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Operational Study #1, M60A1 Main Battle Tank: Technical Interim Report CDRL A006

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Michael A. Companion

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M60A1 Main Battle Tank

Technical Interim Report
CDRL AOO6

February 15, 1990
Prepared under Contract Number 61339-89-C-0029
for
Naval Training Systems Center

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ABSTRACT

An operational study evaluating the utility of ASTAR (Automated Simulator Test and Assessment Routine) and AIMS (Automated Instructional Media Selection) was conducted with the assistance of subject matter experts (SMEs) from the Marine Corps Reserve located in Tallahassee, Florida, and training analysts and SMEs from the Naval Training Systems Center, PM TRADE, and Computer Sciences Corporation located in Orlando, Florida. The subjects were asked to use and evaluate ASTAR and AIMS and to compare them to any existing methodologies with which they were aware. The specific weapon system to which the decision aids were applied was the Marine Corps M60A1 main battle tank. The training devices compared in the study were the MCTFIST M60A1 crew trainer and the GUARD FIST I M1A1 crew trainer. A combination of questionnaires, self-initiated logs, and actual results derived from the use of the two trainer evaluation techniques was used to gather data for the study. The findings indicated that while the concept for the techniques was believed to be sound and both aids were perceived to have benefits, both methodologies had definite shortcomings that should be corrected if wide acceptability is to be achieved. Specific suggestions for changes to the programs that would improve user acceptance were elicited during the course of the study.

1.0 INTRODUCTION

A study of the Automated Simulator Test and Assessment Routine (ASTAR) and Automated Instructional Media Selection (AIMS) decision aids for instructional developers was conducted using the Marine Corps M60A1 main battle tank as the weapon system of interest. The purpose of this study, which is one of a series of studies being conducted on a variety of emerging and operational weapon systems, is to evaluate the utility and impact of the two techniques when exercised in an operational setting. The study applied ASTAR and AIMS to the comparative evaluation of the Marine Corps Tank Full-crew Interactive Simulator Trainer (MCTFIST) and the Guard Unit Armory Device Full-crew Interactive Simulator Trainer (GUARD FIST I) as potential training devices for the M60A1 tank. A brief description of the two decision aids and the tank trainers is provided in the following subsections.

There are a number of tank crew training devices that have been developed, either to prototype or fielded stage. These devices include MCTFIST, GUARD FIST I and SIMNET. There are also a number of tank part-task trainers available, including the Unit Conduct of Fire Trainer (U-COFT) and the Videodisk Interactive Gunnery System (VIGS). This variety of training devices has evolved to accommodate different armoured vehicles, M60 and M1, and different training requirements, Army versus Marine and crew versus gunnery. Though each device is specific to its application, there is a significant degree of overlap and similarity between some devices. If a single device could be used to meet the needs of several related needs, the potential exists for cost and logistics savings through a reduction in the total number of training devices to satisfy tank training requirements.

The MCTFIST was developed to meet specific Marine training requirements for the M60 tank. When this study was initiated the developers of the MCTFIST were responding to a query of whether one of the competing devices, such as GUARD FIST I, SIMNET or U-COFT, could be used to adequately meet the MCTFIST training objectives. This operational study was designed to compare the training effectiveness of MCTFIST and GUARD FIST I on a common subset of the Marine M60 tank training objectives. The results from the study should provide insight about whether GUARD FIST I provides an acceptable training device alternative to MCTFIST. In addition, the study may provide insight concerning the impact of computer generated imagery versus video disk visual scenes on predicted training effectiveness; the primary technology difference between MCTFIST and GUARD FIST I. The intent is to expand this study to include SIMNET as part of the longitudinal study under the ASTAR Operational Evaluation Program.

1.1 ASTAR

The Automated Simulator Test and Assessment Routine (ASTAR) is an automated decision aid designed to assist an analyst in evaluating the effectiveness of a training device or method.

ASTAR uses generally accepted training principles to evaluate the effectiveness of any training method that involves practice on job tasks. ASTAR helps the analyst evaluate a training approach by asking questions about the learning difficulty or the transfer of training to the job environment, and converts the judgments provided by the analyst about various facets of the training system into a forecast of the system's effectiveness. The analyst responds to a series of questions asked by ASTAR and assigns the training device under evaluation a subjective rating score between zero and one hundred. The rating score represents the analysts' perception of the effectiveness of the training device on a percentage basis.

The ASTAR program has three levels of evaluation based upon the level of detail provided by the analyst. Level One utilizes general ratings from the analyst without the need to build a data base of tasks and subtasks as Level Two or Three does. The decision of which level to use depends upon the amount of information available to analyst about the training device/method, the operational equipment/performance, the tasks to be trained, and the trainees themselves.

Using the analyst's ratings, ASTAR computes several "effectiveness" scores which can be used to make comparisons among devices or methods. An Acquisition Effectiveness score and a Transfer Effectiveness score provide a basis for comparisons of what is learned on the device and what remains to be learned on the job. These scores can be combined to provide a summary score of Training Effectiveness.

1.2 AIMS

The Automated Instructional Media Selection (AIMS) aids the analyst in the selection of media/training equipment to satisfy training requirements. The system is more flexible than other instructional media selection tools in that the user can change the definitions and assumptions about needed features inherent in the system. The analyst establishes a set of training objectives and then uses a checklist to identify the media attributes required to train each objective. The selected media are then ranked in order of relatedness to critical attributes, and the total number of times each medium is selected across all objectives is tabulated and printed out in a worksheet format. AIMS contains a data base consisting of up to 99 media and 99 media attributes. The analyst can add to or delete from the data base, thereby changing the media model to fit particular needs.

1.3 Study Training Devices

The this section provides a brief description of the two alternate training devices, MCTFIST and GUARD FIST I, compared in this operational study.

1.3.1 **MCTFIST**. MCTFIST is a training system that enables a full tank crew to develop and sustain individual and crew tactical engagement and gunnery skills through simulation of selected gunnery tables. The system includes an Instructor/Operator who

manages the training and provides comprehensive after-action reviews. Training takes place within a stationary, powerless M60A1 tank. All crew members (Tank Commander, Gunner, Driver, and Loader) participate in selected gunnery tasks. The crew observes appropriate visual and aural effects while using actual tank controls to simulate the tank's operation. Training exercises involve simulated cross-country travel and engagements with enemy forces.

