adjust indirect or aerial fire	4.3	Tactics
Conduct mounted tactical movements	4.3	Tactics
Wait for order to open fire and then shift fire on order	4.3	Tactics
Use an automated communications electronics operation instructions (CEOI)	4.2	Communications
Prepare for an NBC attack	4.2	NBC
Implement MOPP and later initiate unmasking procedure	4.1	NBC
Conduct and evaluate crew training	4.1	Personnel & Training
Plan use of available time	4.1	Personnel & Training
Know the various methods of advance and attack employed by the tank platoon	4.1	Tactics
Supervise and/or perform before & after operations preventive maintenance checks	4.1	Maintenance

Given the emphasis in Armor to put "steel-on-target," it is interesting that few Target Engagement/Gunnery tasks were among those most highly rated. Examining the ratings in Appendix A shows that most of the Target Engagement/Main Gun and Machinegun tasks have low Frequency of Failure ratings. In actuality, this may or may not be true. True gunnery performance may be overestimated by feedback received from the firing tables exercises. The probability of knocking out an enemy tank in actual combat is likely to be less than the probability of knocking over a pop-up target on a "G2ed" Table VIII course.

Category Rankings Analysis

The soldiers were asked in Part II of the questionnaire to rank order the relevance or importance of each category to tank commander proficiency. These results are shown in Table 5.

Table 4

Tasks with Highest Frequency of
Failure Ratings

<u>Task</u>	<u>Freq Fail</u>	<u>Category</u>
Construct field expedient antennas	3.9	Communications
Prepare a simplified fallout/rainout prediction	3.9	NBC
Select an appropriate explosive for a mission	3.9	Mines & Demolitions
Perform maintenance checks and services on mine clearing rollers	3.9	Maintenance
Estimate distance at night	3.8	Night Vision Devices
Prepare and submit NBC-4 reports	3.7	NBC
Supervise an assault breach of a minefield	3.7	Mines
Counsel subordinates on personal affairs, problems and fears	3.7	Personnel
Live off the land	3.7	Survival
Operate & maintain mine detector sets	3.6	Mines & Demolitions
Inspect demolitions for serviceability & properly store	3.6	Mines & Demolitions

Unlike the rated importance of gunnery tasks, Target Engagement along with Maintenance are now found ranked most relevant to TC proficiency. This certainly is to be expected.

Table 6 combines these analyses and shows the tasks rated highest in Attributable Risk for the Target Engagement category. In the task analysis, gunnery tasks were separated into several categories, namely Target Engagement/Main Gun, Machineguns, Commander's Weapon Station, and Target Acquisition. From this point on, however, all of these tasks will be considered together as the Target Engagement category to guarantee that no critical gunnery tasks are excluded.

Critical Incident Analysis

In an attempt to better understand TC excellence, a modified Critical Incident Technique (Flanagan, 1954) was also administered. With this the soldiers were asked to describe what differentiated an excellent TC from one who was "above average." While not without flaws, the critical incident approach is straight forward and well suited for identifying extremes in performance.

Procedure. Part IV of the questionnaire asked the 11 SMEs to describe an "excellent" TC in their own words. Specifically, the instructions were:

PART IV. CRITICAL INCIDENTS.

Please think for several moments about the best tank commander(s) you have ever known. Briefly describe the characteristics and/or the abilities of this individual(s) which made him an "excellent" TC and which distinguishes him from other TCs who were "above average".

Table 5

Mean Rankings of Categories to TC Proficiency

Target engagement/main gun	3.9
Maintenance	3.9
NBC	6.1
Tactics	6.6
Land navigation	6.7
Target acquisition	8.6
Communications	8.7
Machineguns	8.8
Ammunition	10.9
Grenades and smoke	11.3
Commander's weapon station	11.6
First aid	11.7
Security & intelligence	12.2
Camouflage/cover & concealment	13.0
Personnel, training & admin	13.6
Personal night vision devices	14.6
Small weapons	15.0
General equipment	15.3
Individual fitness	15.7
Survival, escape & evasion	16.3
Mines & demolitions	16.4
Customs & laws of war	21.1
Wheeled vehicles	21.6

Table 6

Target Engagement Tasks with the
Highest Attributable Risk

<u>Task</u>	<u>AR</u>
Boresight main gun	11.8
Engage surprise targets	10.6
Engage target with main gun in emergency mode	9.5
Lay main gun for direction	8.5
Decide priority of multiple targets	8.2
Detect targets from TC position	8.1
Identify targets	7.9
Detect/identify with TIS	7.8
Issue simultaneous target fire command	7.6

Results. The writing ability of the SMEs varied considerably, as did the length of the responses which ranged from several sentences to a 400 word biography. The responses were broken down into 89 simple statements, which were then sorted into 18 clusters. Table 7 shows these clusters with several responses for each; the number in parentheses indicates the number of responses for that category.

Table 7

Critical Incident Response Clusters

AN EXCELLENT TC:

- a. Has general leadership qualities. (6)
 - An excellent TC is a dynamic, "natural" leader
 - Leadership is the key factor
 - Is able to apply leadership skills effectively
- b. Motivates his crew. (4)
 - Is an excellent motivator
 - Motivates crew to perform to standard
 - Demands nothing less than perfection of his subordinates
- c. Knows the capabilities of his crew. (4)
 - Knows what his personnel can and cannot do
 - Knows how to use his personnel

- d. Maintains high morale. (5)
- Maintains high morale and harmony with crew
 - Gets crew to work together to accomplish mission
- e. Performs maintenance. (3)
- Performs maintenance on communications equipment
 - Performs automotive maintenance
- f. Maintains supply accountability. (3)
- Maintains accountability of equipment
 - Ensures proper equipment is available
- g. Has pride. (4)
- Takes pride in his equipment
 - Has pride in himself and his country
- h. Is achievement oriented. (7)
- Enjoys the challenge of his job
 - Has drive to better himself
 - Has high standards
- i. Has a positive attitude. (5)
- Has a positive attitude toward job and crew
 - Most important, has a "can do" attitude toward mission
- j. Demonstrates good communication skills. (9)
- A most successful TC takes time to explain what is expected of crew
 - Is articulate
 - Is able to explain tanks in simple terms when appropriate
- k. Is knowledgeable of equipment. (8)
- Knows tank inside and out
 - Knows the capability of the equipment
 - Knows all operations of the equipment
- l. Is intelligent. (4)
- Has knowledge to accomplish the total mission
 - Is highly intelligent
- m. Can effectively engage targets. (4)
- Can fight his own tank and control the elements
 - Quickly identifies targets

- n. Uses good tactics. (2)
- Fully utilizes terrain
 - Maintains formations
- o. Is a good problem-solver. (3)
- Can deal quickly with problems when they arise
 - Has ability to react rapidly to unexpected circumstances
- p. Is an excellent trainer. (9)
- Takes time to train his subordinates
 - Practices on areas where he and his crew are weak, and not on areas where they look good
 - Trains his crew in gunnery at every available moment.
- q. Is concerned about his crewmembers. (5)
- Ensures the needs and welfare of the crew are always met
 - Looks after the crew
- r. Counsels his crew. (4)
- Counsels crew in areas of importance
 - Offers good advice to subordinates
-

The most outstanding feature of these results is that they predominately identify soft skills as the differentiating characteristics of TC excellence. Specifically, the most frequently cited categories were those of training and communication. TC excellence must be defined to include more than good gunnery performance and the demonstration of the other hard skills.

The excellent TC must be able to demonstrate the hard skills required to direct the weapons systems at his command. In addition, the TC must possess the skills necessary to interact effectively with his crew and those higher in the chain of command. He must show a legitimate concern for his crew as well as have pride in himself, his equipment and the Army in general. He must also desire to succeed at the challenges placed on him and his crew.

FRAMEWORK FOR TESTING HARD SKILLS

A variety of testing techniques are available to evaluate the hard skills necessary to perform the numerous TC tasks. The decision to use a particular technique is based on a number of factors. These include the time required to develop the test and the time and cost of administering the test. Other considerations include the availability of equipment and test security.

One important factor concerns the nature of the skill being tested. Tasks requiring motor skills for the most part require some form of hands-on testing. For example, "Laying the main gun" requires fine motor movements.

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which must be accurate in time and space. A valid test of this skill should measure accuracy within these dimensions. By contrast, the successful completion of many other tasks results from procedural knowledge. Successful performance of these tasks results from understanding how to do something. While such tasks, e.g., "Operating the Chemical Agent Alarm System," do require action, success or failure is primarily a function of job knowledge. An important distinction for deciding an appropriate testing technique is whether the task principally has a motor skill component or alternatively is based on job knowledge.

Testing Methods

The general advantages and disadvantages, along with specific armor examples, of paper and pencil tests, tests using visual slides, videotapes or discs, or various training devices, as well as actual equipment, will now be discussed.

Paper and Pencil. Paper and pencil tests are clearly most appropriate for assessing the job knowledge components of a task. Given some creativity, however, a wide variety of information can be tested, especially when the questions are accompanied with artwork. A test item may, for example, include a sight picture through the telescope including reticle and target. The soldier can then be asked about proper lead with respect to mil relations. Examples of this are included in the draft Handbook for Sight Picture Training (USAARMC, 1984). The development of this artwork can sometimes be expensive and time consuming.

One of the biggest advantages of paper and pencil tests concerns the ease of administration. Once the test is developed it can be widely distributed with standardized administration. For example, the paper and pencil tests on Call-for-fire currently being used in the Armor School and NCO Academy can be easily administered with minimal resource requirements.

Test security is always important and can be increased by developing alternate test forms. Parallel tests are being used, for example, in 19K BNCOC. The typical formats of paper and pencil tests are true/false, multiple choice, matching, or fill in the blank. The advantage to this objective item format is that it is unambiguously scored; the item is either correct or incorrect.

One disadvantage of paper and pencil tests is that they provide only a loose control of timing. Perhaps their biggest problem in the military is, however, that they can lack face validity. Certain individuals are going to be reluctant to accept paper and pencil tests as valid for some tasks, regardless of how well the test may be constructed. This is due in part to the strong emphasis which has been placed on performance based testing. This trend, in general, seems to be reversing with greater emphasis again being placed on understanding why something is being done along with being able to perform the task, (Armistead, 1983).

Visual Slides. These are mostly used to augment paper and pencil tests. Slides provide better quality artwork for not much more cost. One of the biggest advantages to using slides is the added control in administration.

A scene, for example, may be presented for only a few seconds during which time the soldier must make a decision. With paper and pencil tests one usually only controls the total test time, whereas with slides the timing of every item can be controlled.

Bessemer and Kraemer (1979) have developed an audiovisual simulated performance test using 35mm slides for disassembly and assembly of the 105 mm Main Gun breechblock mechanisms. This research exemplifies how visual slides can be used to evaluate knowledge of procedural sequences. Visual slides are also appropriate for testing identification of combat vehicles.

Video Tape/Disc. Video tapes and video discs can also be used in conjunction with paper and pencil tests. They offer the same advantages as visual slides, but additionally present motion and sound which increases the realism and number of applications. In addition, the information is presented in real time. Interactive videodiscs have recently been introduced where the soldier can interact with information on a video screen by using a keyboard, joystick, or touch screen. Questions can thereby be presented directly on the screen. Videodiscs are now being used as part of Computer Assisted Instruction (CAI) systems and also for the visual displays in gunnery trainers. This technology is, however, only now starting to emerge.

Video and visual slides can also be used to show procedural sequences and to ask the soldier whether the steps are correct or incorrect. While this sometimes is a useful method of testing, it is not without limitation. Being able to recognize a procedural error does not mean that the soldier can do the task. The disadvantages of video tapes and discs are their cost and the time required to develop them. While paper and pencil tests can be easily modified, changes in video are more costly. Similarly, test security is jeopardized if only one version of a test is developed and then repeatedly administered. Videodiscs do, however, readily permit the random presentation of questions and pictures.

Training Devices. Training devices, by definition, are designed to train. They usually have evaluation capabilities but these are often yoked to the application of the trainer. Test construction can deviate from the normal process to become "What can we test with this machine?" This is in contrast to developing an instrument to evaluate what has ahead of time been determined to be important. Modifications can sometimes be made to the software to change the function of the trainers. The main advantage of training devices is that they are realistic and the motor requirements are often similar to the actual equipment. This makes them appropriate for testing motor skills.

The newer training devices have extremely high resolution visual displays which use videodiscs or computer generated imagery. In other cases, however, the video is unrealistic with poor quality. Videodiscs showing a variety of threat vehicles should be available for the new trainers and these will have numerous testing and training applications. Currently this is not the case. Another limitation of using training devices for widespread testing is their limited availability and mobility.

The new computer-based simulators such as the Unit-Conduct Of Fire Trainer (U-COFT) and the Simulation in Combined Arms Training (SIMCAT) permit

the accurate monitoring of numerous performance factors. These simulators are designed to measure accuracy and reaction times for part and whole tasks under a variety of conditions, e.g., degraded modes. Computer-Based training devices can also systematically vary the difficulty of test items or scenarios such that the computer can home in on the ability level of the test taker. The "Battlesight" arcade-style part task gunnery trainer, for example, increases and decreases the difficulty of the simulated engagement to match the gunner's level of performance. While these devices hold great potential for performance testing, identifying the appropriate performance measures is essential.

Actual Equipment. Testing on the actual equipment has high face validity in that it allows the exact procedures or skill of interest to be tested. In practice, however, testing with actual equipment may be troublesome. For example, the evaluation of "Preventive Maintenance Checks and Services" too often results in only obvious problems being tested such as oil on the ground. Only so many maintenance problems can be induced without potential damage to the equipment or to persons performing the maintenance. Again one may be forced to test what is convenient. This limitation in the number of symptoms to be tested threatens the security and the validity of the test. Another disadvantage of testing with actual equipment is that the testing situation may not be very well controlled.

Testing with actual equipment is nearly essential in certain situations, particularly those involving motor skills. For example, if one is interested in M-16 marksmanship, other testing techniques would likely be out of the question. Not many situations exist where testing with actual equipment is essential.

Task by Testing Method Matrix

Several tasks with the highest Attributable Risk have been identified for each of the top six ranked categories. Table 8 shows a matrix of these tasks with the testing techniques previously discussed. An "X" indicates that testing technique is feasible, if not currently available. Each feasible technique is discussed in Appendix C. For the most part the tasks identified have been taken directly from the task list used in the task analysis. In certain instances they have been broadened to include tasks which are similar. Also, in several cases tasks are drawn from other categories; for example, two highly rated tasks dealing with minefields are included under tactics.

In Appendix C, the recommended testing method is discussed first, although each method described is suitable. This recommendation is based on the following questions.

1. Does the task to be tested primarily require a motor skill or job knowledge? Those requiring motor skills, as discussed before, should use hands-on testing with actual equipment or simulators.

2. What measures are possible with that technique? If successful completion of the task, for example, requires accuracy and speed, the test should measure both.

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3. What is the estimated validity of the testing method and/or measures to be gathered? This involves a subjective evaluation based on experience and an awareness of the underlying skills required to perform the task. A real danger exists, however, in making assumptions about test validity. Face validity is not enough.

4. What are the costs? Is the technique currently available or how much will it cost to develop the test? Also, how much are the administration costs including personnel, time, and materials.

5. How easy is the technique to administer? This concerns test security as well as time and resource requirements.

The following matrix does not constitute a concrete recommendation for tasks to be used on a test of TC excellence. If for no other reason, such a test would likely be too long. The matrix does, however, represent the results of a relatively novel task selection technique and the matrix serves as an aid to those individuals or agencies who do construct tests.

Table 8
Task by Testing Method Matrix

	Paper & Pencil	Slides	Video Tape/Disc	Training Device	Tank Actual Equip
<u>TARGET ENGAGEMENT</u>					
1. Boresight main gun	X	X	X	X	X
2. Detect/identify targets (normal/thermal)	X	X	X	X	
3. Engage targets Lay gun Issue fire commands Analyze threat	X	X	X	X	
4. Fire control system failure/degraded mode	X	X		X	
<u>MAINTENANCE</u>					
1. Troubleshoot engine & transmission	X	X	X		X
2. Troubleshoot fire control & electrical systems	X	X	X	X	X
3. Troubleshoot TC indicator and warning lights	X	X	X	X	X
4. Supervise/perform before & after PMCS	X	X	X		X
<u>NBC</u>					
1. Prepare & submit NBC-4 reports	X			X	
2. Operate & supervise the personnel decontamination system	X	X	X		X
3. Implement MOPP & later initiate unmasking	X	X	X	X	X
4. Operate & maintain the automatic chemical agent alarm system	X	X	X		X
5. Prepare a simplified fallout/rainout prediction	X				

	Paper & Pencil	Slides •	Video Tape/Disc	Training Device	Tank Actual Equip
<u>TACTICS</u>					
1. Call for/adjust indirect fire	X	X	X	X	
2. Supervise an assault breach/report locations & lanes through a minefield	X	X	X	X	
3. Select river crossing sites	X	X	X	X	X
4. Analyze & utilize terrain	X	X	X	X	X
5. Plan troop movement/attack	X	X	X	X	X

<u>LAND NAVIGATION</u>					
1. Locate an unknown point on a map by inter-section/resection	X				
2. Determine degree of slope, distance & line of sight from a map	X				
3. Prepare and use a map overlay	X	X	X	X	X
4. Select a movement/withdrawal route using a map	X				

<u>COMMUNICATION</u>					
1. Recognize ECM and implement ECCM	X				X
2. Use an automated CEOI	X				X
3. Encode/decode using KTC 600D	X				X
4. Use KTC 1400D numerical cipher/authentication system	X				X
5. Decide whether or not to break listening silence	X			X	

Tasks Selected from Criticality Ratings.