The simulator provides the following crew capabilities:

a. Tank Commander (TC) - uses the M17A1 Range finder and the TC weapon system controls to acquire targets, determine target range, and fire the main gun and the coaxial machine gun.

b. Gunner - uses the M32 primary sight, M105D telescope (ballistic sight), and gunner controls to acquire targets, select ammunition, and fire the main gun and the coaxial machine gun.

c. Driver - uses the steering T-bar, gear selector, accelerator pedal, and brake to control the tank's apparent (simulated) motion. Simulated tank speed and engine revolutions per minute are shown on simulated gauges.

d. Loader - selects and loads the main gun dummy rounds and sets the SAFE/FIRE switch in the proper position.

MCTFIST uses computer graphics imaging (CGI) to superimpose targets, target signatures, and weapons effects on filmed background scenery to provide a realistic training experience. The CGI allows complete freedom of target placement and movement, while the video scenery provides the realism of an actual engagement. The video background reflects varied terrain and provides a ranging and engagement capability from 500 to 2,000 meters. The current MCTFIST scenery was photographed at the National Training Center, Fort Irwin, California and portrays a daylight desert environment.

Trainer hardware components consist of both off-the-shelf and custom-designed items. These trainer hardware components include:

a. Personal Computer (PC) - controls the trainer and provides data for the after-action reviews and for management of the training situation.

b. Video Disk Players - provide the scenery for the training exercises.

c. Sensors - placed at or near the actual tank controls sense the crew's activation of the controls.

d. Optical Corrective Components - ensure proper presentation of visual effects.

e. Sound Equipment - replicates engine and gun sounds.

The MCTFIST trainer currently includes 15 tasks taken from the gunnery tables in FM 17-12-2, "Tank Combat Tables". The system permits the trainees to engage three types of stationary and moving targets (the T-72 tank, BMP personnel transport, and GAZ-66 truck) at various ranges. The crew must meet time and performance standards under specified conditions in either the training or the testing mode. The tank can simulate movement across country and into and out of turret-down and hull-down positions. Targets may be engaged in stabilized or unstabilized modes, and the TC and Gunner may use precision, battlesight, or degraded gunnery techniques.

1.3.2 **GUARD FIST I**. Like MCTFIST, GUARD FIST I is a full crew trainer that simulates both daytime and thermal engagements. It uses CRT's mounted on the Army's M1 main battle tank to present targets. These targets can be simulated with either European or desert terrain as background. Other simulated features include tank movement within a limited area of operation, full 360 degree rotation of the turret, and firing of both the main gun and the coaxial machine gun.

The GUARD FIST I training system provides the means for the M1 tank crew to practice full-crew interaction procedures from a stationary tank. Training is conducted with the turret in the travel lock position. The system presents a realistic simulated scenario on CRT's to selected crew vision ports. Training scenarios present realistic simulated environments that require the crew to respond as they would in combat engagements, using proper full crew interactive procedures, tank controls, and fire control components. Sensors attached to the tank controls provide real-time responses to crew reactions during simulated battle engagement exercises. GUARD FIST I is transportable and can be installed at National Guard Armories and Reserve Centers wherever desired.

The training system can support the following training tasks:

a. Stationary own-vehicle engagements.

b. Moving own vehicle engagements.

c. Daylight engagements.

d. Nighttime engagements.

e. COAX engagements with stationary targets.

f. Main gun engagements with one to three fully exposed, stationary or moving targets.

g. Main gun engagements with one to three partially exposed, stationary or moving targets.

In addition, GUARD FIST I provides for training tasks that duplicate the following degraded operational conditions:

a. Laser range finder failure.

b. Loss of symbology.

c. Stabilization failure.

d. GPS/Thermal Imagery System failure.

e. Three-man engagements simulating the loss of a crew member.

f. Ballistic computer failure as evidenced by the simultaneous failure of both a and b above.

The GUARD FIST I Training System does not provide prepare-to-fire checks, boresighting, navigational engagements with the 0.50 caliber machine gun, or the manual fire mode. Exercises are designed to train combat gunnery and crew interaction activities only.

2.0 **APPROACH**

The operational exercises of the ASTAR and AIMS decision aids were conducted on two similar tank crew trainers: the Marine Corps MCTFIST simulator, designed for installation on an M60A1 main battle tank, and the Army GUARD FIST simulator, designed for mounting on an M1 main battle tank. The study was designed to assess the operational utility of the ASTAR and AIMS techniques as viable standardized decision aids for use by DoD in the Instructional System Development process, and to evaluate, compare, and rank the two devices in terms of their effectiveness as trainers for M60A1 tank crews.

2.1 Subjects

2.1.1 **MCTFIST Application**. Three subjects participated in the MCTFIST portion of the study: a Project Director from NAVTRASYSCEN familiar with training analysis and design, a contractor representative from the simulator manufacturer, who was familiar with the device and the tank, and a tank gunnery sargent who served as a subject matter expert (SME). This particular mix of subjects provided a good balance of relevant background and experience for the study. The section of the User Attitude Questionnaire addressing comfort with computers indicated that both the training analyst subjects were highly experienced in the use of computers as part of their job. They

also indicated comfort in using personal computers as part of their job. The SME did not complete the questionnaire; it was evident that this subject was less experience in the use of computers.

2.1.2 **GUARD FIST I Application**. The NAVTRASYSCEN Project Director and contractor representative, who participated in the MCTFIST portion of the study, were involved in the GUARD FIST I portion of the study. They provided a common reference point across the two portions of the study. These two subjects were aided in the GUARD FIST I evaluation by a Project Director from PM TRADE. This individual was familiar with the GUARD FIST I trainer and also provided subject matter expertise for the M1A1 main battle tank. All three subjects in this portion of the study were highly experienced in the use of computers, as part of their job, and were comfortable with their use.

2.2 Procedure

2.2.1 **MCTFIST Application**. The NAVTRASYSCEN representative was given approximately eight hours of training (primarily in AIMS) during the study material development phase of the study. With a background in training, this subject then developed the media pool and list of the attributes to be used in the AIMS application. He then entered the ratings for the media/attributes matrix. The remaining two subjects were trained on ASTAR and AIMS prior to the conduct of the MCTFIST evaluation.

The MCTFIST application of ASTAR and AIMS was conducted at different times in Tallahassee and Orlando. The portion of the study conducted in Tallahassee provided access to the SME. Following completion of both the ASTAR and AIMS techniques, a debriefing session was held with the subjects to discuss their experiences and opinions, and to identify any problems that would warrant future actions. In addition, the subjects were asked to complete an attitude survey, designed to assess their reaction to the technology, and to keep a log of several factors concerning evaluation methods and time spent in technique familiarization and actual analysis.

2.2.2 **GUARD FIST I Application**. The GUARD FIST I portion of the study was completed at a later date on a single day. It was conducted in Orlando by the Navy Project Director, the PM TRADE Project Director, and the contractor representative. Because of the participation of two subjects on the MCTFIST evaluation, no additional training was required. The PM TRADE representative served as the GUARD FIST I subject matter expert. Following completion of both the ASTAR and AIMS techniques, a debriefing session was held with the subjects to discuss their experiences and opinions, and to identify any problems that would warrant future actions.

2.3 Study Materials

The materials developed for this study include the task/training objectives list, M60A1 and M1A1 control and display

lists, and the AIMS media list, attribute list, rating matrix and worksheets.

Most of the basic data base for the ASTAR model was developed by the MCTFIST application subjects working together at the Marine Corps Reserve Center in Tallahassee. To facilitate the data base development, an ASTAR Workbook was completed. The workbook assists the subjects in making the evaluation/rating decisions required for the analysis. The workbook prompted the subjects to collect and organize the background information necessary to answer the ASTAR questions in a reasonably well informed manner. The workbook items were reviewed and/or actually filled out off-line before performing the analysis. The M60A1 task list and controls and display lists were developed in a committee mode after which each subject, working independently, completed the worksheets for the operational tank and the training system. Separate M1A1 control and display lists were developed later for the GUARD FIST I portion of the study. The subjects worked independently to develop data of sufficient detail to potentially conduct an ASTAR Level 3 analysis.

Eleven major operational tasks, Table 1, were selected for the study. These tasks were also used as the training objectives for the AIMS analysis. The number of tasks was limited to eleven in order to keep the time required for the subjects to enter data within manageable boundaries. However, the tasks selected were representative of a complete mission, beginning with preparation for tactical operation, cycling through four different firing modes, and concluding with shut-down from tactical operations.

The basic AIMS data base was prepared by the subjects whose expertise was in the training field. For this study, AIMS was not used as a pure media selection model. Instead it was used to directly compare the alternate training devices. Hence, the media pool was comprised of the MCTFIST and GUARD FIST I. The list of relevant attributes was developed as part of the MCTFIST portion of the study. The AIMS rating matrix was developed during the course of the entire study with the appropriate subjects from each application providing the AIMS ratings for their respective trainer. The critical attributes for each task were then selected by the MCTFIST application subjects working together so that consensus was reached. All the data was ready to run by the end of the session. Figure 1 presents the AIMS worksheet, listing the total attribute pool by topic area.

During the course of the MCTFIST study, the subjects raised the concern that ASTAR was not designed for the multi-person crew trainers being evaluated. The investigators developed a modified version of ASTAR in which the questions and procedures were directed at multi-person crews. The changes involved assigning a equal portion of each appropriate question to each crew member and a communication factor. For example, on a 100 point scale assign 20 points to each of the four crew positions and 20 points to communication. Two MCTFIST subjects reanalyzed the data with this modified procedure. No difference was observed in the ASTAR

TABLE 1

TANK TASK LISTING

1.0 Prepare tank for tactical operations

2.0 Communicate using intercom/radio

3.0 View/monitor terrain

4.0 Drive/operate tank

5.0 Acquire/identify targets

6.0 Conduct direct fire precision gunnery engagement(s)

7.0 Conduct direct fire battlesight gunnery engagement(s)

8.0 Conduct direct fire stabilization gunnery engagement(s)

9.0 Conduct direct fire degraded mode gunnery engagement(s)

10.0 Conduct machine gun engagements

11.0 Secure tank from tactical operations

TABLE 2

AIMS WORKSHEET/ATTRIBUTES LIST FOR M60A1

SELECTION WORKSHEET FOR USE WITH THE FILE : M60

Objective Number:_____

Objective:

_____

_____

Put a check in the boxes next to the attributes required of any medium which might be used to meet this objective.

*CONDITIONS
- |__| 1. DAY
- |__| 2. NIGHT
- |__| 3. CLEAR VISUAL
- |__| 4. DEGRADED VISUAL

*STANDARDS
- |__| 5. TANK COMBAT TABLES
- |__| 6. INSTRUCTOR EVALUATION
- |__| 7. PERFORMANCE TIME

*EXTERNAL SCENE
- |__| 8. MOVEMENT
- |__| 9. RATE OF CHANGE
- |__| 10. LOCATION
- |__| 11. RECOGNITION
- |__| 12. IDENTIFICATION
- |__| 13. COLOR
- |__| 14. FIELD OF VIEW

*INTERNAL SCENE
- |__| 15. ALPHA NUMERIC DISPLAY
- |__| 16. GRAPHIC DISPLAY
- |__| 17. GAUGE 3D DIGITAL
- |__| 18. INDICATOR ANOLOG
- |__| 19. COLOR LIGHT DISPLAY

*COMMUNICATIONS
- |__| 20. VERBAL/VOICE
- |__| 21. NON-VERBAL SIGNAL
- |__| 22. SOUND/NOISE/TONE

*PHYSICAL CUES
- |__| 23. CONTROL FEEL/TOUCH
- |__| 24. MOTION/MOVEMENT/FORCE

*MENTAL CUES
- |__| 25. DECIDE WEAPON SELECT
- |__| 26. DECIDE MISSION OPTIONS
- |__| 27. RECALL FACTS/RULES

*MISCELLANEOUS
- |__| 28. CREW COORDINATION
- |__| 29. STANDARD OPERATIONS
- |__| 30. DURATION
- |__| 31. FREQUENCY
- |__|

summary scores, less than one point on any scale. Hence, the need for a modified version of ASTAR to accommodated multi-person crew trainers seems debatable.

3.0 **RESULTS**

3.1 ASTAR Evaluation

Two full-crew tank training devices, MCTFIST and GUARD FIST I, were evaluated for their effectiveness as trainers for the Marine Corps M60A1 main battle tank. The subjects conducted ASTAR Level 1 and Level 2 evaluations of the devices, comparing them with the operational tank system. The subjects assigned consensus ratings to the ASTAR questions for use as input to the ASTAR system. Evaluation summaries were produced for each of the two trainer options. Figure 1 shows the ASTAR Level 1 analysis summary. Figure 2 provides the ASTAR Level 2 task level summary (no subtasks were used in this study).