As previously discussed, there are several good reasons for using Attributable Risk to select items for the test of TC excellence. Foremost is that this technique selects items which are both critical to mission success and which are also frequently failed. Other selection techniques which focus on criticality may be more appropriate for other purposes such as selecting tasks to be trained. In any case criticality techniques are the traditional Army approach and are therefore more widely accepted.

HumRRO has used a criticality technique variation to identify relevant TC tasks for training (Morrison, Drucker & O'Brien, in preparation) as part of a large ARI project to revamp the 19K BNCOC Course for M1 TCs. Specifically, they asked 28 NCOs from M1 NETT teams to rate TC tasks on a 4 point scale with the scale anchors being "No Need to Know," "Nice to Know," "Should Know," and "Must Know." In an attempt to broaden the applicability of this paper to include tasks appropriate for BNCOC end-of-course testing, Appendix D presents an alternate list of tasks based on criticality ratings alone. This list is the combined result of both HumRRO's "Need to Know" criticality ratings and the similar "Importance to mission success" ratings gathered in the present study.

The tasks for each category were selected by looking at the top six rated tasks for each methodology. If a task was highly rated in both studies, it was included. In most of the categories this was the case for at least four of the tasks. The additional tasks were selected by looking at the relative rankings of the remaining top rated tasks within their respective task lists. If the top rated item on one list was not selected because it did not match a task on the other list, it was nevertheless added because of its ranking in its own list. In several instances there were slight wording differences in the tasks between the lists, but this posed no real problems. As can be seen in Appendix D, two more tasks are listed for the Target Engagement category because of its breadth and overall importance with six tasks being listed for the other categories. In addition, the two most critical First Aid tasks are also listed.

ASSESSMENT OF SOFT SKILLS

The valid assessment of leadership and other soft skills identified in the critical incident analysis is difficult. Developing instruments to measure these types of skills has been a major effort within psychology for the past several decades. As a result, several different testing methodologies have developed including both objective and subjective techniques. These techniques were evaluated for the purpose of selecting one for use in discriminating TCs on soft skill dimensions.

Attempts have been made to quantify these skills with objective self-report inventories in which the person is asked straight forward questions about their behaviors, beliefs, and preferences. Self-report inventories are sometimes desirable in that no one knows themselves better than himself. Burnside (1982) reports that subjective appraisals have not, however, been consistently accurate. Such tests are not suitable for situations which result in selection or promotion. Individuals will too often be induced to

provide answers to match what they believe will be rewarded rather than what they would actually do in the given situation. For example, it would be unreasonable to ask a TC to rate himself as to how fairly he treats his crew if the results of that test were to affect his career. Even the most honest person would undoubtedly over-estimate his fairness. Some procedures are available which attempt to minimize these problems such as a Forced Choice Adjective Checklist in which the alternatives are matched for social desirability (Edwards, 1957).

Other objective techniques for assessing soft skills are the In-basket technique (Fredricksen, Saunders, and Wand, 1957) and a similar technique, the Assessment Center Method (Bray, 1976). These techniques evaluate how well a person deals with simulated problem situations. For example, a TC might be told that he has been assigned to a new crew with a particular set of problems, e.g., hardware failures, training deficiencies, low morale. The TC would be asked to describe and document how he would handle these problems in a given time frame, for example, in the following three days before the unit was to participate in a major exercise.

These techniques are primarily aimed at assessing decision-making, organization, and efficient use of time. It is unfortunately rather time-consuming and has not proven to be all that successful at predicting performance. How a person behaves in a contrived situation with artificial time constraints may bear little resemblance to his performance on the actual job. This approach is perhaps better used as a training technique by which, for example, a soldier could be helped to improve his decision-making style and abilities.

Since the objective measurement of soft skills is questionably valid at best, the task is often accomplished by having other people make subjective judgments about an individual's skills or level of performance. These judgments can take several forms. Pairs of individuals can, for example, be directly compared to one another on one or more dimensions of interest or a group of people can be ranked on the dimension. By far the most commonly used judgmental measure is, however, the rating scale.

One of the major problems with rating scales is that they often have low reliability, particularly inter-rater reliability. This can be largely the result of ambiguous response categories in which the scale anchors are actually of little use. Consider the following scale.

Quality of work: Low 1 ————— 2 ————— 3 ————— 4 ————— 5 High

This rating is likely to be highly unreliable since the interpretation of what characterizes low or high quality is left completely up to the individual rater. Similarly, the scale dimension, "Quality of work" is likewise ambiguous and this would also lead to greater unreliability. A very important point to remember is that the validity of a test or scale cannot exceed the square of its reliability. If a scale yields an inter-rater reliability of .70, the highest possible validity for that scale is .49, i.e., over half of the measurement is error.

Smith and Kendall (1963) introduced a rating technique which potentially increases inter-rater reliability by the use of behavioral anchors. These Behaviorally Anchored Rating Scales (BARS) contain specific examples of good, adequate, and poor performance for a particular job. The scales also have high face validity in that the wording is generated by job incumbents. In a comparison of several scaling techniques, Bernardin (1977) asserts that the rigorous procedures used in the construction of the BARS virtually ensures quality in the final product. This technique has therefore been selected to measure the soft skills necessary for TC excellence.

Procedures for Developing the Behaviorally Anchored Rating Scales (BARS)

The development process involves a number of steps involving several groups of Subject Matter Experts. First the relevant skills or performance dimensions to be measured were identified by selecting those categories from the critical incident analysis which dealt with soft skills. In addition, "Plan use of available time" was included along with "Conduct and evaluate training," as they were the tasks with the highest Attributable Risk rating from the Personnel and Training management category.

The second step required that behavioral examples of good, adequate, and poor performance for each of the selected categories be written by soldiers with armor experience. Five officers and five NCOs were given a questionnaire which asked them to write these behavioral statements. The questionnaire is included as Appendix E.

The soldiers were then given the following 13 categories: attitude, counsels crew, supply accountability, motivation, time assets, concern for crew, intelligence, leadership, communication skills, achievement motivation, promoting morale, problem solving, and training. Under each category name were three levels as indicated in the example. Most of the participants wrote several behavioral examples for each level of each category.

The third step required that the behavioral items be independently verified as belonging to a particular category. This procedure helped to assure that the resulting scales were unidimensional. Each behavioral item was written on a separate card and then five persons from the ARI Fort Knox Field Unit sorted them into categories. Only items in which at least 3 out of 5 persons agreed on the same category were kept. Because of the consistent overlap in the sorting, leadership and motivation were combined and subsequently called Leadership Skills. Following this step, 20-30 behavioral items or anchors remained for each of the categories.

The fourth step required that scale values be determined for the remaining behavioral anchors. Another questionnaire was developed which included in part, 15-17 of the behavioral anchors for each of the categories. This was administered to a total of 19 soldiers composed of 11 Armor NCOs who were currently enrolled in the Advanced Noncommissioned Officers Course (ANCOC) at Ft Knox and 8 officers who were enrolled in the Armor Officer Advance Course (AOAC). These soldiers were instructed to rate each item on a 7 point scale in order to establish scaled anchors for the BARS.

Two additional sets of questions were included. In the first part the soldiers were asked to rate the 12 categories as to how important or relevant they felt that category was to TC proficiency. These were rated on a 7 point scale ranging from "not very important" to "extremely important." The last set of questions asked who should rate the E6-TC, the Platoon Sergeant and the Platoon Leader as TCs and why?

Results and Discussion

Appendix F includes the Behavioral Anchors along with the mean rating for each. As can be seen, each anchor is written in a "This TC could be expected to..." format. The rationale is that the anchor describes a location or a metric on a unidimensional scale. It should not be confused as a behavioral checklist where an item indicates that a TC actually has completed some action or performed in some specific way.

From these ratings, six specific anchors were chosen for each scale. One problem consistently reported in other work developing BARS is that it is difficult to get examples of "adequate" or average performance. This situation arose here where most of items were rated towards one extreme or the other. For the most part, two low anchors, one middle anchor, and three anchors at the high end of the scale were selected for the final BARS. It is suspected that the majority of actual TC ratings will be 4 or above. The final 12 BARS along with administration instructions are presented as Appendix G.

Table 9 shows the mean importance rating for the 12 categories. As can be seen, six of the categories are clustered in the 6.3 - 6.5 range and six are clustered in the 5.7 - 5.8 range. These data basically reaffirm the appropriateness of the 12 categories selected for the BARS. Somewhat significant is that Supply Accountability was rated as more important by Officers, $\bar{M} = 6.5$ than by NCOs, $\bar{M} = 5.1$, $t_{(17)} = 2.61$, $p < .05$.

Table 9

Mean Relevance Ratings of
the 12 BARS Categories

<u>Category</u>	<u>Mean</u> <u>(max = 7)</u>
1. Achievement orientation	6.3
2. Leadership skills	6.5
3. Promoting unit morale	5.7
4. Counseling skills	5.8
5. Problem solving	5.8
6. Communication skills	6.3
7. Use of time	5.8
8. Supply accountability	5.7
9. Training	6.4
10. Intelligence	5.7
11. Concern for Crew	6.4
12. Personal attitudes	6.4

These scales undoubtedly do not represent 12 independent dimensions of TC skills. This will be easily discernable by looking at the intercorrelations of the ratings once the BARS are fielded. If the scales are found to be redundant, reducing the number of scales may be desirable. On the other hand, assuming that the scale scores will be combined in some manner, getting 12 ratings essentially increases the reliability of the measure.

Table 10 shows the responses of the NCOs and Officers when asked who should rate the E6-TC, the Platoon Sergeant (PSG) and Platoon Leader (PLD) as a TC.

Table 10

Responses of NCOs and Officers
as to Who Should Rate the TCs

Who should rate?			
	E6-TC	PSG	PLD
NCOs	PSG - 8	CO - 4	CO - 5
	PSG & PLD - 3	1SG - 3	CO & PSG - 3
		CO & 1SG - 2	PSG - 2
		1SG & PLD - 1	BNCO - 1
		CO & PLD - 1	
Officers	PSG - 7	PLD - 7	CO - 7
	PLD - 1	PLD & CO - 1	CO & PSG - 1
	PSG & PLD - 1		

Everyone generally agreed that the PSG should rate the E-6 TC. The explanation was that the PSG had the most dealings with E-6 TCs and therefore could make the best judgment. The officers and NCOs disagreed considerably as to who should rate the PSG. The NCOs were opposed to being rated by the PLD for two reasons. First, they felt that they had more experience as a TC than did the PLD and secondly, they expressed some apprehension that the PLD would use the ratings as a threat or as a "club." This latter point was also raised several times as to why the PLD should not rate the E-6 TC. Similarly, nearly half of the NCOs felt the PSG should have some part in the rating of the PLD. Not surprisingly, not many of the officers felt they should be rated by NCOs.

CONCLUSION

This paper provides a framework for the evaluation of TC proficiency, with particular focus on TC excellence. The task analyses show that the excellent TC must be able to perform a wide variety of tasks encompassing target engagement, maintenance, NBC, tactics, land navigation, and communications. In addition, the excellent TC must be an effective trainer and be able to demonstrate leadership and other soft skills which impact crew morale and performance.

Two different task selection procedures are discussed which identify the hard skill tasks appropriate for testing TC proficiency. Several alternative testing methods are proposed for each of the selected tasks. As a means for assessing the soft skills, twelve Behaviorally Anchored Rating Scales (BARS) have been developed. These scales are included along with a description of the BARS development process.

The Task by Testing Method matrix and the BARS taken together lay the groundwork for performance criteria which quantify TC proficiency, and in extension TC excellence. This performance measure can be used to develop a general skill profile of current TCs in the Armor force or similarly can be used to compare the readiness of TCs in USAREUR and CONUS. Likewise, it can be used to compare the effectiveness of various training programs such as the Ft Knox, Ft Hood, and Hohenfels BNCOC. In other applications, these measurements might be used to certify individual TC excellence or as a means for selecting an elite Armor unit.

Once the comprehensive testing of TC proficiency has begun, formal and on-the-job training will likely focus on improving the performance of these tasks and categories selected for evaluation. This is highly desirable, given that the hard skills selected are the most critical and possibly the most frequently failed. Similarly, while soft skills have long been seen as desirable, the systematic assessment of these skills will place greater emphasis on them than ever before. As a result this is likely to strengthen the overall leadership qualities of the TC. In general, this process of assessing TC excellence will likely lead to wider spread TC excellence in tomorrow's Armor force.

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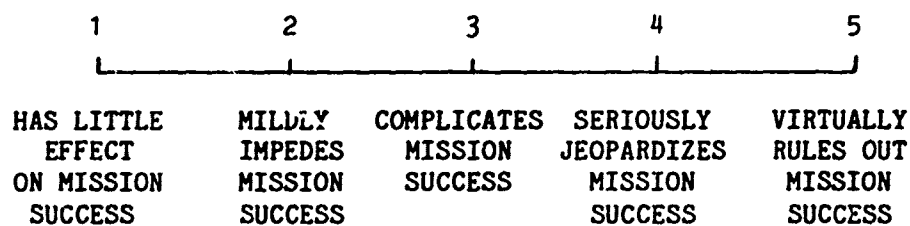
APPENDIX A
WRITTEN INSTRUCTIONS AND GRAPHIC SCALES
USED IN ATTRIBUTABLE RISK ANALYSIS

PART I. IMPORTANCE OF A TASK TO THE MISSION

Please consider each task relative to the "Global" mission of a tank commander. Indicate how you believe the failure to perform that task would affect the likelihood of mission success. In other words, how important is the task to the success or failure of the tank commander's mission. For each of the tasks in Part I, please circle one numeral (1-5) which corresponds to the scale at the top of the page. Remember that the order of the tasks has been randomized.

At the top of each page was the following scale taken from Johnson et al. (1983).

FAILURE TO ADEQUATELY PERFORM TASK X:



PART II.

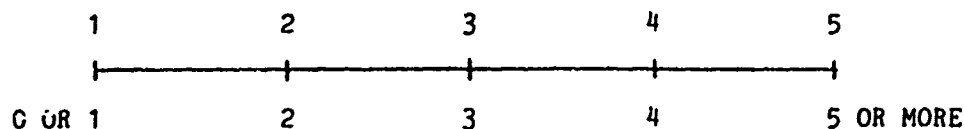
Please rank order the following categories as to their relevance to tank commander proficiency. The most relevant or important category should be given a "1", the second most a "2", ... and the last a "3".

PART III. FREQUENCY OF TASK FAILURE.

Based on your general experience with TCs during events such as NTC, ARTEPs and tank combat tables, please indicate the number of TCs out of ten (10) who you believe could not adequately perform each task. As before, for each task, circle one numeral (1-5) which corresponds to the scale at the top of the page.

Similar to Part I, at the top of each page was the following scale.