Both the ASTAR Level 1 and ASTAR Level 2 analyses predicted MCTFIST to be more effective at training the Marine tank task requirements identified for this study. The ASTAR Level 1 total scores were 66.70 for MCTFIST and 105.46 for GUARD FIST I. For the ASTAR Level 2 analysis, the total scores were 86.71 for MCTFIST and 56.88 for GUARD FIST I.

The ASTAR scores for the two devices are quite different. An examination of the subscores provides insight on the composition of the difference. Of the two basic subscores, acquisition and transfer, most of the difference between the two devices occurs on the transfer portion of the score. This is logical since the operational environment, for this study, is the M60 main battle tank and the MCTFIST is a M60A1 trainer, while the GUARD FIST I is a M1A1 trainer. Hence, their should be a significant transfer problem for the GUARD FIST I since it is design for a different tank.

The difference between the two devices on the acquisition score is much smaller, but still favors the MCTFIST for both the ASTAR Level 1 and ASTAR Level 2 analyses. Since performance deficit is the same in both situations, the difference in acquisition reflects the training capabilities of the devices for the M60A1 task environment. Because the MCTFIST was designed for M60A1 training, whereas the GUARD FIST I was not, the analysts rated MCTFIST better on the difficulty of learning the tasks and quality of training. Hence, the findings support what would be predicted based on learning/training principles.

The analysts during the MCTFIST study, utilized some of the raw ratings as an analysis tool. They examined the ratings for some factors on a task by task basis to identify where they had assigned low scores. If a score was low or out of line with that assigned to other tasks, it might indicate a design problem. Hence it could be used to identify areas of needed design

ASTAR 1 EVALUATIONS

MCTFIST trainer

Performance Deficit	55		
Learning Difficulty	65		
Training Problem		35.75	
Quality of Training-Acquisition	83		
Acquisition-Efficiency		.91	
Acquisition			39.29
Residual Deficit	35		
Residual Learning Difficulty	65		
Physical Similarity	89		
Functional Similarity	92		
Transfer Problem		22.75	
Quality of Transfer-Training	70		
Transfer Efficiency		.83	
Transfer			27.41
Sum			66.70

GUARD FIST I Trainer

Performance Deficit	55		
Learning Difficulty	73		
Training Problem		40.15	
Quality of Training-Acquisition	75		
Acquisition-Efficiency		.86	
Acquisition			46.69
Residual Deficit	25		
Residual Learning Difficulty	65		
Physical Similarity	89		
Functional Similarity	60		
Transfer Problem		45.25	
Quality of Transfer-Training	60		
Transfer Efficiency		.77	
Transfer			58.77
Sum			105.46

Figure 1. Evaluation summary for ASTAR 1 analysis.

ASTAR 2 EVALUATIONS - TASK

MCTFIST Trainer		
Training Problem	32.86	
Acquisition-Efficiency	.91	
Acquisition		36.11
Transfer Problem	20.15	
Transfer Efficiency	.97	
Transfer		20.77
Sum		56.88
GUARD FIST I Trainer		
Training Problem	38.42	
Acquisition-Efficiency	.94	
Acquisition		40.87
Transfer Problem	43.70	
Transfer Efficiency	.79	
Transfer		55.32
Sum		96.19

Figure 2. Evaluation summary for ASTAR 2 (task level) analysis.

improvement. While not a standard analysis, the examination of basic data as part of the ASTAR analysis appears logical and seems to provide useful insight. If this capability was extended in ASTAR, it might reduce some of the questions associated with how ASTAR works. ASTAR could then be used more to visual trends and problem areas.

An attempt was made to conduct an ASTAR Level 3 analysis as part of this operational study. Subjects, during the MCTFIST portion of the study, encountered problems during the data base development and while conducting the ASTAR ratings. Their computers would at times "hang up" or not permit access to all the questions. A review of these problems, plus observation of problems in the other operational studies, suggests that their is a basic problem with ASTAR. An analysis indicated that ASTAR only had problems when run on AT class machines. There were never any problems when ASTAR was run on a PC or PC/XT class of machine. ASTAR is a relatively old program. The pattern of problems indicated that the COBOL complier used to compile ASTAR is not compatible with 80286 code machines. It is likely that the compiler used for ASTAR was developed prior to the release of 80286 machines and it, therefore, has a machine code problem. This problem would probably be remedied by recompiling ASTAR with a later COBOL compiler. Because of this problem, ASTAR Level 3 analyses were not conducted on both training devices. Figure 3 provides the results of the ASTAR Level 3 analysis conducted for MCTFIST on a PC/XT class computer.

3.2 AIMS Evaluation

The results of the AIMS evaluation were consistent. Both devices were selected as acceptable for each of the training objectives. For ten out of the eleven objectives, GUARD FIST I was rated higher than MCTFIST, with a tie on the last objective.

The data base was examined to determine whether there was a clear cut advantage for the GUARD FIST I. The examination revealed several factors that might reduce the strength of the finding. The ratings on the two trainers averaged out the same across most of the attributes. GUARD FIST I was given a significantly higher rating in only two categories of attributes, communications and physical cues. These two categories of attributes are the primary reason that GUARD FIST I achieved a higher overall rating than MCTFIST. This finding also affected the selection process. The subject's identified, that on the average, approximately 90% of the attributes were critical. This means that the specific ratings used in the selection process did not vary significantly from the overall ratings. Furthermore, four of the five attributes in the two categories in which GUARD FIST I had a decisive edge over MCTFIST were always among the critical attributes. Hence, the selection process was driven by a small number of the total pool of attributes. Generally, a much smaller subset of total attribute pool is identified as critical to a training objective. This suggests that either the number of identified critical attributes is to high or that the total number of attributes is too small.

ASTAR 3 EVALUATION

MCTFIST Trainer

Training Problem	26.55	
Acquisition-Efficiency	.76	
Acquisition		34.93
Transfer Problem	23.33	
Transfer Efficiency	.91	
Transfer		25.64
Sum		60.57

Figure 3. Evaluation summary for ASTAR 3 analysis.

The indication from the results of the AIMS evaluation is that the data base was probably inadequate. In addition, the attributes did not adequately reflect the design difference between the two trainers. As stated initially, the GUARD FIST I used computer generated imagery for the visual scene, while the MCTFIST uses video disk supplemented by computer generated cues. The desire was to determine the impact of this technology difference on training, but the attribute pool does not provide sufficient differentiation on this design feature. It will be critical during any potential implementation of AIMS to teach analysts how to construct/tailor the AIMS data base to address the critical design issues.

Another possible negative influence on the selection process is the small task list/training objectives used in the study. The training objectives used were very high level, which could easily reduce the sensitivity of AIMS to differentiate between media options. The small training objective list was driven by the limits ASTAR places on the task data base.

3.3 User Attitude Questionnaire

A user attitude survey was developed for the study to assess the subject's reactions to the use of the two techniques. The questions addressed the analysts'/SME's acceptance of and attitudes toward the user friendliness and overall usefulness of the decision aids. The subjects general background and comfort level in working with computers was also addressed. A copy of the questionnaire with the composite ratings and comments for this operational study can be found in Appendix D.

The results of questionnaire are reflected in the composite scores and comments presented below. The elements of each question are arranged in rank order, based on the composite scores received. A brief discussion of each survey item follows.

3.3.1 **OVERALL ATTITUDES**. This question addressed the overall attitudes of the subjects toward the general utility, ease of operation, relevance, and effectiveness of the ASTAR and AIMS techniques as well as the conventional methods (CM) they are now using. The combined scores of the subjects show that the conventional method rated highest in all elements except for "ease of use". Composite scores (1 = highest; 3 = lowest) are presented below.

Utility		Ease of Use		Relevance		Effectiveness	
CM	1.0	AIMS	1.0	CM	1.0	CM	1.0
AIMS	2.0	ASTAR	2.0	ASTAR	2.0	AIMS	2.0
ASTAR	3.0	CM	3.0	AIMS	3.0	ASTAR	3.0

A combination scores for each technique across all elements ranks the conventional method highest with a score of 1.5, AIMS second with a score of 2.0, and ASTAR third with a score of 2.5.

The individual rankings across criteria were varied. Generally, the conventional methods were rank the highest. Between AIMS and ASTAR, AIMS was generally ranked higher.

3.3.2 **REACTIONS TO ASTAR**. The following sections summarize the analysts' reactions to ASTAR in seven different areas. In each area, a synopsis of the ratings is provided followed by a composite score for each characteristic. All questions were rated on a scale of 1 = low; 4 = average; 7 = high.

3.3.2.1 Overall Reactions. The scores in this category were quite negative. Two of the items rated: received the lowest score possible. Complete composite scores were:

Useful/Not Useful	2.5
Flexible/Rigid	2.0
Inadequate/Adequate Power	2.0
Productive/Unproductive	1.2
Ease/Difficulty of Use	1.0
Satisfying/Frustrating	1.0

3.3.2.2 Reactions to ASTAR Screens. The most notable reaction here indicated that the presentation of questions was reasonably clear. The remaining rankings were below average. Complete composite scores were:

Clear/Confusing Question Presentation	5.5
Logical/Illogical Organization of Menus	2.0
Helpful/Non-Helpful Prompts	1.0
Clear/Confusing Menu Function Labeling	1.0

3.3.2.3 ASTAR Terminology. Consistency of terms and easily understandable language earned ASTAR above average scores in this area. Conversely, the computer keeping the user informed of what it is doing scored near the bottom of the scale. This reflected the subjects feeling of not fully understanding what ASTAR was doing.

Consistent/Inconsistent Terms Throughout	5.5
Easily Understood/Confusing Language	5.0
Always/Never keeps you informed	1.5

3.3.2.4 Learning ASTAR. The most significant responses here indicated that subjects felt learning to operate the system and exploring new features by trial and error was somewhat difficult. This concern was repeated in the comments section described later.

Thorough/Incomplete Instructional Materials	3.5
Helpful/Not Helpful Instructional Materials	3.0
Easy/Difficult to learn ASTAR operation	1.0
Easy/Difficult to Explore New Features	1.0

3.3.2.5 Using ASTAR. All the scores in this area were well below average, particularly user memory requirements and helpfulness of error messages.

Always/Never Can Perform Tasks Straightforwardly	2.0
Helpful/Not Helpful Audio/Visual Feedback	2.0
Low/High User Memory Requirements	1.5
Helpful/Not Helpful Error Messages Provided	1.5

3.3.2.6 ASTAR Output. This area, concerning the presentation of the results the ASTAR analysis, was undoubtedly the area of most concern to the subjects. This was evident from the content of the written comments made and the low rating scores given the three survey elements covering this area.

Usefulness/Non-Usefulness of Analysis Results	1.0
Ease/Difficulty of Understanding Analysis Results	1.0
Clarity/confusion of results format	1.0

3.3.2.7 Acceptance of ASTAR The elements in this category were scored on the basis of 4 points for a favorable response and 1 point for an unfavorable response. The responses indicated that the ASTAR model as it currently exists, did not receive a great deal of acceptance by the subjects. Four of the six statements received the lowest possible score. In the scores presented below, the higher the rating, the more agreement there is with the statement. The ratings scales for these questions range from 1.0 to 4.0.

I Could Do Work With ASTAR	1.5
I Would Have Little Use for ASTAR in Daily Work	1.5
I Would Feel Comfortable Working With ASTAR	1.0
ASTAR Will Increase My Job Effectiveness	1.0
I Would Find It Hard to Stop Working With ASTAR	1.0
I Could Do Just As Well Some Other Way	1.0

3.3.2.8 General Comments on ASTAR. The above data resulted from system of rating scales that were part of the attitude survey. In addition to the rating scales, user comments were solicited in response to questions asked in a number of areas. These comments are summarized below.

1. What aspect(s) of ASTAR do you like most?

   a. The overall concept of an automated system to perform training effectiveness evaluations of multiple training devices was considered quite worthwhile. It was felt that the use of such a technique could result in cost, time, and manpower savings.

   b. Having a tool to provide quantitative data which can be used in the decision making process during the design and development of training systems.

   c. Computer documentation of trainer and weapon system hardware, controls and displays, and operator tasks on IBM compatible software.