THE NUMBER OF TCs OUT OF TEN (10)
WHO CAN NOT ADEQUATELY PERFORM TASK X:



APPENDIX B

CATEGORIZED TASK LIST WITH MEAN IMPORTANCE RATINGS, FREQUENCY OF FAILURE RATINGS, AND ATTRIBUTABLE RISK SCORES

<u>AMMUNITION</u>	<u>Imp</u>	<u>Freq Fail</u>	<u>AR</u>
Know function & safety of each type of round	2.8	1.8	5.1
Inspect, identify, prepare for stowage 105mm and Cal .50 rounds	2.6	1.8	4.8
Inspect DA Form 2408-4 (Weapons Data Card) for accuracy	2.4	3.0	6.7
Supervise personnel handling ammunition	3.3	1.9	7.0
<u>COMMUNICATIONS</u>			
Operate & maintain a combat vehicle crewman's (CVC) helmet	3.1	2.0	6.9
Decide when & how to communicate with an OP	3.0	2.9	9.2
Mount & operate a radio set e.g., AN/VRC-64	3.3	2.1	7.2
Construct field expedient antennas	2.2	3.9	7.6
Preset tactical radio	2.8	2.5	7.2
Recognize Electronic Countermeasures (ECM) & implement electronic counter-countermeasures (ECCM)	3.8	3.3	12.6
Decide whether or not to break radio listening silence	3.8	2.9	12.0
Communicate using visual signaling techniques	3.4	2.2	7.6
Install & operate hot loop wire communications	2.7	2.5	7.3
Prepare written messages	3.0	3.2	9.7
Enter or leave radio net	2.6	2.2	5.7
Use the KTC 1400D numerical cipher/authentication system	3.8	2.2	8.6
Use an automated Communications Electronics Operation Instructions (CEOI)	4.2	2.2	9.1
Encode & decode messages using the KTC 600D tactical operations code	3.7	2.5	10.1
Operate telephone sets TA-1/PT and TA-312/PT	2.1	2.0	4.2

	<u>Imp</u>	<u>Freq Fail</u>	<u>AR</u>
<u>FIRST AID</u>			
Apply preventive measures to limit, recognize, and give first aid for weather related (heat/cold) injuries	3.2	2.2	7.1
Restore breathing using appropriate cardiopulmonary resuscitation techniques	3.2	2.8	9.5
Transport a casualty/evacuate a wounded man from his vehicle	2.8	2.7	7.6
Apply a dressing to an open wound	3.1	1.9	6.1
Apply and enforce preventive measures to control disease and poisoning	3.3	3.2	10.7
Evaluate a casualty	2.8	2.1	5.3
Recognize & give first aid to a nerve/blood/blister agent casualty	3.9	2.5	9.7
<u>INDIVIDUAL FITNESS</u>			
Lead physical conditioning activities appropriate to mission	3.2	3.1	9.7
Administer physical fitness test	2.6	3.3	8.3
<u>NBC</u>			
Implement Mission Oriented Protective Posture & later initiate unmasking procedures	4.1	2.9	12.1
Prepare and submit NBC - 4 reports	3.5	3.7	12.9
Collect, read & report radiation dosages	3.4	3.2	11.1
Prepare a simplified fallout/rainout prediction	2.8	3.9	11.2
Prepare for an NBC attack	4.2	1.8	7.5
Conduct partial decontamination	3.8	2.4	8.9
Supervise the fitting of appropriate MOPP gear	3.2	2.5	8.5
Decontaminate skin, clothing and equipment	4.0	2.4	9.5
Recognize, react and give the alarm for a chemical or biological hazard	4.0	1.9	7.9
Conduct NBC training	3.3	2.9	9.7
Direct the crossing of contaminated area	3.5	3.3	11.6

	<u>Imp</u>	<u>Freq Fail</u>	<u>AR</u>
Position, operate & maintain the automatic chemical agent alarm system	3.7	3.1	11.9
Prepare and submit NBC-1 reports	3.4	2.4	8.8
Drink, use the latrine & sleep while wearing protective clothing	3.6	3.0	11.0
Operate and supervise the personnel decontamination system	3.6	3.4	12.3
<u>LAND NAVIGATION</u>			
Conduct land navigation training & supervise personnel performing land navigation duties	3.7	2.8	10.3
Prepare and strip map	3.0	2.7	8.4
Determine degree of slope, elevation of a point, distance, and limit of line of sight from a map	3.0	3.4	10.1
Determine & use six-digit grid coordinates	3.7	1.8	7.0
Navigate from one point on the ground to another	3.9	2.4	9.7
Determine magnetic & grid azimuths using a compass and/or a protractor	3.2	2.7	9.1
Decide whether to negotiate an obstacle or to bypass it while maintaining position in a platoon	3.4	2.3	8.0
Operate & maintain a lensatic compass	2.4	2.0	5.1
Identify terrain features, conventional signs & symbols, and military symbols on a map	3.8	1.9	7.0
Prepare & use a map overlay	3.8	2.6	10.1
Maintain orientation in a moving tank by comparing terrain features visible from tank with those shown on a map	3.9	2.6	9.8
Orient a map and adjoining map sheets	3.2	1.9	6.3
Navigate using field expedient methods to determine distance & direction	3.6	2.9	9.8
Locate an unknown point on a map by resection and intersection	3.2	3.3	10.8
Select a movement route using a map	3.5	2.9	10.6

	<u>Imp</u>	<u>Freq Fail</u>	<u>AR</u>
<u>MINES & DEMOLITIONS</u>			
Operate & maintain mine detector sets, e.g., AN/PRS-7, AN/PSS-11	2.5	3.6	8.8
Inspect demolitions for serviceability and properly store or stow on vehicle	2.3	3.6	8.0
Supervise an assault breach of a minefield	3.5	3.7	12.8
Probe for mines	2.8	2.9	8.3
Report location and lanes through minefields	3.7	3.3	12.8
Instruct subordinates in the safe use of mine & accessories	3.1	3.1	9.9
Assemble & emplace a non-electric/electric detonation system	2.5	3.5	8.8
Install, remove & disarm the claymore & M18 antipersonnel mines with & without tripwires	2.8	2.2	6.8
Detonate or neutralize explosives	2.7	3.6	9.6
Identify & use minefield markers	3.0	2.4	7.7
Construct, emplace & remove wire obstacles and trip flares	2.5	2.2	5.3
Select an appropriate explosive for a mission e.g., demolish bridge, destroy ammunition, construct hasty positions (with explosives)	2.3	3.9	8.7
Install, remove & disarm the M21 metallic antitank mine	3.0	3.4	10.3
Locate mines by visual means	2.8	2.4	7.2
Install & remove a hasty protective minefield	3.5	2.9	9.5
<u>PERSONNEL, TRAINING MANAGEMENT & ADMIN</u>			
Conduct and/or assist on-the-job training (OJT)	3.4	2.1	7.3
Develop remedial training & recommend personnel to attend such specialized training	3.3	2.5	8.4
Establish goals & standards & then communicate these to subordinates so that they understand them	4.0	2.5	9.8
Conduct & evaluate crew training	4.1	2.6	10.3
Report personnel, supply & maintenance status	3.1	2.5	7.5

	<u>Imp</u>	<u>Freq</u> <u>Fail</u>	<u>AR</u>
Conduct searches, inform individuals of rights, & report violations according to the UCMJ	2.1	3.4	7.1
Initiate adjustment procedures for lost, damaged or destroyed property	2.6	2.7	6.8
Select the methods of instruction to be used to accomplish training objective and the personnel to present training	3.3	2.0	7.2
Critique crew performance	3.7	3.3	12.6
Plan use of available time	4.1	2.9	12.1
Recognize peers, i.e., other TCs, for their positive accomplishments and help peers overcome performance deficiencies	3.0	2.2	6.4
Evaluate how well training is being conducted using training test results	3.3	2.5	7.8
Respect the rights, privileges, and human dignity of others	3.0	2.0	6.2
Prepare a training outline	1.8	2.4	4.9
Establish effective & cooperative senior/subordinate relationships	3.0	2.4	7.1
Use the job book as a basis of training	3.3	3.0	9.5
Identify individual and unit training objectives	3.7	2.6	9.4
Investigate complaints	3.6	2.2	7.6
Conduct both formal & informal counseling sessions, and prepare and maintain counseling records	3.9	2.2	8.8
Assign tasks & duty positions based on work priorities and workload distribution	3.3	2.8	8.5
Promote & maintain morale	3.2	2.9	8.5
Recognize personal strengths & weaknesses in order to set goals for personal improvement	3.1	2.4	7.5
Recommend changes to commander's policies	2.5	2.7	6.6
Conduct personnel affairs in a manner that reflects favorably on the Army and the individual as a leader	3.2	1.6	4.9
Describe the key elements of the army training system including the use of extension training materials & equipment	3.4	2.0	6.3

	<u>Imp</u>	<u>Freq Fail</u>	<u>AR</u>
Describe & use the contents of a soldier's manual	2.3	3.0	6.9
Receive & orient newly assigned personnel	2.6	3.4	8.6
Evaluate work performance & prepare Enlisted Evaluation Report (EER)	3.0	2.8	8.6
Prepare & supervise tank gunnery training	3.5	2.6	9.1
Influence subordinate & behaviors by the use of rewards & punishments	3.8	3.5	13.2
Implement policies & actions which develop self-discipline & confidence	3.5	2.6	8.8
Administer leaves & passes	3.0	2.8	8.3
Execute drill movements & conduct dismounted drills	3.0	1.9	6.0
Counsel subordinates on personal affairs, problems & fears	2.7	3.7	9.9
Identify solutions to performance problems	3.1	2.5	7.7
Prepare, conduct & evaluate individual training	2.3	2.4	6.0
Promote & maintain good discipline	3.6	2.4	8.4
Maintain open channel of communication between subordinates & superiors	2.7	2.6	8.0
Describe the content of a unit's ARTEP mission and identify individual & leader tasks that are required to support the mission	2.9	2.8	7.6
Organize a three-man crew, engage targets with such	3.4	2.4	8.2
Instruct personnel in tank weapons systems and in unit defense procedures	3.8	1.9	7.0
Recommend & initiate disciplinary measures, reclassification, or elimination	3.3	2.3	7.5
Recommend personnel for promotions or awards	2.7	2.6	7.3
Prepare for inspection and inspect personnel, equipment & troop areas	3.2	2.2	7.1
Advise commander on unit readiness, gunnery related subjects, and unit training programs	3.6	2.5	8.6

	<u>Imp</u>	<u>Freq</u> <u>Fail</u>	<u>AR</u>
<u>TACTICS</u>			
Prepare and issue an oral operations order (OPORD)	3.2	3.4	10.5
Identify withdrawal route	3.7	2.8	10.3
Occupy overwatch position and displace forward from overwatch position	4.0	2.5	9.9
Conduct mounted tactical movements	4.3	2.3	10.0
Rehearse unit defense plan	3.9	2.8	11.1
Establish an observation post	3.0	1.8	5.7
Construct field shelters	2.5	2.5	6.4
Assign fields of fire	4.2	1.9	8.4
Move over, through, or around obstacles (except minefields)	4.0	2.2	9.3
Consolidate & reorganize a crew following enemy contact	3.9	2.6	9.7
Mark routes for vehicles	3.2	2.1	6.8
Analyze & utilize terrain	3.9	2.8	11.2
Prepare a range card	2.8	2.0	6.6
Maintain correct position in platoon formation	3.0	2.2	7.0
Call for/adjust indirect or aerial fire	4.3	3.2	13.5
Enforce tactical security plan	4.0	2.5	10.0
Wait for order to open fire & then shift fire on order	4.3	1.8	8.1
Plan troop movement/attack	3.9	2.8	11.2
Determine type of fire support required	3.0	3.1	9.7
Select alternate or supplementary positions	3.8	1.6	6.2
Issue a FRAG order	3.1	3.1	9.9
Conduct day & night surveillance without aid of electronics device	3.1	2.3	7.6
Supervise the preparation of defensive positions	4.1	2.3	9.6
Conduct a tactical road march	3.5	1.9	7.0

	<u>Imp</u>	<u>Freq</u> <u>Fail</u>	<u>AR</u>
Know the various methods of advance and attack employed by the tank platoon	4.1	2.0	8.3
Estimate range	3.1	2.8	9.2
Select, assign, & inspect tactical positions	3.4	2.3	8.1
React to indirect fire	3.7	2.0	8.1
Know tactical principles to employ in tank vs. tank action, and in attacking antitank gun positions	4.2	2.2	9.5
Direct evasion of enemy antitank guided missiles	3.9	2.6	10.7
Conduct a reconnaissance	3.4	2.6	9.6
Move under direct fire	3.9	2.4	9.9
Emplace & recover field expedient warning devices	2.7	2.6	7.4
Establish silent watch	2.3	1.5	3.5
Select river crossing sites	3.3	3.5	12.3
Direct rapid movement into assigned area	3.0	2.0	6.1
Assign sectors of observation	3.5	1.8	6.5

CAMOUFLAGE/COVER & CONCEALMENT

Conceal movement by using weather, light conditions, route selection, & battlefield noise	3.4	2.2	7.2
Select individual battlefield positions that afford concealment & cover	3.3	2.1	7.1
Direct the camouflage of self, weapons & position	3.0	1.6	5.0
Conceal movement by using smoke	3.4	2.2	8.3
Remove evidence of previously occupied areas	2.6	2.3	6.3
Enforce camouflage, noise, light & litter discipline	3.4	2.1	7.0

SECURITY & INTELLIGENCE

Capture & process enemy personnel & documents	3.0	2.3	7.2
Prepare & submit SPOTREPS	3.3	2.0	6.8
Prepare situation report (SITREP)	3.7	1.7	6.2

	<u>Imp</u>	<u>Freq Fail</u>	<u>AR</u>
Prepare & submit SHELLREPS	2.7	3.3	8.7
Visually identify threat aircraft	3.3	3.1	10.3
Use challenge and password	3.2	1.6	5.0
Maintain security in area of responsibility & report security violations	3.3	1.9	5.7
Recognize and identify friendly & threat armored vehicles	3.7	2.5	9.4
Identify "immediate use" intelligence info	3.6	3.1	11.5
Collect/report information (SALUTE)	3.6	1.4	4.8
Inventory & safeguard classified documents	3.2	2.1	7.5
Deceive enemy as to existence, location, strength & plans of unit	3.2	2.5	8.4

SURVIVAL, ESCAPE, & EVASION

Traverse enemy/unfriendly territory	3.3	3.2	10.8
Perform IAW the code of conduct	2.6	2.7	7.0
Organize fellow P.W.'s	2.7	2.6	7.2
Live off the land	3.3	3.7	11.9

CUSTOMS & LAWS OF WAR

Apply customs & laws of war governing the treatment of captives, protection of civilians, & prevention of criminal acts	2.7	2.3	6.5
Apply customs & laws of war governing forbidden targets, tactics techniques	2.7	2.1	5.9
Know your rights & obligations as a PW	2.3	2.5	5.6

MAINTENANCE

Supervise stowage of materials according to load plan	2.7	1.6	4.6
Maintain operator's part of equipment record folder	2.3	2.0	4.8
Advise commander of status of material readiness	3.6	1.6	5.6
Replace a thrown track, short track, and remove/install track blocks on an M1 tank	3.6	1.7	5.7

	<u>Imp</u>	<u>Freq Fail</u>	<u>AR</u>
Inventory & perform maintenance on basic issue items & TO&E equipment	2.5	1.3	3.3
Troubleshoot the engine & transmission	3.8	3.2	12.2
Troubleshoot the personnel heater, gas particulate filter-unit, & turret vent blower	3.3	3.3	10.5
Assist in performing scheduled preventive maintenance	3.5	1.6	5.7
Supervise and/or perform before & after operations preventive maintenance checks & services	4.1	1.7	7.4
Perform before and after operator maintenance checks & services on the mine clearing roller	2.4	3.9	9.0
Troubleshoot the M1 tank using driver's control panel warning & caution lights	3.8	2.2	8.4
Perform during operations checks & services	3.8	1.6	6.5
Prepare the power pack for removal	3.0	2.3	6.9
Locate information in operator's technical information	3.2	2.1	6.6
Replace roadwheels or torsion bars	2.8	1.8	5.5
Clean & service the 105mm main gun	3.3	1.4	5.3
Inspect DD 1970 (Motor Vehicle Utilization Record)	2.1	2.8	5.9
Repair equipment using field expedient techniques	2.7	2.7	7.7
Prepare DD Form 2408	2.3	3.6	8.4

PERSONAL NIGHT VISION DEVICES

Estimate distance at night	3.0	3.8	11.3
Employ & take advantage of artificial illumination in night operations	3.2	3.0	9.5
Operate & maintain AN/PVS-5 night vision goggles	2.8	2.0	5.8
Operate AN/VVS-2 night vision viewer	2.8	1.8	5.0

SMALL WEAPONS

Prepare for firing, correct malfunctions & engage targets with an M72A2 LAW	2.1	2.0	4.5
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	<u>Imp</u>	<u>Freq Fail</u>	<u>AR</u>
Fire & maintain .45 caliber pistol	2.4	1.5	4.3
Conduct .45 cal pistol preparatory marksmanship training	1.9	1.8	3.4

GRENADES, LAUNCHERS, & SMOKE

Identify, perform safety checks, & engage enemy with hand grenades	2.3	2.3	4.9
Decide when to use M250 grenade launcher	3.2	2.4	7.9
Decide when to use engine smoke generator	3.5	2.3	8.5

WHEELED VEHICLES

Recover a wheeled vehicle using expedient means	1.9	2.7	5.4
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MACHINEGUNS

Issue coax fire commands	3.0	1.6	5.3
Engage target with cal .50 using manual controls	3.4	2.0	7.5
Determine range to coax targets using LRF/GPSE	2.9	1.5	4.5
Direct machinegun engagements with proper fire commands	3.0	1.5	4.5
Estimate range to cal .50 target	3.1	2.6	7.9
Install and remove, zero, boresight, & prepare for travel a machinegun	3.6	2.1	8.2
Set headspace & timing, test firing mechanism and clear a machinegun	3.9	1.7	6.5
Engage targets with M240 coax from CWS	2.7	1.8	4.9
Install, remove, boresight, zero & clear an M250 coax	3.1	1.9	5.9
Adjust cal .50 fire	3.1	1.6	5.3
Troubleshoot M240 machineguns	3.1	1.8	5.9
Install/remove an M240 machinegun in the commanders weapons mount	2.8	1.7	5.6
Engage targets with Cal .50 in power mode	2.5	2.5	5.9

COMMANDER'S WEAPON STATION

Prepare & secure driver's station on M1 tank	2.6	1.4	3.6
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	<u>Imp</u>	<u>Freq Fail</u>	<u>AR</u>
Prepare & secure loader's station	2.7	1.6	4.4
Operate CWS in power mode	3.1	1.7	4.8
Prepare commanders weapon station for operation	3.6	1.7	6.6
Perform prepare to fire checks for main gun	4.0	1.9	8.1
Respond to specific fire control system failures (e.g., GPSE, TIS laser rangefinder, crosswind, cant, lead angle)	4.0	2.9	12.1
Troubleshoot TC indicator/warning lights	3.6	2.4	9.0
Prepare & secure gunner's station	3.9	1.9	7.8
Operate CWS in manual mode	3.0	1.7	5.2
Operate commander's manual range controls	3.4	2.0	7.2
Troubleshoot fire control system	4.2	2.9	12.3
Perform prepare to fire checks for coax	3.2	1.9	6.4

GENERAL EQUIPMENT

Perform operator maintenance of periscopes	2.4	1.5	3.9
Drive an M1 tank	2.6	1.3	3.5
Recover and/or tow an M1 tank	2.6	1.4	3.7
Operate gas particulate filter system	3.0	1.5	4.9
Troubleshoot tank electrical systems	3.4	3.4	11.3
Perform fuel transfer procedures on an M1 tank	2.9	1.9	5.3
Slave start an M1 tank	3.1	1.5	5.0
Operate fire extinguishers	3.4	1.4	4.8

TARGET ACQUISITION

Identify targets with binoculars, naked eyes or GPSE	3.7	2.0	7.9
Detect targets from TC position with binoculars, naked eye, or GP	3.8	2.0	8.1
Select mode of observation for TC & loader to acquire targets	3.1	1.8	5.8
Detect/identify targets with TIS	3.9	1.9	7.8

	<u>Imp</u>	<u>Freq Fail</u>	<u>AR</u>
<u>TARGET ENGAGEMENT/MAIN GUN/MULTIPLE</u>			
Issue main gun precision fire commands	3.2	2.0	6.3
Designate gun select, ammo select and LRFD modes	3.5	1.7	6.3
Decide whether to hand-off target to gunner or engage target	3.0	2.1	6.1
Verify main gun firing status	3.0	1.7	5.1
Direct orientation of the main gun	3.5	1.6	6.0
Perform manual extraction of main gun round	2.9	1.5	4.7
Issue simultaneous target fire command	3.1	2.3	7.6
Decide when to shoot & stop shooting	3.7	1.9	7.1
Lay main gun for direction	3.7	2.3	8.5
Lay on target to be engaged using the GPSE	3.3	2.2	7.6
Determine range to target using LRF/GPSE	3.7	1.7	6.9
Adjust fire using GPSE	3.2	2.1	6.0
Engage target with main gun in manual mode	3.1	1.6	5.2
Perform operator maintenance on the 105mm breechblock assembly	3.0	1.6	5.6
Adjust fire using TIS	3.7	2.1	8.0
Boresight main gun	4.5	2.6	11.8
Engage target with main gun in emergency mode	4.0	2.3	9.5
Load & unload 105mm main gun	2.8	1.5	5.1
Engage targets using range card data	2.0	3.1	6.5
Issue multiple target fire command	2.9	2.2	6.6
Decide priority of multiple targets	3.4	2.3	8.2
Respond to main gun misfire	3.9	1.9	7.7
Lay on target using TIS	3.3	2.0	6.6
Engage surprise targets	4.0	2.4	10.6

APPENDIX C
TASKS BY TESTING METHODS

Target Engagement.

1. Boresight Main Gun. The task requires the use of a Pye-Watson device or black thread to align the gunner's primary and auxillary sights with the main gun.

Actual Equipment. While setting up the test, a master gunner should accurately boresight the main gun; repetition may be necessary. Upon completion the correct elevation and azimuth readings should be recorded, e.g., 1.25 right, 3.52 down. These could then be used as a standard from which deviation scores would be computed. The TC, who should sit in the gunner's seat, would be assisted by the master gunner in using the Pye-Watson device. Scoring would be a function of the deviation from the standard and/or the use of a procedural checklist such as the boresighting checklist in Baker & Roach (1960).

Training Device. Boresighting and system calibrating the M1 is a procedure which will be testable on the soon to be fielded Unit-Conduct of Fire Trainer (U-COFT). This procedure as on the actual tank requires approximately 15 minutes to complete.

Paper and Pencil. The test could include artwork showing the gunner's sights with the Pye-Watson device attached. The TC would then have to answer multiple-choice questions concerning the correct adjustment procedure. In procedures such as this where the TC normally uses a Technical Manual (TM), he should be allowed to do so.

Slides and Video. A boresighting procedure sequence might be presented with the TC answering multiple-choice questions or by having the TC identify correct or incorrect steps.

2. Detect and Identify Targets (normal and thermal). The Army standard requires identification of vehicles as either Friendly or Threat and to a lesser degree requires that the soldier know the proper NATO nomenclature.

Slides. The Training and Audiovisual Support Center (TASC) has a Combat Vehicles Identification (CVI) training program which contains slides of 30 self-propelled combat vehicles from the US, USSR, France, Germany, and England. These include slides showing both thermal and daylight images with front, side, and oblique views. The measures should include both the identification of Friend or Threat and the correct nomenclature, e.g., T-72.

Training Devices. Several sets of miniature vehicles are available and these are described in TRADOC Pam 71-9. A new high quality set of miniature vehicles called "The Army Vehicle Recognition Kit" has recently been manufactured by Miltra. This set can possibly be acquired on purchase request by a servicing Training Aids Support Center. These models can be used on a miniature tank range for added realism.

As mentioned earlier, some videodiscs and tapes of threat vehicles are available for certain gunnery trainers. These include the MK60 and the Tank

Gunnery and Missile Tracking System (TGMTS) which has the TC view rear projected films from an actual tank. It is doubtful at this time, however, that enough visual materials exist for these trainers for them to be used to adequately test vehicle identification. Wicat has produced a videodisc on Call for Fire for a stand alone videodisc system which shows various threat vehicles.

The discussions so far have addressed vehicle identification. Target detection is more difficult to test. The detection phase of target acquisition could be handled by several of the gunnery trainers now being developed. These include the U-COFT which should be available in FY85, the Simulation in Combined Arms Training (SIMCAT) and the Videodisc Gunnery Simulator (VIGS) both available in FY86, and the Tank Weapons Gunnery Simulation System (TWGSS) and the Target Acquisition and Identification Trainers (TAIT) which are scheduled for fielding in FY87.

Paper and Pencil. The Soldier's Manual of Common Tasks (FM-21-2) has line drawings of threat vehicles which could also be used to test vehicle identification.

3. Engage Targets. Lay gun, Fire commands, Analyze threat - This obviously is a very important composite set of tasks. Laying the main gun requires motor skills which would best be tested on Gunnery Trainers. One of the most critical aspects of this involves "handing off" the target to the gunner. This will be better tested on the simulators which train and test crew interactions such as the U-COFT and SIMCAT. In addition the U-COFT, SIMCAT and others will be well-suited for testing threat analysis and fire commands. Again, these are unfortunately not available at this time.

Paper and Pencil and Slides. The ARI Field Unit-Ft Knox has developed a training package which is appropriate for testing fire commands and threat analysis (Simpson, McCallum, McIntyre, Casey, Fuller, 1984). Converting these materials should require only minor modification. These materials show a picture of a scene with the TC's tank in the foreground along with threat vehicles. He is then presented the following.

THE SITUATION

Scenario No. 18

- o You are attacking and have penetrated the outer ring of enemy defenses.
- o Your Laser Rangefinder has failed.
- o Round loaded is HEAT.
- o A T-72 approaches your direct front, range 1,000 meters. It has seen you.
- o Off to your right, at a range of about 900 meters, you see a 122-mm self-propelled howitzer. It does not see you.

QUESTIONS

1. Which target is the MOST DANGEROUS threat?
2. Under the circumstances, what is the most appropriate initial fire command?

These questions would be presented on slides using a projector coupled to a timer. The test could then measure both accuracy and latency. A scoring scheme would need to be developed to handle partially correct responses. For example, correctly calling the alert may be weighted less than calling for the correct ammunition or properly identifying the most dangerous threat vehicle.

This process could be adapted for video where the time would begin when the threat vehicles come into sight.

4. Respond to Specific Fire Control System Failure/Degraded Gunnery.

Paper and Pencil. Kraemer (1984) has developed a series of training booklets which include a number of multiple-choice questions about degraded gunnery. As just described, converting the questions to slides would make it possible to get latency measures for the various scenarios.

Training Devices. Some of the previously mentioned gunnery trainers including the U-COFT will have the capability to train and test in degraded gunnery modes.

Another possible testing technique is described by Biers and Sauer (1982). They developed a procedure by which soldiers performed computer control panel operations using a computer generated image of an M1 computer control panel. This simulated equipment is displayed on an Apple Video Monitor.

Maintenance.

1. Troubleshoot engine and transmission
2. Troubleshoot fire control and electrical system
3. Troubleshoot TC indicator/warning lights
4. Supervise and perform before and after Preventive Maintenance Checks and Services (PMCS)

These tasks will be discussed together in that the procedures for each are essentially the same. In each situation, the TC is required to determine the symptoms for that particular system. He then must perform the troubleshooting and maintenance procedures given for those symptoms in the "-10" Operator's Manuals for the M1 tank. The next step involves correctly reporting any malfunctions that cannot be corrected at the crew level to organizational maintenance on DA Form 2404.

Paper and Pencil. The symptom is described to the TC and he must follow the branching procedures described in the TM to locate the proper action. The test should require him to note the page and paragraph number which identifies the correct response and then when appropriate he should fill out DA Form 2404. The scoring should be based on identifying the correct paragraph and also on properly filling out DA Form 2404. Without even considering the results of the task analysis, it is well known that this procedure is highly critical and also too frequently failed and/or ignored.

Slides. These could be used to show a series of operational and faulty equipment, electrical connections or procedures. Slides could also show which indicator/warning lights were on or off. The same procedure of paragraph identification and form completion should be used. For additional realism and for finer discrimination, an audio tape of the equipment sounds might be played along with the slide. This process might better be handled with videotape.

Training Devices. Several training devices are available to evaluate maintenance procedures. The same testing procedures should again be used. For the electrical system, certain faults can be induced on the Turret Organizational Maintenance Trainer (TOMT). Various engine and transmission malfunctions can likewise be induced on the recently fielded M1 AGT 1500 Turbine Engine TRU-SH Trainer. Also, TASC has available a mock-up of the indicator and warning lights.

Actual Equipment. This same procedure can, of course, be performed on the actual tank. There is, however, a limit to the number of faults which can easily and safely be induced.

NBC.

1. Prepare and Submit NBC-4 Reports. This is technically a skill level 4 task but it is included in the 19K BNCOC course. The task consists of preparing an NBC-4 report which gives radiation dose-rate measurements in a standard format.

Paper and Pencil. The soldier is given the time of day, a 6-digit location coordinate and the reading from an IM-174 radiacmeter. He must from this information prepare the report and submit it according to a fixed NBC format. A test of this nature is currently given in BNCOC. It is recommended that the test should be made more demanding by including additional information in the scenario beyond what is required.

Training Devices. It is possible to induce readings on the IM-174 radiacmeter. This could therefore be easily added to the procedure.

2. Operate and Supervise the Personnel Decontamination System. This requires the TC to use the M258A1 decontamination (DECON) kit or the M13 or M258 DECON kits to decontaminate skin, face eyes, and personal equipment.

Paper and Pencil. The TC would be asked questions about how and when to use the equipment.

Slides/Video. A decontamination sequence could be shown with the TC indicating what is correct or incorrect.

Actual Equipment. The TC could actually be given the DECON kits, and be asked to properly use them. This technique would require that a scoring checklist be developed. As with other tests using actual equipment, this would require a considerable amount of time to administer.

3. Implement MOPP and Later Initiate Unmasking.

This set of tasks requires the TC to know the proper procedures for the wearing of MOPP gear at the various levels. He must also know the procedures for initiating unmasking both when he does and does not have a chemical agent detector kit available.

Actual Equipment. Given the serious nature of implementing MOPP, the TC should be given a timed test for properly putting on his MOPP gear. This should be used in conjunction with a Paper and Pencil Test which tests procedural knowledge.

Slides/Video. As described before, the TC could be shown the procedures and asked to indicate what is correct or incorrect and why.

4. Operate and Maintain the Automatic Chemical Agent Alarm System.

The TC must follow a rather lengthy procedure described in the TM to put the alarm system into operation, and another procedure for servicing the equipment.

Paper and Pencil. The TC should be given a timed test on the various procedures with the TM as an aid.

Slides/Video. The procedural sequence could be shown with the TC having to indicate what is correct and incorrect and why.

Actual Equipment. It would, of course, be possible to have the TC actually carry out the procedures on the alarm system. This would most likely take more time than is worth.

5. Prepare a Simplified Fallout/Rainout Prediction.

This procedure estimates the location of potential nuclear hazards prior to the NBC-3 report.

Paper and Pencil. Given nuclear burst information, a current effective downwind message, and a simplified fallout predictor job aid, the TC must derive a prediction.

Tactics.

1. Call For/Adjust Indirect Fire.

This task received the highest rating in the Attributable Risk analysis. Also, the diagnostic test given for this task in 19E/K BNCOC at Ft Knox is the most frequently failed with a pass rate of less than 5% for FY84. The Army standard requires that an initial request for fire be made within 3 minutes after the target has been designated and that adjustments be made within 30 seconds after each round impacts. The observer must achieve effect within five adjustments and be within 50 meters of the target.

Paper and Pencil. The BNCOC diagnostic test presents the soldier with a grid map and a scenario giving grid coordinates and call signs. The soldier must use a protractor to calculate direction in mils to the target and then write the initial call-for-fire. The testee is then shown a series of figures as in Figure 1 from which adjustments must be made.

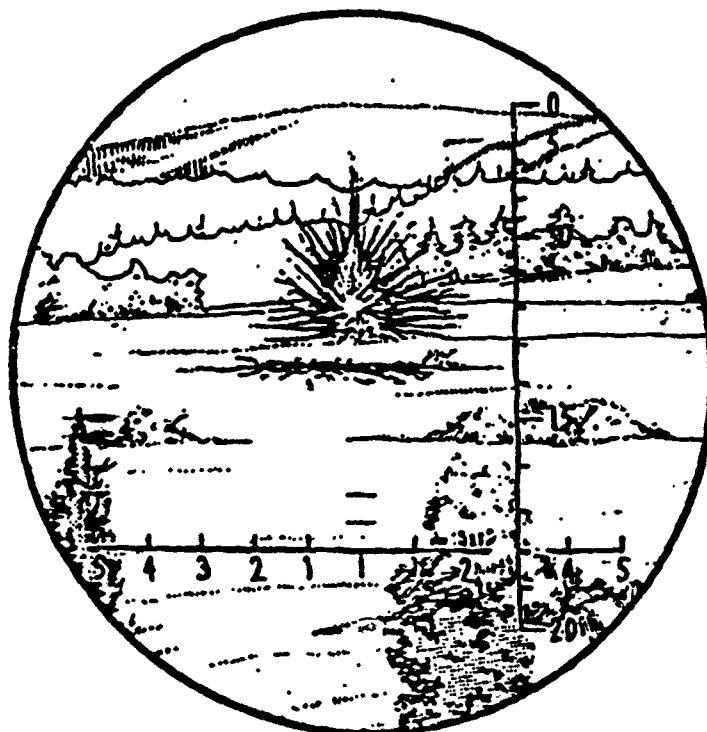


Figure 1. Artwork used in BNCOC Call-for-fire test

This same type of still artwork was used in Wicat's call-for-fire video-disc and similarly could be presented on slides.

Training Devices. Several training devices are either currently available or soon will be for testing call-for-fire. The Training Set, Fire Observation (TSFO) is an electromechanical training device which employs computer driven optics to simulate field artillery fire on a projected terrain scene. While this device does deliver realistic times of flight, flash to bang time, and fuze and smoke simulation, the device is better suited for training than widespread testing applications. It requires a rather large classroom specially modified for the TSFO and also requires some familiarity with the system before valid evaluation can occur.

Terrain boards can also be used for evaluating call-for-fire. Bessemer (1984) at ARI-Ft Knox has developed a Training Exercise (TRAX) using the Dunn-Kempf Terrain Board which includes call-for-fire procedures. In addition, SIMCAT will include call-for-fire sequences.

2. Supervise an Assault Breach of a Minefield/Report Locations and Lanes Through a Minefield.

In that this task is primarily based on job knowledge, a paper and pencil test evaluating the procedural steps is appropriate. The TC could also

be shown a slide sequence or video demonstrating the procedures. As for training devices, a terrain board might be used.