2. What aspect(s) of ASTAR do you like least?

   a. There was considerable criticism of the output data, or ASTAR results, as presented in the final summary. It was felt that the lack of definition of the data rendered it meaningless. The general tenor of the comments indicated that the subjects did not know what the data was telling them and there were no documents or screen presentations to tell them how to interpret the different scores.

   b. A second negative aspect cited was the tediousness and length of time associated with the entry of almost identical lists of controls and displays for both the operational system and the trainer in both the workbook and the computer. This was believed to be unnecessary, redundant and inefficient.

   c. A third feature considered to be a weakness of the system was the lack of organization of the menus which prohibited a free flow in and out of the process. In other words, there was no capability to escape from the program at any point and then return at a later time to the same point. This could be done, of course, but not quickly and conveniently. Instead, the user was forced to work his way through a time consuming and complex procedure to arrive at his point of interest.

3. What do you feel could be done to improve ASTAR?

   a. ASTAR should be reprogrammed to make it more user friendly and to provide a more meaningful output.

   b. Generally speaking, the subjects felt that the system should be made more user friendly by adding the following capabilities:

      (1) Simplified utility menus to allow easy editing, addition, and deletion of controls and displays,

and task and subtask data.

(2) A way to save data on both hard drive and floppy disks.

4. How long did it take you to become comfortable using ASTAR?

   a. The responses to this question indicated an average of more than three hours.

5. Do you feel there were differences in the decisions made about the training system analyzed from those which were or would have been made using your current approach to training effectiveness evaluation?

   a. All subjects felt that there were no differences because the output data is not presented in a fashion that lends itself to decision making, i.e. the meaning of the summary results is unclear.

3.3.3 **REACTIONS TO AIMS**. The following sections summarize the subject's reactions to the AIMS methodology in seven areas. As above, the elements of each question are arranged in rank order as based on their composite scores. All questions were rated on a scale of 1 = low; 4 = average; 7 = high.

3.3.3.1 Overall Reactions to AIMS. These scores tended to be slightly below average for all of the items considered except for the flexible/rigid score which was average. Composite scores were:

Flexible/Rigid	4.0
Useful/Not Useful	3.0
Productive/Unproductive	3.0
Ease/Difficulty of Use	3.0
Inadequate/Adequate Power	3.0
Satisfying/Frustrating	3.0

3.3.3.2 Reactions to AIMS Screens. All scores in this category were below average with helpful/non-helpful prompts receiving the lowest possible score.

Clear/Confusing Question Presentation	2.0
Clear/Confusing Menu Function Labeling	2.0
Logical/Illogical Organization of Menus	2.0
Helpful/Non-Helpful Prompts	1.0

3.3.3.3 AIMS Terminology. The most noteworthy score here reflected the attitude that the computer never keeps the user informed about what it is doing.

Consistent/Inconsistent Terms Throughout	3.0
Easily Understood/Confusing Language	3.0
Always/Never keeps you informed	1.0

3.3.3.4 Learning AIMS. The scores in this area ranged from average to lowest score possible; the low score indicating that trial and error learning of new features is quite difficult.

Helpful/Not Helpful Instructional Materials	4.0
Thorough/Incomplete Instructional Materials	4.0
Easy/Difficult to learn AIMS operation	2.0
Easy/Difficult to Explore New Features	1.0

3.3.3.5 Using AIMS. The scores in this area, like many of those cited above, are below average. Audio/visual feedback and error messages were considered of no help and were given the lowest possible score.

Low/High User Memory Requirements	2.0
Always/Never Can Perform Tasks Straightforwardly	2.0
Helpful/Not Helpful Audio/Visual Feedback	1.0
Helpful/Not Helpful Error Messages Provided	1.0

3.3.3.6 AIMS Output. This area, concerning the presentation of the results of the AIMS analysis, was considered very inadequate by the subjects. The results format was the only score higher than 1 and that score was only a 2, still a below average value.

Clarity/confusion of results format	2.0
Ease/Difficulty of Understanding Analysis Results	1.0
Usefulness/Non-Usefulness of Analysis Results	1.0

3.3.3.7 Acceptance of Aims. The elements in this category i.e. acceptability, were scored on the basis of 4 points for a favorable response and 1 point for an unfavorable response. There were no negative responses in this area. All scores were identical, i.e. slightly above average. Ratings scales on these questions ranged form 1.0 to 4.0.

I Am Sure I Could Do Work With AIMS	3.0
I Expect To Have Little Use for AIMS in Daily Work	3.0
I Would Find It Hard to Stop Working With AIMS	3.0
I Could Do Just As Well Some Other Way	3.0
I Would Feel Comfortable Working With AIMS	3.0
AIMS Will Increase My Job Effectiveness	3.0

3.3.3.8 General Comments on AIMS. The above data resulted from system of rating scales that were part of the attitude survey. In addition to the rating scales, user comments were solicited in response to questions asked in a number of areas. These comments are summarized below.

1. What aspect(s) of AIMS do you like most?

   a. The task/objective worksheet provides a convenient, easily understood basis for identifying critical attributes.

2. What aspect(s) of AIMS do you like least?

   a. The output data (results) of running the AIMS model are not clear and, therefore, not too useful.

3. What do you feel could be done to improve AIMS?

   a. Program an extensive, generic list of attributes already rated against a generic pool of media, from which an appropriate selection could be made for each application.

4. How long did it take you to become comfortable using ASTAR?

   a. Three or more hours was the response recorded for this question.

5. Do you feel there were differences in the decisions made about the training system analyzed from those which were or would have been made using your current approach to training effectiveness evaluation?

   a. All subjects felt that there were no differences.

4.0 CONCLUSIONS

This operational study of ASTAR and AIMS conducted by NTSC, PM TRADE, SME and contractor personnel provided an appropriate test environment. The M60A1 weapon system was selected for this study. The MCTFIST and GUARD FIST I training devices provided a good application of the two techniques, since they permitted the analysts to compare the merits of the two simulators as M60A1 full crew tank trainers. The two training device analyzed helped to evaluate the utility of the decision aids.

Overall, the user acceptance of the two techniques was rather low. Though AIMS tends to be rated higher than ASTAR. It is evident that ASTAR and AIMS are considered quite worthwhile in concept but somewhat flawed in terms of user friendliness. The

user interface is clearly the major factor in determining future acceptance of the two methodologies. This lack of user friendliness overshadows the potential benefits of ASTAR and AIMS.

The subjects involved in the study felt that the concept of automated decision aids to assist instructional developers in the evaluation and comparison of training effectiveness in different emerging devices, or in proposed changes to existing devices, should be valuable tools for the design of training systems. The ability to conduct ASTAR evaluations at three different levels of device development, for instance, was felt to be of particular benefit. The subjects believed that the proper application of ASTAR should result in considerable savings in time, cost and man hours during the analysis phases of training development. However, subjects would prefer not to use the programs as they presently exist, because of their unfriendly nature.