3. Select River Crossing Sites.
4. Analyze and Utilize Terrain.
5. Plan Troop Movement and Attack.

These will be discussed together in that they each involve assessing and making use of critical terrain features from a map and the field.

Paper and Pencil. The soldier would be given a series of military terrain maps with several points designated by the letters, A, B, C, and D, etc. For each set of several maps there would be a scenario giving information about the Mission, Enemy, Terrain, Troops, and Time Requirements (METT-T). The soldier would have to select the locations and answer questions concerning the five military aspects of terrain. For example, given the scenario which point on the map would be the most likely avenue of approach for a threat Mechanized Infantry Battalion, or which is the best river crossing site.

Slides. A similar procedure might be used where several slides are shown and the soldier would have to select the visual scene providing the best Observation and Fire, Concealment and Cover, Obstacles, Key Terrain, or Avenues of Approach (OCOKA).

Videodiscs. One application of videodiscs being developed is that of "surrogate travel." By moving a joystick, a person is able to control a simulated sequence which lets him look around or move in various directions. HumRRO (Ramsberger, Sticha, Knerr, Elder, Rossenblatt, Pariss, Wagner & Leopold, 1984) has produced a videodisc in which a soldier can visually scan 180 degrees by moving a joystick. Accompanying each scene is a corresponding contour map with several designated points. The soldier must look around, decide where he is, and then choose the correct reference point on the map. This surrogate travel approach would be quite appropriate for training and testing the tasks being discussed here. For example, the soldier could move up and down a river in search of a river crossing site. These videodiscs would, however, have to be developed.

Training Devices. These tasks are also appropriate for testing on a terrain board. The TRAX program being developed includes several tactical troop movement scenarios, and integrates terrain analysis with communications and simulated firing. Terrain boards usually give a "birds-eye" view of the battlefield, but it is possible to restrict the view to near line of sight by using limited view sight tubes. A scoring scheme would have to be developed if terrain boards are to be used for testing.

Actual Equipment. While expensive it is possible to use actual tanks or other motorized vehicles in the field. BNCOC has recently tried out such a mounted land navigation exercise.

Land Navigation.

1. Locate an unknown point on a map by intersection and resection.

2. Determine degree of slope, distance and line of sight from a map.

These tasks require by definition a paper and pencil test using a map. Latency could also be used as a measure in addition to accuracy.

3. Prepare and Use a Map Overlay.

This requires drawing graphic information on the overlay and also knowing and using military graphic symbols.

Paper and Pencil. Given a map and an Operations or Frag order, the soldier would have to draw the map. The map would be scored for accuracy and completeness. Slides could be used to present map overlays with the symbols and the soldiers could be asked for their meaning. To assess the use of overlays, surrogate travel videodisc, training devices such as a terrain board or traveling in actual equipment might be used.

4. Select a Movement or Withdrawal Route Using a Map.

This is essentially the same as the latter tasks discussed under tactics.

Communication.

1. Recognize Electronic Counter Measures (ECM) and Implement Electronic Counter-Countermeasures.

Paper and Pencil. A multiple choice test for this task is included in the BNCOC POI. In addition, the BNCOC test requires the soldier to identify the various types of jamming by listening to audio tapes.

Actual Equipment. The soldier could be required to demonstrate the anti-jamming procedures on an actual radio. This might be done in conjunction with the next set of tasks.

2. Use Automated Communications-Electronics Operation Instructions (CEOI).
3. Encode and Decode Messages Using the KTC 600D Tactical Operations Code.
4. Use the KTC 1400D Numerical Cipher/Authentication System.

Paper and Pencil. Given an automated CEOI, a KTC 600D operations code extract, a KTC 1400D cipher/authentication system extract, a time period, his unit designation, the designation of the unit to be contacted, a message to be coded and uncoded, the soldier will follow the prescribed procedure. A criterion scoring checklist is provided in the BNCOC POI.

Actual Equipment. As mentioned above, an actual radio may be used as part of this requirement. The scoring should be based both on accuracy and time to complete the task.

5. Decide Whether or Not to Break Listening Silence.

Paper and Pencil. A series of scenarios would have to be developed which specify the necessary information to make a decision. The TC would

then be asked what to do in the various situations. Alternatively, the TC could be directly questioned about security principles.

Training Devices. This might be tested as part of terrain board exercises. If terrain boards were to be used, several tasks should be combined together into a scenario.

APPENDIX D
TASKS SELECTED FOR TESTING
BASED ON CRITICALITY RATINGS

Note: Unless specifically designated, the task was selected as being highly critical in both the present (ARI) and HumRRO studies.

Target Engagement

1. Boresight main gun
2. Direct Main gun engagements
3. Set headspace and timing, test firing mechanism and clear cal .50 machinegun
4. Perform Prepare-To-Fire checks
5. Detect & identify targets
6. Respond to specific fire control system failures (ARI)
7. Prepare Commander's Weapon Station for operation (HumRRO)
8. Issue a fire command (HumRRO)

Maintenance

1. Supervise and/or perform before and after operations Preventive Maintenance Checks and Services (PMCS) for the M1 tank
2. Supervise and/or perform before and after operations Preventive Maintenance Checks and Services (PMCS) on the Commander's Weapon Station
3. Troubleshoot the fire control system (ARI)
4. Troubleshoot the engine and transmission (ARI)
5. Troubleshoot the M1 tank using driver's control panel warning and caution lights (ARI)
6. Perform during operations checks and services (ARI)

NBC

1. Prepare for an NBC attack
2. Implement MOPP and later initiate unmasking
3. Conduct partial decontamination
4. Decontaminate skin, clothing & equipment (ARI)
5. Recognize, react, and give the alarm for a chemical or biological hazard (ARI)

6. Operate the automatic chemical agent alarm system (ARI)

Tactics

1. Call for/adjust indirect or aerial fire
2. Select firing positions/defensive positions/fields of fire
3. Direct evasion on enemy anti-tank guided missiles
4. Conduct mounted tactical movements
5. Prepare a Situation Report (SITREP) (HumRRO & highest rated task in security & intelligence category)
6. Know tactical principles and methods of advance and attack (ARI)

Land Navigation

1. Navigate from one point on the ground to another point
2. Determine location on the ground by terrain association
3. Identify terrain features, and conventional and military symbols on a map
4. Prepare and use a map overlay (ARI)
5. Maintain orientation in a moving tank (ARI)
6. Orient a map on the ground by terrain association (HumRRO)

Communication

1. Use automated Communications Electronics Operation Instructions (CEOI)
2. Use KTC 1400D numerical cipher/authentication system
3. Encode and decode messages using the KTC 600D tactical operations code
4. Decide whether or not to break listening silence
5. Recognize Electronic Countermeasures and implement Electronic Counter-Countermeasures (ARI)
6. Enter or leave a radio net (HumRRO)

First Aid

1. Recognize and give first aid to a nerve/blood/blister agent casualty (ARI)
2. Give first aid for burns (HumRRO)

APPENDIX E
BEHAVIORAL STATEMENT QUESTIONNAIRE
DEVELOPMENT OF A TC CHECKLIST

For each of the following qualities or characteristics, please give an example of a TC's Behavior which demonstrates High, Acceptable, and Low performance of that quality or category.

For example:

Training

Good trainer: When a crewman has a question about a procedure on the tank, the TC helps him without making the crewman feel stupid or that he is bothering the TC.

Adequate trainer: The TC conducts crew drills to completion but without focus or enthusiasm.

Poor trainer: The TC humiliates or embarrasses members of the crew during training.

Attitude

Positive Attitude:

Adequate Attitude:

Negative Attitude:

Counsels Crew

Good Counselor:

Adequate Counselor:

Poor Counselor:

Supply Accountability

Good:

Adequate:

Poor:

Motivation

Good Motivator:

Adequate Motivator:

Poor Motivator:

Time Assets

Makes Good Use of Time:

Adequate Use of Time:

Poor Use of Time:

Concern for Crew

Show much concern for crew:

Shows some concern for crew:

Shows little concern for crew:

Intelligence

High:

Adequate:

Low:

Leadership

= Good Leader:

Adequate Leader:

Poor Leader:

Communication skills

• Good Communication skills:

Adequate Communication skills:

Poor Communication skills:

Achievement Motivation

High achievement orientation:

Moderate achievement orientation:

Low achievement orientation:

Morale

Promotes high morale:

Promotes fair morale:

Promotes poor morale:

Problem-Solving

Good problem solver:

Adequate problem solver:

Poor problem solver:

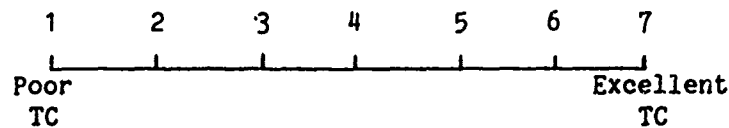
Training

Good trainer:

Adequate trainer:

Poor trainer:

APPENDIX F
MEAN RATINGS OF THE BEHAVIORAL ANCHORS



A. Achievement Orientation: The ability and desire to successfully accomplish a task.

- 1.8 1. This TC could be expected to not really care if he succeeds or fails a mission.
- 6.2 2. This TC could be expected to keep distractions in perspective and to accomplish the goal.
- 5.9 3. This TC could be expected not to balk when he receives a mission.
- 2.6 4. This TC could be expected to work hard at the beginning of a mission, but to slow down and quit trying before completion.
- 3.4 5. This TC could be expected to perform as required without doing any more than is required.
- 2.0 6. This TC could be expected to show little or no initiative.
- 1.7 7. This TC could be expected to frequently fail missions.
- 3.6 8. This TC could be expected to accomplish a mission with little innovation and achieve "just passing" results.
- 6.2 9. Even with less than necessary time and materials, this TC could be expected to accomplish his mission.
- 6.3 10. This TC could be expected to continually monitor his personal progress toward goals.
- 6.3 11. This TC could be expected to set high goals for himself and his crew.
- 6.0 12. This TC could be expected to focus on the mission at hand and to accomplish it.
- 6.5 13. This TC could be expected to focus on the completion of a mission as the major priority, but accomplish other tasks at the same time.
- 6.3 14. This TC could be expected to modify long term goals when appropriate.
- 5.4 15. This TC could be expected to receive awards for above average performance.
- 3.4 16. This TC could be expected to accomplish no more than is expected.
- 1.8 17. This TC could be expected to show little indication of wanting to succeed.

B. Leadership Skills: The ability of the TC to motivate his crew to good performance.

- 2.5 1. This TC could be expected to behave as if all he is paid for is supervision.
- 2.0 2. This TC could be expected to repeatedly have subordinates who desire to change crews.
- 1.3 3. During training, this TC could be expected to talk down to or belittle subordinates.
- 6.2 4. This TC could be expected to talk to crew members about their importance to mission accomplishment.
- 1.6 5. This TC could be expected to let his low morale negatively influence the unit.
- 6.4 6. This TC could be expected to promote individual initiative in his subordinates.
- 6.0 7. This TC could be expected to always reward good performance of his crew.
- 5.2 8. This TC could be expected to usually reward good performance.
- 3.2 9. This TC could be expected to stand around and tell everyone what to do.
- 6.6 10. This TC could be expected to encourage his crew to achieve progressively tougher standards.
- 6.2 11. This TC could be expected to get his crew motivated.
- 2.6 12. This TC could be expected to always punish poor performance but rarely reward good performance.
- 6.3 13. Simply on his word this TC could be expected to get his unit to enthusiastically perform any mission.
- 6.3 14. This TC could be expected to lead by example.
- 3.7 15. This TC could be expected to neither belittle nor encourage his crew.
- 5.9 16. This TC could be expected to reward good performance and punish poor performance.
- 6.4 17. This TC could be expected to be highly respected by his crew.

C. Promoting Unit Morale: The ability to instill confidence, courage, and high spirits in himself and his peers.

- 1.5 1. This TC could be expected to show poor morale and say he does not care.
- 2.0 2. This TC could be expected to have a crew that does not enjoy working for him.
- 6.2 3. This TC could be expected to always show high morale himself.
- 6.3 4. This TC could be expected to always be trying to lift the morale of his unit.
- 3.4 5. This TC could be expected to talk about wanting good morale in the unit but not doing much to promote it.
- 5.3 6. This TC could be expected to keep morale up most of the time.
- 2.5 7. This TC could be expected to have crewmembers who are dissatisfied with their assignment.
- 2.3 8. This TC could be expected to have crewmembers who do not want to be associated with their TC.
- 6.3 9. This TC could be expected to make crewmembers feel important.
- 4.0 10. This TC could be expected to inhibit individual gratification of spiritual, social, and intellectual pursuit.
- 6.3 11. By training his crew to be technically and tactically proficient, this TC could be expected to instill a feeling of security in his crew.
- 5.7 12. This TC could be expected to solve morale crises as they arise.
- 6.3 13. This TC could be expected to ensure that his soldiers' spiritual, social, and intellectual pursuits are supported and enhanced.
- 2.5 14. This TC could be expected to not really try to make the crew feel important.
- 5.8 15. This TC could be expected to have a crew who enjoys working for him.
- 6.3 16. By emphasizing their good work, this TC could be expected to always instill a feeling of accomplishment in his crew.

D. Counseling Skills: The ability to provide appropriate information in personal and professional areas.

- 6.3 1. This TC could be expected to counsel frequently for both positive and negative performance.
- 4.2 2. This TC could be expected to sometimes give criticism which is not constructive.
- 6.2 3. This TC could be expected to counsel his crew in all aspects of their behavior.
- 3.7 4. This TC could be expected to counsel only as frequently as required.
- 6.0 5. This TC could be expected during counseling to make his crew feel as comfortable as possible.
- 6.4 6. This TC could be expected to counsel each crew member both formally and informally on a regular basis.
- 3.9 7. This TC could be expected to counsel only job related aspects of the crewmans' behavior.
- 6.2 8. This TC while counseling could be expected to quickly identify and discuss the real issue.
- 2.7 9. This TC could be expected to counsel only negative behaviors.
- 6.4 10. This TC could be expected to help his crew with personal problems as well as military problems.
- 2.8 11. This TC could be expected to counsel only on an irregular basis.
- 2.4 12. This TC could be expected when dealing with personal issues to avoid discussing the problem.
- 6.3 13. This TC could be expected to find time to listen to his men's problems.
- 1.2 14. This TC could be expected not to counsel his crew at all.
- 5.6 15. This TC could be expected to give constructive criticism.
- 1.9 16. This TC could be expected to counsel in a degrading manner.

E. Problem Solving: The ability to identify a problem and find a workable solution.

- 2.3 1. When a symptom in the tank indicates maintenance is needed, this TC could be expected to have difficulty identifying the problem.
- 5.9 2. This TC could be expected to identify the cause of a variety of problems.
- 1.3 3. This TC could be expected to not even try to solve problems, but just ignore them.
- 2.8 4. This TC could be expected to get a problem solved, but not to do much to prevent it from happening again.
- 5.0 5. While not always successful, this TC could be expected to at least try to solve all appropriate problems.
- 6.3 6. This TC could be expected to always solve problems if possible and then take actions to insure the problems do not happen again.
- 6.2 7. This TC could be expected to be able to recognize a training problem and then implement a solution.
- 3.7 8. When a problem arises, this TC could be expected to have trouble in gathering the appropriate supporting facts and then identifying alternatives.
- 6.1 9. This TC could be expected to try to find out information when he does not know something.
- 3.3 10. This TC could be expected to have difficulty determining the solution to problems.
- 3.7 11. This TC could be expected to have some trouble choosing the best course of action.
- 6.3 12. This TC could be expected to show a lot initiative in problem solving.
- 6.4 13. This TC could be expected to identify problems in a reasonable amount of time, usually gather all of the facts, produce at least 2 courses of action and then choose the best course of action.
- 6.0 14. This TC could be expected to solicit solutions to problems from outsiders or crewmembers.
- 6.5 15. This TC could be expected to identify problems quickly, gather all of the relevant facts, produce several viable alternatives and then chose the best course of action quickly.

F. Communication Skills: The ability to produce and understand written and oral messages.

- 5.6 1. This TC could be expected to talk to his crew and have them understand what he is saying.
- 5.7 2. This TC could be expected to have little or no difficulty with oral presentations.
- 2.2 3. This TC could be expected to talk to his crew and not have everyone understand.
- 6.3 4. This TC could be expected to communicate clearly and concisely in both oral and written communications.
- 6.0 5. This TC could be expected to write good EERs.
- 5.4 6. This TC could be expected to read and write adequately.
- 5.2 7. This TC could be expected to be an adequate listener.
- 2.7 8. This TC could be expected to often have difficulty verbalizing or writing his ideas.
- 4.6 9. This TC could be expected to be able to get most everyone to understand him.
- 6.1 10. This TC could be expected to give instructions which are complete, thorough and understood by all crewmen.
- 5.0 11. This TC could be expected to write EERs which require minor corrections by superiors.
- 6.1 12. This TC could be expected to be fluent with spoken and written language.
- 2.0 13. This TC could be expected to cause confusion and misunderstanding during instruction.
- 2.7 14. This TC could be expected to have difficulty with most written correspondences.
- 6.2 15. This TC could be expected to be a good listener to superiors and subordinates.
- 6.1 16. This TC could be expected to be able to communicate to those above and below him.

G. Use of Time: The ability to make constructive use of one's own, and others' time.

- 5.9 1. This TC could be expected to not waste his subordinates' time.
- 2.6 2. This TC could be expected to fail to accomplish a training mission in the time allotted.
- 3.4 3. This TC could be expected to bypass necessary steps to save time.
- 5.5 4. This TC could be expected to be innovative in the use of time.
- 2.4 5. This TC could be expected to be consistantly late with suspenses.
- 2.5 6. This TC could be expected to frequently not use available time for training.
- 5.8 7. This TC could be expected to organize his use of time by-setting goals.
- 5.7 8. This TC could be expected to most always have extra time for that one additional training mission.
- 5.5 9. This TC could be expected to spend enough time on instruction to accomplish the mission.
- 6.2 10. This TC could be expected to complete whatever he is doing in a minimum amount of time.
- 5.8 11. This TC could be expected to accomplish his mission with time to spare.
- 4.4 12. This TC could be expected to complete tasks mostly in the required time, but occasionally needing more time.
- 1.8 13. This TC could be expected to almost never get things done on time.
- 1.4 14. This TC could be expected to waste time and then require work to be performed after duty hours.
- 1.4 15. This TC could be expected to waste soldiers' time by goofing off.
- 3.4 16. This TC could be expected to not waste soldier's time but maybe rush through instruction.
- 2.2 17. This TC could be expected to keep giving excuses that he does not have time to help his crew with their problems.

H. Supply Accountability: The ability to acquire and retain equipment without needless loss.

- 5.7 1. This TC could be expected to accomplish inventories in a timely and accurate fashion.
- 5.5 2. This TC could be expected to conduct inventories in accordance with AR 710-2.
- 2.3 3. This TC could be expected to fail to maintain an accurate inventory.
- 5.5 4. This TC could be expected to insure his crew is responsible for all of the items they are signed for.
- 3.0 5. This TC could be expected to have quite a bit of excess on hand.
- 5.7 6. This TC could be expected to follow through on repair or replacement of all unservicable items.
- 2.0 7. This TC could be expected to have quite a few reports of survey.
- 1.7 8. This TC could be expected to almost never have the proper equipment on hand.
- 5.7 9. This TC could be expected to insure his crew has all of the items they need.
- 5.4 10. This TC could be expected to have sufficient equipment to effect mission accomplishment.
- 6.0 11. This TC could be expected to ensure his crew has enough supplies and training to survive.
- 6.0 12. This TC could be expected to report losses promptly and accurately.
- 5.6 13. This TC could be expected to ensure property is hand receipted to user level.
- 5.6 14. This TC could be expected to have property accounted for.
- 5.7 15. This TC could be expected to maintain monthly inventories.
- 5.1 16. This TC could be expected to conduct inventories on a regular basis.

I. Training: The ability to evaluate, create, and conduct formal or informal instruction which produces crew proficiency.

- 1.8 1. This TC could be expected to not train properly.
- 5.4 2. This TC could be expected to maintain crew proficiency by conducting some crew drills on a continuous basis.
- 5.8 3. This TC could be expected to integrate new crew members as soon as possible.
- 2.5 4. This TC could not be expected to be able to effectively identify the training needs of his crew.
- 6.2 5. This TC could be expected to make crew members cross-train on different positions in the tank.
- 2.9 6. This TC could be expected to wait for gunnery training to develop crew proficiency.
- 5.6 7. This TC could be expected to use the soldier's manual as a training tool.
- 6.5 8. This TC could be expected to train each crewmember to the utmost of his ability.
- 6.4 9. This TC could be expected to take the time needed to insure his crew is well trained.
- 5.0 10. This TC could be expected to identify some crew training needs.
- 5.8 11. This TC could be expected to identify the training needs of his subordinates.
- 3.8 12. This TC could be expected to rely on the soldier's manual and usually tells his subordinates to "read it".
- 5.3 13. This TC could be expected to use the soldier's manual standards.
- 3.6 14. This TC could be expected to orient new crew members quickly but not to practice crew drills until the gunnery training cycle.
- 5.9 15. This TC could be expected to frequently conduct training during available time and "in the cracks".
- 2.0 16. This TC could be expected to tell his crew how to do something but not to show them.

J. Intelligence: Having knowledge and the common sense to apply it.

- 3.2 1. This TC could be expected to have some trouble dealing with new concepts and their application.
- 5.4 2. This TC could be expected to be enrolled in correspondence courses.
- 5.9 3. This TC could be expected to quickly grasp new concepts.
- 2.0 4. This TC could be expected to primarily read comic books.
- 5.9 5. This TC could be expected to be working on furthuring his education.
- 5.4 6. This TC could be expected to have ~~little~~ trouble in the practical applications of his knowledge.
- 6.3 7. This TC could be expected to show a superior ability to apply knowledge in a practical situation.
- 5.2 8. This TC could be expected to grasp new concepts in a reasonable amount of time.
- 5.0 9. This TC could be expected to know a little of everything.
- 2.6 10. This TC could be expected to not really know everything he is trying to train.
- 5.6 11. This TC could be expected to have good knowledge about his job.
- 6.2 12. This TC could be expected to max his SQT.
- 6.0 13. This TC could be expected to be well read.
- 5.2 14. This TC could be expected to pass his SQT.
- 1.9 15. This TC could be expected to fail his SQT.
- 6.0 16. This TC could be expected to not only be able to do his job, but to also understand how and why everything is done.

K. Concern for Crew: The ability to take care of the needs of his crew.

- 6.1 1. This TC could be expected to take time to listen to his crews' problems.
- 5.8 2. This TC could be expected to make his crew feel as comfortable as possible.
- 2.5 3. This TC could be expected to not worry about his crew.
- 2.8 4. This TC could be expected to avoid spending time with his crew after duty hours.
- 1.7 5. This TC could be expected to not care much about what happens to his crew.
- 6.2 6. This TC could be expected to frequently discuss technical, professional, and social problems with his crew.
- 5.6 7. This TC could be expected to usually set his crew at ease during training and counseling.
- 2.6 8. This TC could be expected to avoid helping his crew when they need it.
- 2.5 9. This TC could be expected to allow his crews' personal and intellectual growth to stagnate.
- 5.8 10. This TC could be expected to be personally concerned about his crew and their problems.
- 4.4 11. This TC could be expected to take care of his crew when they need it, but generally needs to be around more.
- 5.9 12. This TC could be expected to know each crew member well.
- 1.9 13. This TC could be expected to shrug off his crew's problems without concern.
- 6.1 14. This TC could be expected to motivate his crew to solve their own problems with help if necessary.
- 5.5 15. This TC could be expected to ensure that crewman do not embarrass themselves with their actions.
- 6.4 16. This TC could be expected to make his crew feel that he is always ready to help.

L. Personal Attitude of the TC: The degree of self-discipline and motivation displayed in the absence of direct supervision.

- 6.0 1. This TC could be expected to demonstrate an energetic approach to mission accomplishment.
- 2.8 2. This TC could be expected to require continual prodding even for the most basic missions.
- 2.2 3. When given any task to complete, this TC could be expected to express displeasure.
- 5.8 4. This TC could be expected to be energetic with a positive attitude.
- 5.6 5. This TC could be expected to believe he can do any mission.
- 2.0 6. This TC could be expected to usually have a positive attitude.
- 2.2 7. This TC could be expected to constantly complain about required tasks.
- 5.5 8. This TC could be expected to have a good sense of humor.
- 2.0 9. This TC could be expected to make negative comments about the chain of command to his subordinates.
- 2.4 10. This TC could be expected to have no sense of humor.
- 1.8 11. This TC could be expected to frequently criticize the chain of command.
- 2.0 12. This TC could be expected to have a general negative attitude.
- 6.0 13. Even when things are not going well, this TC could be expected to keep his head up.
- 5.6 14. This TC could be expected to demonstrate a good sense of humor.
- 6.3 15. This TC could be expected to try his best at everything he does.
- 2.8 16. This TC could be expected to believe his way is the only way.
- 4.8 17. This TC could be expected to never complain.

APPENDIX G

12 BEHAVIORALLY-ANCHORED RATING SCALES

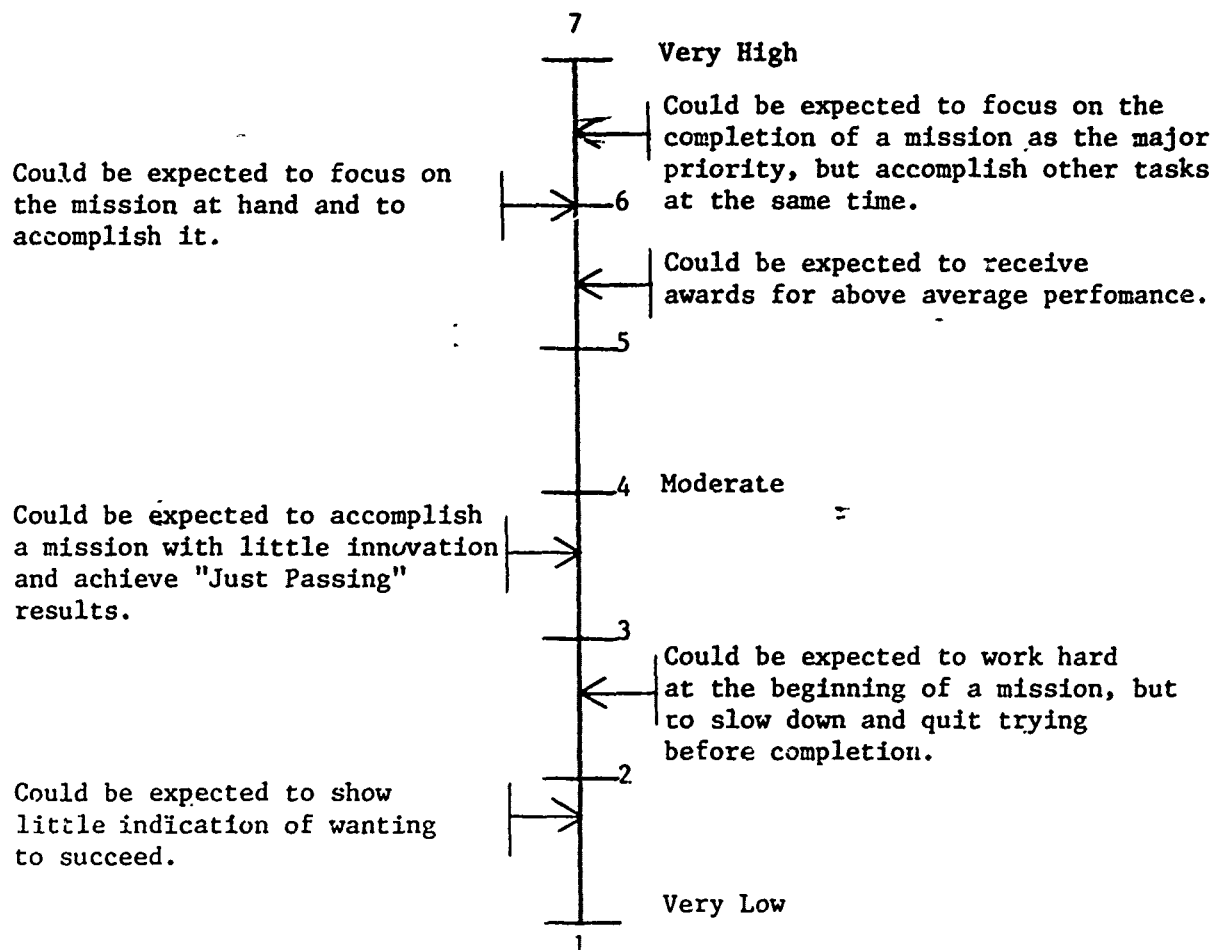
INSTRUCTIONS.

For each of the following Behaviorally Anchored Rating Scales, you are to rate the TC on the dimension named and described at the top of each page. By reading the anchors on each scale, you should be able to get a good idea of what each scale is measuring. You should also be able to get a good idea as to what each scale value, e.g., "5", represents. The anchors are not intended to indicate that a TC has specifically performed a certain task, but that in your opinion he "could be expected" to perform at that level of the scale.

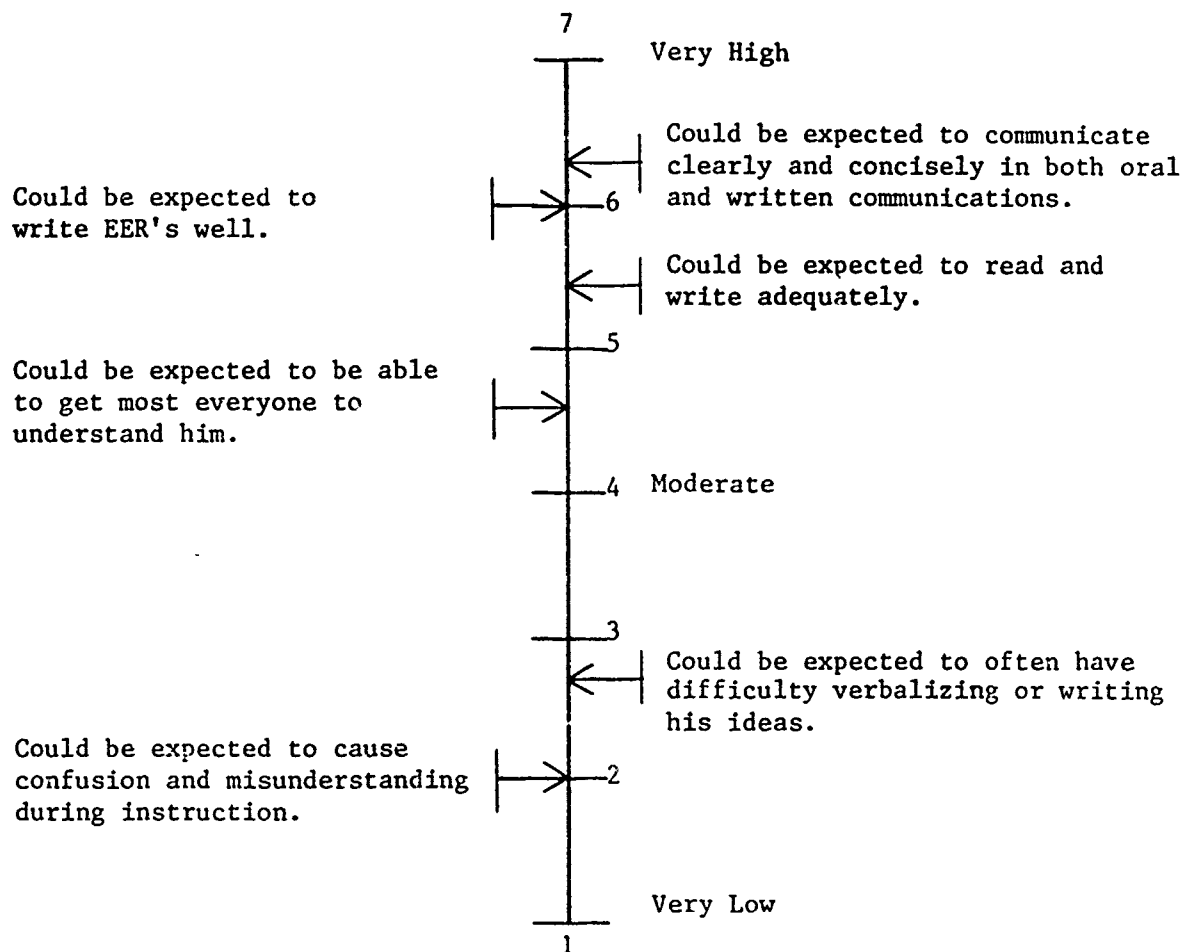
Please then read the dimension description at the top of each page along with the various behavioral anchors. For each of the separate scales, circle the numeral (1-7) that best represents the TC's level of performance for that dimension.