ASTAR and AIMS are relatively old programs. They were developed before many of the recent advancements in the design and technology of both software and human/computer interfaces. AIMS is considered generally acceptable, but certain features would still need to be updated to ensure widespread adoption. The primary needs in AIMS are an improved data base structure, an improved data entry capability, and a much improved editing function. ASTAR will require much more extensive enhancement in the same general areas as AIMS before it can gain general user acceptance. ASTAR's greatest needs are for a better data base development capability and a more systematic and expanded editing function. ASTAR also needs better data output options (graphics perhaps) and a system of helps or explanations of the summary data to make it easier for the analyst to interpret study results.

The findings of this operational study indicate that both ASTAR and AIMS will require modifications before implementation as standard evaluation techniques. Without these modifications, user acceptance would be poor at best. Most of the shortcomings can be alleviated by modifying the programs to incorporate current software practices, data base techniques, and user interface standards. The subjects who participated in the study made a number of specific recommendations for improvement to both the ASTAR and AIMS interfaces. Given the nature of the required modifications, an acceptable version of the programs should be achievable with only moderate resources. There would still be areas of concern that would be more difficult to alleviate, however. Terminology, for instance, tends to be application specific, so it would be difficult to use generic terminology in the ASTAR questions and prompts. In addition, the concerns about the basic ASTAR computations could not be updated without negating previously established validity. As a result, shortcomings associated with the mechanics of ASTAR could be corrected with minimum problems while content related flaws cannot be easily addressed.

A new problem was encountered during this operational study. It appears that ASTAR is old enough that the program used to compile ASTAR is not compatible with newer microprocessors. This is not necessarily a major problem to correct, but it reflects the need to conduct a major update of ASTAR before any planned implementation. It also accentuates that the problems with ASTAR are basic to the program and can not be alleviated with cosmetic changes.

In summary, this operational study of the ASTAR and AIMS automated decision aids demonstrated that while neither ASTAR nor AIMS is user friendly as presently programmed, both techniques have the potential to become useful, widely accepted decision aids for evaluating candidate trainer suites and selecting training system media. Some reprogramming will be required, however, to correct several programming flaws and to make the decision aids more user friendly.

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5.0 APPENDICIES

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APPENDIX A

AIMS MEDIA/ATTRIBUTE RATING MATIX

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MEDIA X ATTRIBUTES TABLE

ATTRIBUTE NUMBER ----> / MEDIA	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. MCTFIST	5	2	5	2	5	3	4	3	4	4	2	2	4	3
2. GUARD FIST I	3	4	3	2	5	3	5	4	4	2	2	2	4	4

MEDIA X ATTRIBUTES TABLE ** CONTINUED **

ATTRIBUTE NUMBER ----> / MEDIA	15	16	17	18	19	20	21	22	23	24	25	26	27	28
1. MCTFIST	3	3	4	4	3	4	3	2	3	2	4	4	4	5
2. GUARD FIST I	4	3	3	4	4	5	5	5	4	3	5	5	4	5

MEDIA X ATTRIBUTES TABLE ** CONTINUED **

ATTRIBUTE NUMBER ----> / MEDIA	29	30	31
1. MCTFIST	5	5	5
2. GUARD FIST I	5	5	4

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APPENDIX B

AIMS MEDIA SELECTION WORKSHEETS

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SELECTION WORKSHEET FOR USE WITH THE FILE : M60

Objective Number: 1.0

Objective: Prepare tank for tactical operations

Put a check in the boxes next to the attributes required of any medium which might be used to meet this objective.

*CONDITIONS
- |x| 1. DAY
- |x| 2. NIGHT
- |x| 3. CLEAR VISUAL
- |__| 4. DEGRADED VISUAL

*STANDARDS
- |__| 5. TANK COMBAT TABLES
- |x| 6. INSTRUCTOR EVALUATION
- |x| 7. PERFORMANCE TIME

*EXTERNAL SCENE
- |__| 8. MOVEMENT
- |__| 9. RATE OF CHANGE
- |x| 10. LOCATION
- |x| 11. RECOGNITION
- |__| 12. IDENTIFICATION
- |__| 13. COLOR
- |x| 14. FIELD OF VIEW

*INTERNAL SCENE
- |x| 15. ALPHA NUMERIC DISPLAY
- |x| 16. GRAPHIC DISPLAY
- |x| 17. GAUGE 3D DIGITAL
- |x| 18. INDICATOR ANOLOG
- |x| 19. COLOR LIGHT DISPLAY

*COMMUNICATIONS
- |x| 20. VERBAL/VOICE
- |x| 21. NON-VERBAL SIGNAL
- |x| 22. SOUND/NOISE/TONE

*PHYSICAL CUES
- |x| 23. CONTROL FEEL/TOUCH
- |x| 24. MOTION/MOVEMENT/FORCE

*MENTAL CUES
- |x| 25. DECIDE WEAPON SELECT
- |x| 26. DECIDE MISSION OPTIONS
- |x| 27. RECALL FACTS/RULES

*MISCELLANEOUS
- |x| 28. CREW COORDINATION
- |x| 29. STANDARD OPERATIONS
- |__| 30. DURATION
- |__| 31. FREQUENCY
- |__|

SELECTION WORKSHEET FOR USE WITH THE FILE : M60

Objective Number: 8.0

Objective: Conduct direct fire stabilization gunnery engagement(s)

Put a check in the boxes next to the attributes required of any medium which might be used to meet this objective.