7

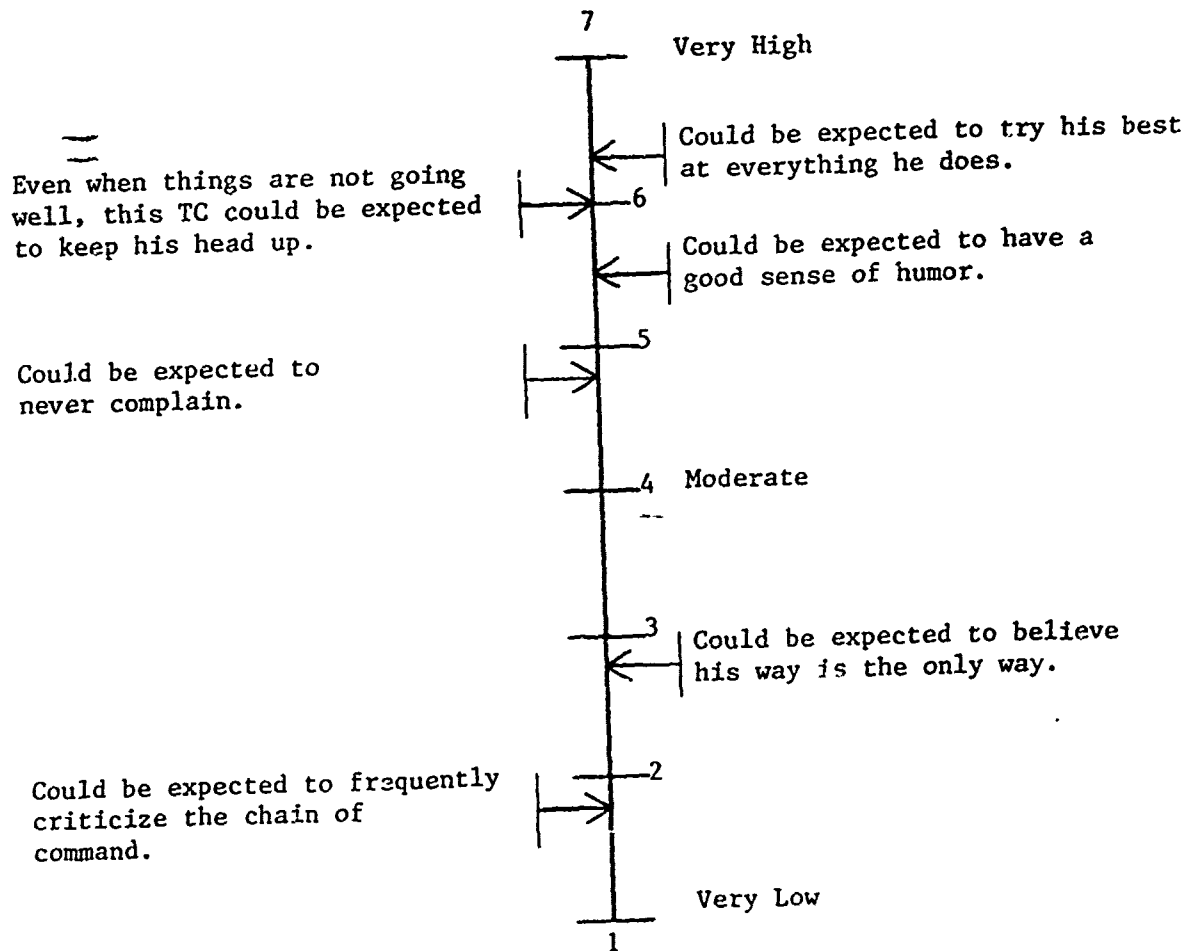
ACHIEVEMENT ORIENTATION: THE ABILITY AND DESIRE TO SUCCESSFULLY ACCOMPLISH A TASK.



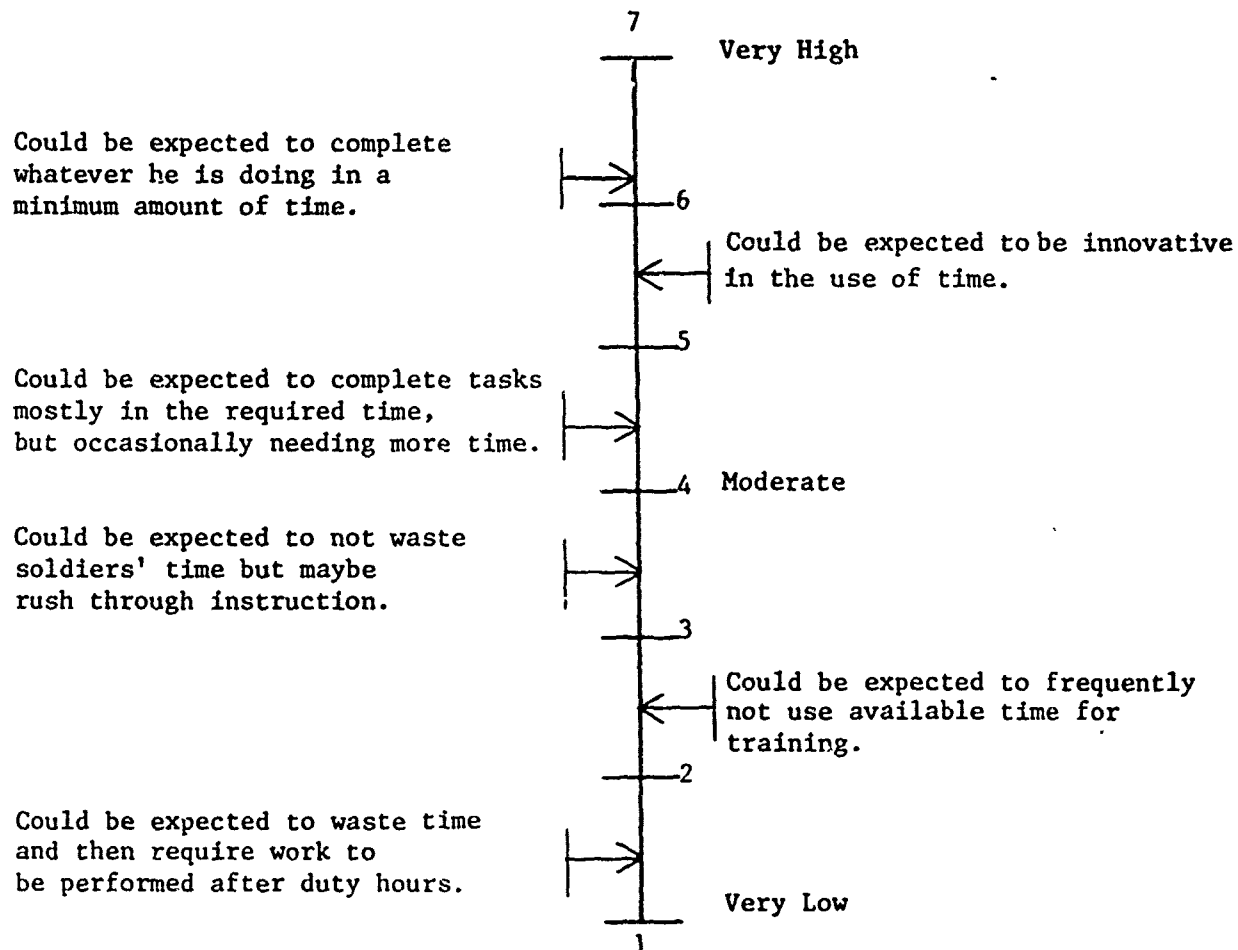
COMMUNICATION SKILLS: THE ABILITY TO PRODUCE AND
UNDERSTAND WRITTEN AND ORAL MESSAGES.



PERSONAL ATTITUDE: THE DEGREE OF SELF-DISCIPLINE
AND MOTIVATION DISPLAYED IN THE ABSENCE OF
DIRECT SUPERVISION.



USE OF TIME: THE ABILITY TO MAKE CONSTRUCTIVE
USE OF ONE'S OWN AND OTHERS' TIME.



PROBLEM SOLVING: THE ABILITY TO IDENTIFY A
PROBLEM AND FIND A WORKABLE SOLUTION.

Could be expected to identify problems quickly, gather all the relevant facts, produce several viable alternatives, and then choose the best course of action quickly.

7 Very High

Could be expected to recognize a training problem and then implement a solution.

While not always successful, this TC could be expected to at least try to solve all appropriate problems.

Could be expected to have some trouble choosing the best course of action.

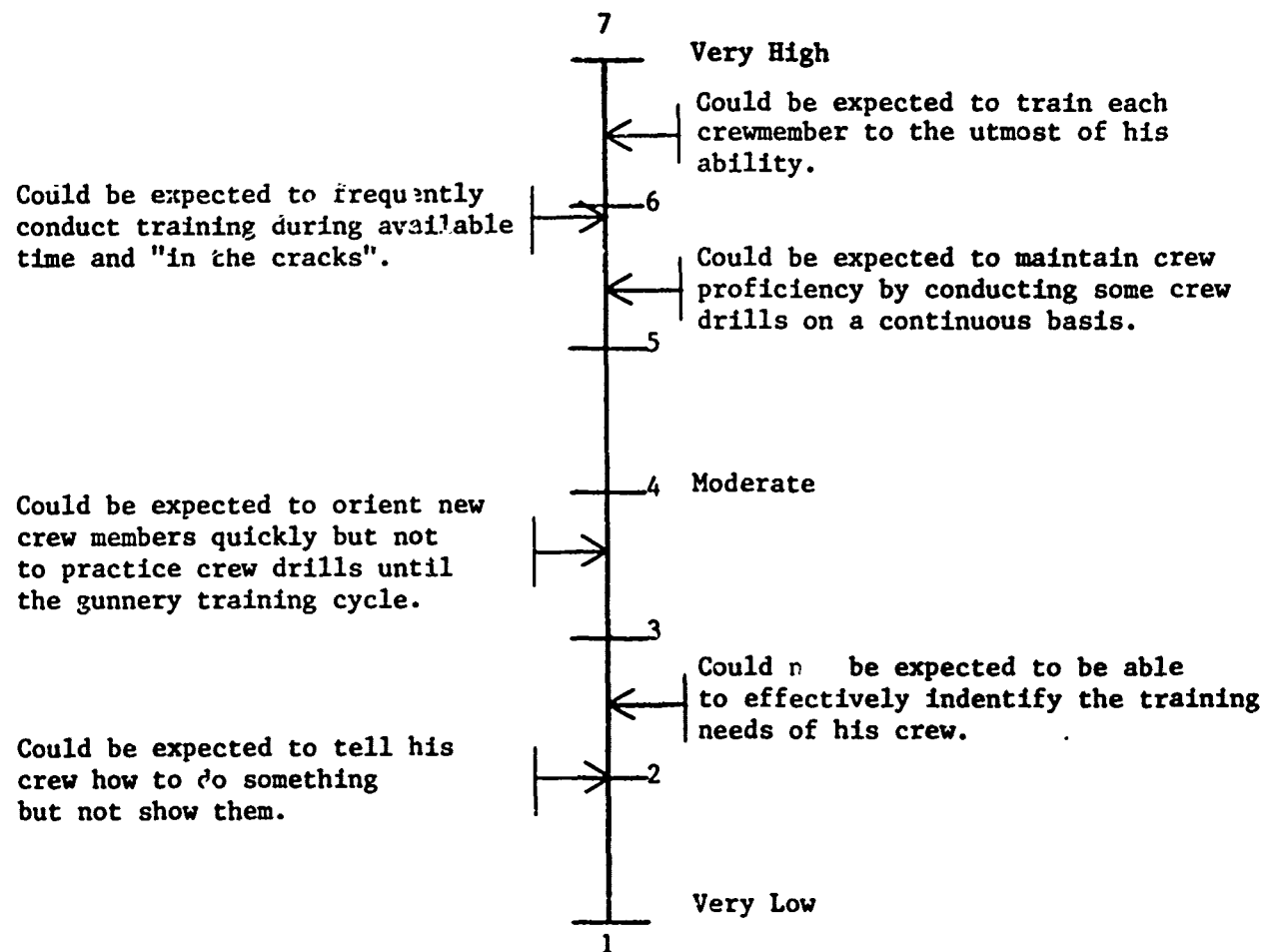
4 Moderate

When a symptom in the tank indicates maintenance is needed, this TC could be expected to have difficulty identifying the problem.

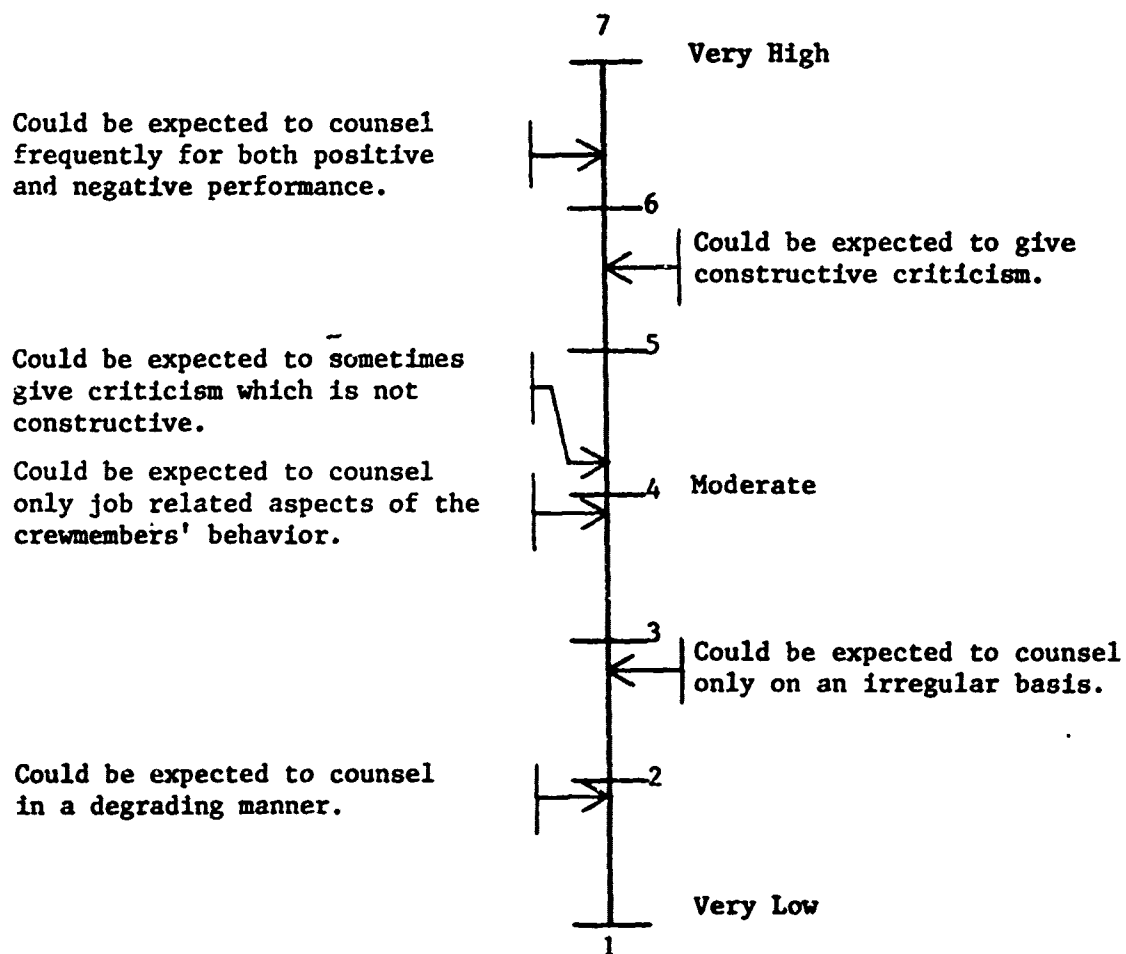
Could be expected to not even try to solve problems, but to just ignore them.

1 Very Low

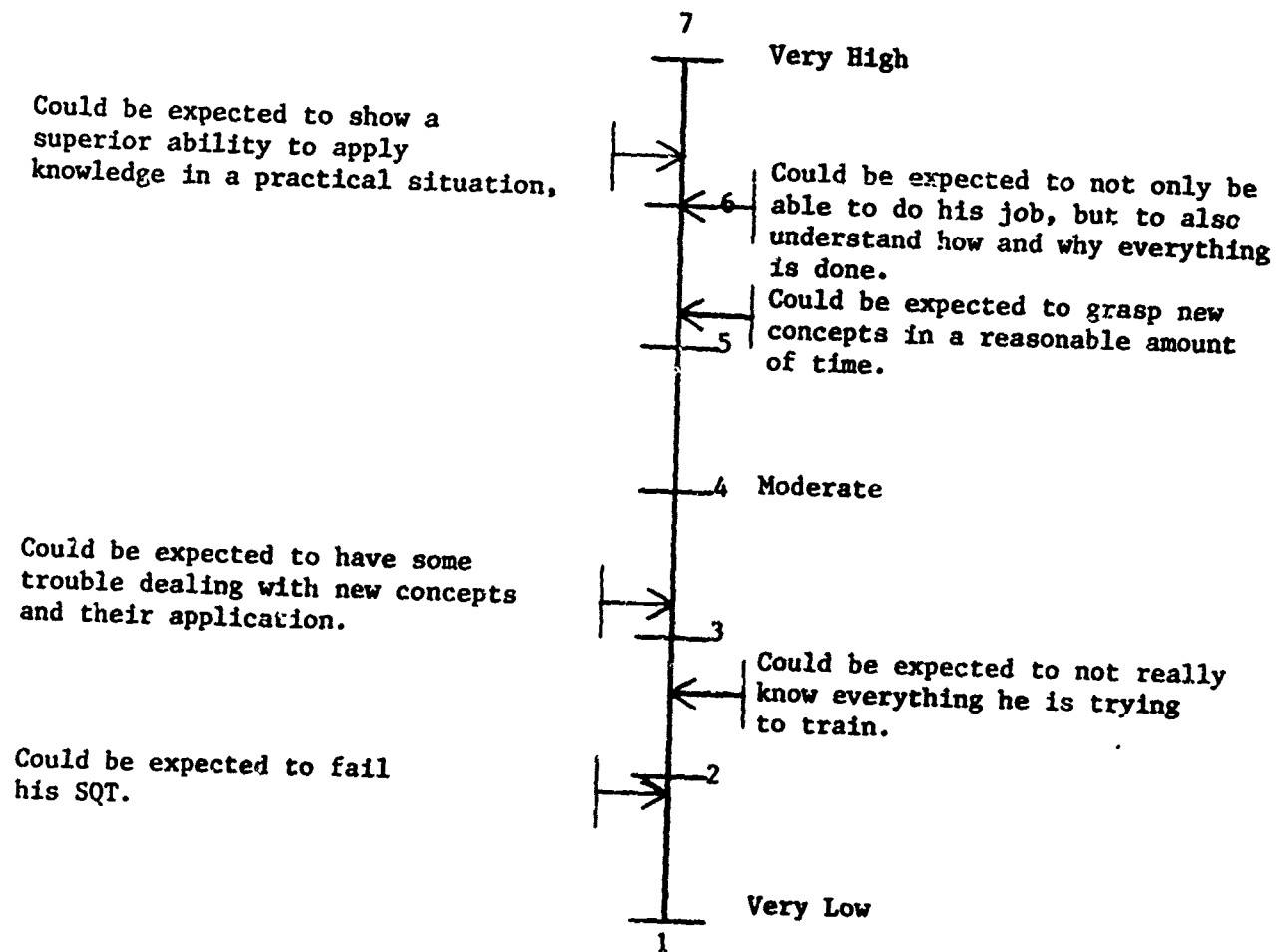
TRAINING: THE ABILITY TO EVALUATE, CREATE, AND
CONDUCT FORMAL AND INFORMAL INSTRUCTION
WHICH PRODUCES CREW PROFICIENCY.



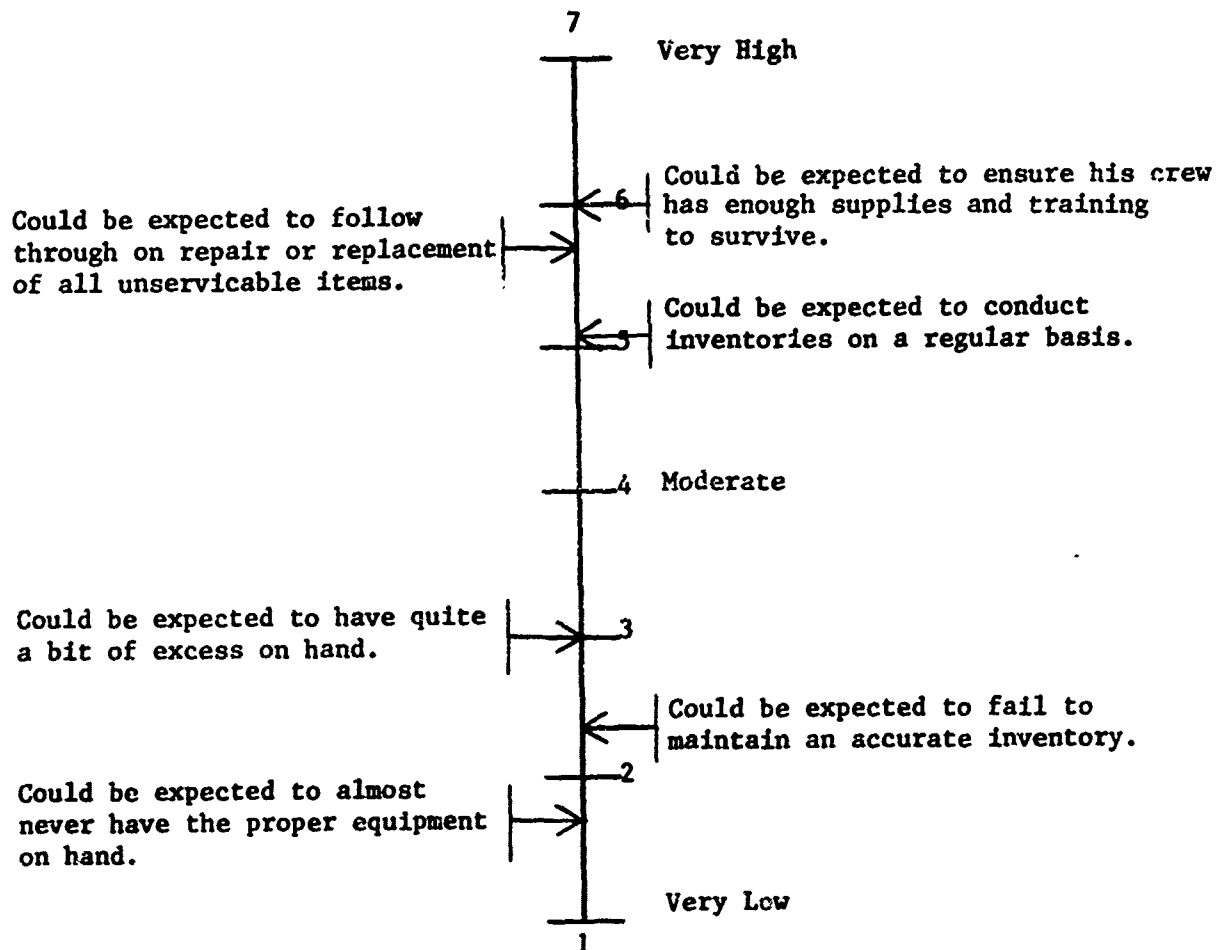
COUNSELING SKILLS: THE ABILITY TO PROVIDE APPROPRIATE
INFORMATION IN PERSONAL AND PROFESSIONAL
AREAS.



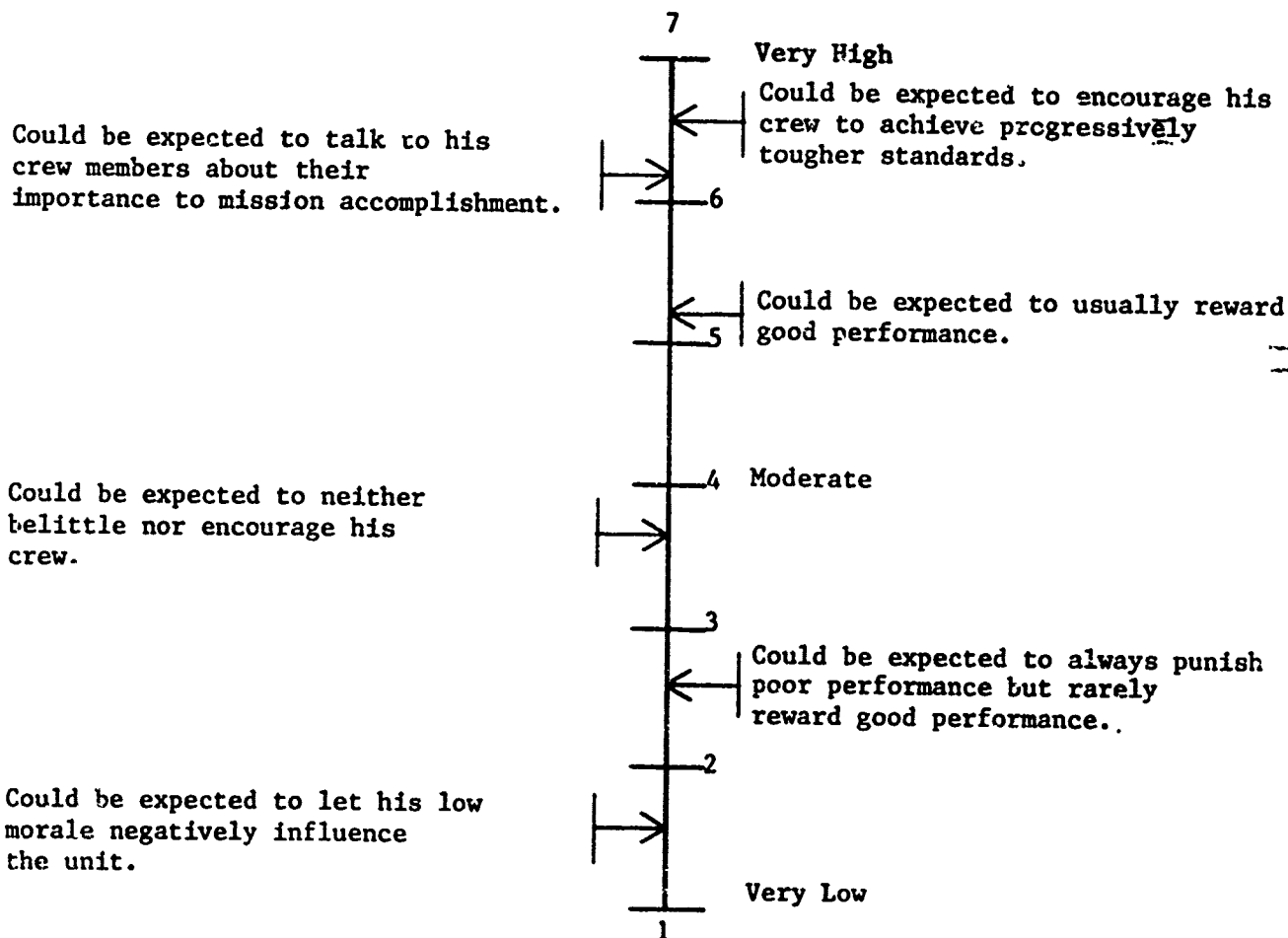
INTELLIGENCE: HAVING KNOWLEDGE AND THE COMMON
SENSE TO APPLY IT.



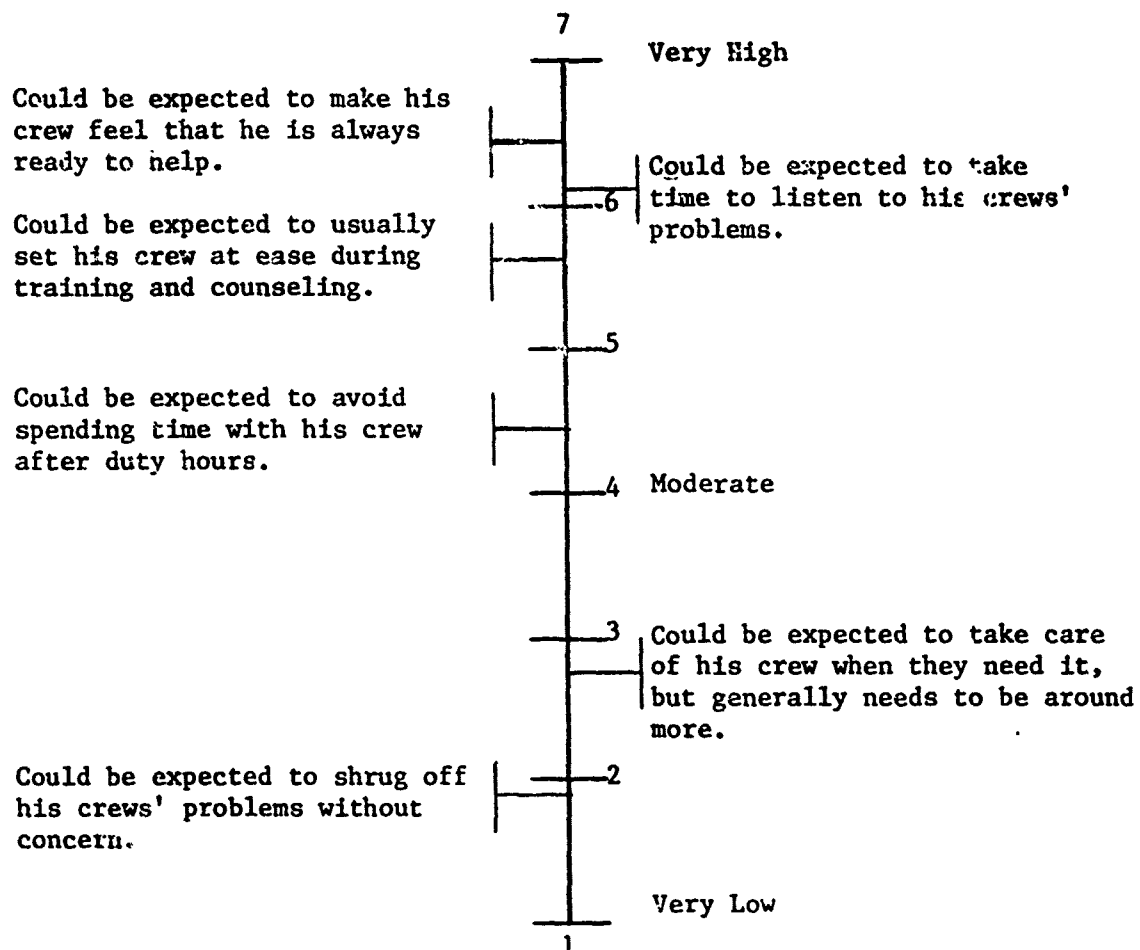
SUPPLY ACCOUNTABILITY: THE ABILITY TO ACQUIRE AND
RETAIN EQUIPMENT WITHOUT NEEDLESS LOSS.



LEADERSHIP SKILLS: THE ABILITY OF THE TC TO MOTIVATE
HIS CREW TO GOOD PERFORMANCE.



CONCERN FOR CREW: THE ABILITY TO TAKE CARE OF THE
NEEDS OF HIS CREW.

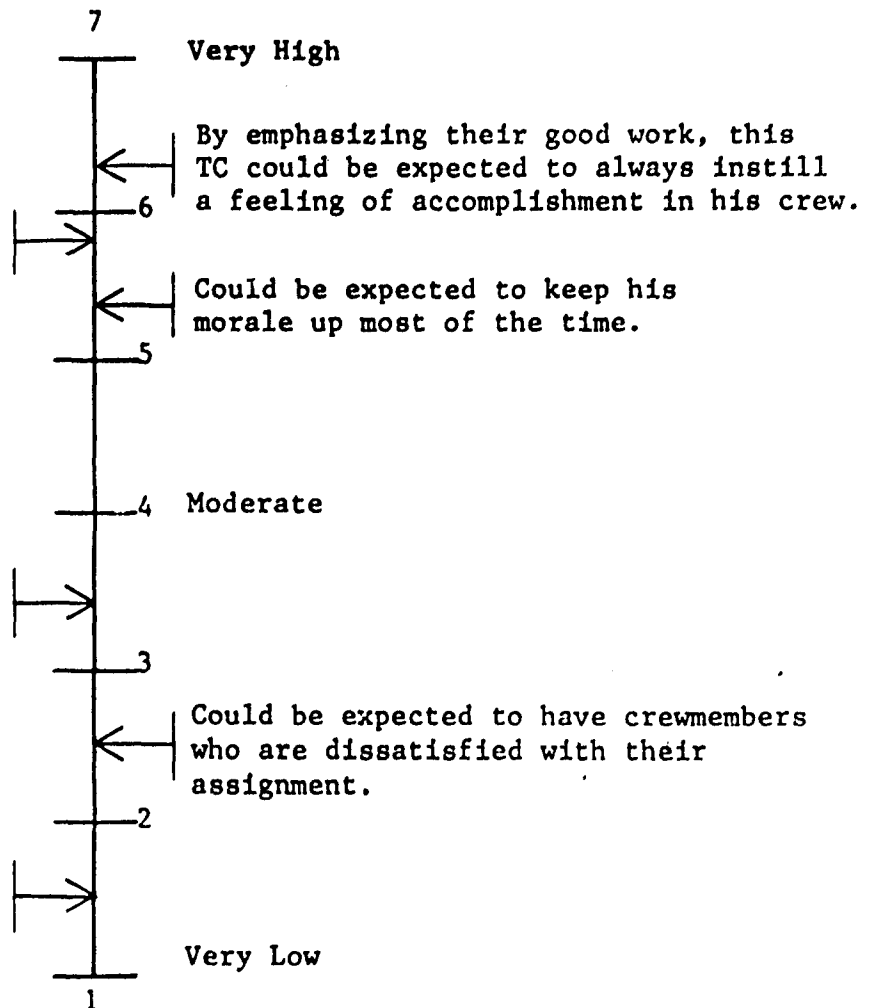


PROMOTING UNIT MORALE: THE ABILITY TO INSTILL CONFIDENCE,
COURAGE, AND HIGH SPIRITS IN HIMSELF AND
HIS PEERS.

Could be expected to have a
crew who enjoys working
for him.

Could be expected to talk about
wanting good morale in the unit but
not doing much to promote it.

Could be expected to show poor
morale and say he does not care.



E

G-

END

D