*CONDITIONS
- |x_| 1. DAY
- |x_| 2. NIGHT
- |x_| 3. CLEAR VISUAL
- |x_| 4. DEGRADED VISUAL

*STANDARDS
- |x_| 5. TANK COMBAT TABLES
- |x_| 6. INSTRUCTOR EVALUATION
- |x_| 7. PERFORMANCE TIME

*EXTERNAL SCENE
- |x_| 8. MOVEMENT
- |x_| 9. RATE OF CHANGE
- |x_| 10. LOCATION
- |x_| 11. RECOGNITION
- |x_| 12. IDENTIFICATION
- |x_| 13. COLOR
- |x_| 14. FIELD OF VIEW

*INTERNAL SCENE
- |x_| 15. ALPHA NUMERIC DISPLAY
- |x_| 16. GRAPHIC DISPLAY
- |__| 17. GAUGE 3D DIGITAL
- |__| 18. INDICATOR ANOLOG
- |__| 19. COLOR LIGHT DISPLAY

*COMMUNICATIONS
- |x_| 20. VERBAL/VOICE
- |__| 21. NON-VERBAL SIGNAL
- |x_| 22. SOUND/NOISE/TONE

*PHYSICAL CUES
- |x_| 23. CONTROL FEEL/TOUCH
- |x_| 24. MOTION/MOVEMENT/FORCE

*MENTAL CUES
- |x_| 25. DECIDE WEAPON SELECT
- |x_| 26. DECIDE MISSION OPTIONS
- |x_| 27. RECALL FACTS/RULES

*MISCELLANEOUS
- |x_| 28. CREW COORDINATION
- |x_| 29. STANDARD OPERATIONS
- |x_| 30. DURATION
- |x_| 31. FREQUENCY
- |__|

SELECTION WORKSHEET FOR USE WITH THE FILE : M60

Objective Number: 9.0

Objective: Conduct direct fire degraded mode gunnery engagement(s)

Put a check in the boxes next to the attributes required of any medium which might be used to meet this objective.

*CONDITIONS
- |x| 1. DAY
- |x| 2. NIGHT
- |x| 3. CLEAR VISUAL
- |x| 4. DEGRADED VISUAL

*STANDARDS
- |x| 5. TANK COMBAT TABLES
- |x| 6. INSTRUCTOR EVALUATION
- |x| 7. PERFORMANCE TIME

*EXTERNAL SCENE
- |x| 8. MOVEMENT
- |x| 9. RATE OF CHANGE
- |x| 10. LOCATION
- |x| 11. RECOGNITION
- |x| 12. IDENTIFICATION
- |x| 13. COLOR
- |x| 14. FIELD OF VIEW

*INTERNAL SCENE
- |x| 15. ALPHA NUMERIC DISPLAY
- |x| 16. GRAPHIC DISPLAY
- |x| 17. GAUGE 3D DIGITAL
- |x| 18. INDICATOR ANOLOG
- |__| 19. COLOR LIGHT DISPLAY

*COMMUNICATIONS
- |x| 20. VERBAL/VOICE
- |__| 21. NON-VERBAL SIGNAL
- |x| 22. SOUND/NOISE/TONE

*PHYSICAL CUES
- |x| 23. CONTROL FEEL/TOUCH
- |x| 24. MOTION/MOVEMENT/FORCE

*MENTAL CUES
- |x| 25. DECIDE WEAPON SELECT
- |x| 26. DECIDE MISSION OPTIONS
- |x| 27. RECALL FACTS/RULES

*MISCELLANEOUS
- |x| 28. CREW COORDINATION
- |x| 29. STANDARD OPERATIONS
- |x| 30. DURATION
- |x| 31. FREQUENCY
- |__|

SELECTION WORKSHEET FOR USE WITH THE FILE : M60

Objective Number: 10.0

Objective: Conduct machine gun engagements

Put a check in the boxes next to the attributes required of any medium which might be used to meet this objective.

*CONDITIONS
- [x] 1. DAY
- [x] 2. NIGHT
- [x] 3. CLEAR VISUAL
- [x] 4. DEGRADED VISUAL

*STANDARDS
- [x] 5. TANK COMBAT TABLES
- [x] 6. INSTRUCTOR EVALUATION
- [x] 7. PERFORMANCE TIME

*EXTERNAL SCENE
- [x] 8. MOVEMENT
- [x] 9. RATE OF CHANGE
- [x] 10. LOCATION
- [x] 11. RECOGNITION
- [x] 12. IDENTIFICATION
- [x] 13. COLOR
- [x] 14. FIELD OF VIEW

*INTERNAL SCENE
- [x] 15. ALPHA NUMERIC DISPLAY
- [x] 16. GRAPHIC DISPLAY
- [x] 17. GAUGE 3D DIGITAL
- [ ] 18. INDICATOR ANOLOG
- [ ] 19. COLOR LIGHT DISPLAY

*COMMUNICATIONS
- [x] 20. VERBAL/VOICE
- [ ] 21. NON-VERBAL SIGNAL
- [x] 22. SOUND/NOISE/TONE

*PHYSICAL CUES
- [x] 23. CONTROL FEEL/TOUCH
- [x] 24. MOTION/MOVEMENT/FORCE

*MENTAL CUES
- [x] 25. DECIDE WEAPON SELECT
- [x] 26. DECIDE MISSION OPTIONS
- [x] 27. RECALL FACTS/RULES

*MISCELLANEOUS
- [x] 28. CREW COORDINATION
- [x] 29. STANDARD OPERATIONS
- [x] 30. DURATION
- [x] 31. FREQUENCY

SELECTION WORKSHEET FOR USE WITH THE FILE : M60

Objective Number: 11.0

Objective: Secure tank from tactical operations

Put a check in the boxes next to the attributes required of any medium which might be used to meet this objective.

*CONDITIONS
- |x| 1. DAY
- |x| 2. NIGHT
- |x| 3. CLEAR VISUAL
- |__| 4. DEGRADED VISUAL

*STANDARDS
- |__| 5. TANK COMBAT TABLES
- |x| 6. INSTRUCTOR EVALUATION
- |x| 7. PERFORMANCE TIME

*EXTERNAL SCENE
- |__| 8. MOVEMENT
- |__| 9. RATE OF CHANGE
- |x| 10. LOCATION
- |x| 11. RECOGNITION
- |__| 12. IDENTIFICATION
- |__| 13. COLOR
- |x| 14. FIELD OF VIEW

*INTERNAL SCENE
- |x| 15. ALPHA NUMERIC DISPLAY
- |x| 16. GRAPHIC DISPLAY
- |x| 17. GAUGE 3D DIGITAL
- |x| 18. INDICATOR ANOLOG
- |x| 19. COLOR LIGHT DISPLAY

*COMMUNICATIONS
- |x| 20. VERBAL/VOICE
- |x| 21. NON-VERBAL SIGNAL
- |x| 22. SOUND/NOISE/TONE

*PHYSICAL CUES
- |x| 23. CONTROL FEEL/TOUCH
- |x| 24. MOTION/MOVEMENT/FORCE

*MENTAL CUES
- |x| 25. DECIDE WEAPON SELECT
- |x| 26. DECIDE MISSION OPTIONS
- |x| 27. RECALL FACTS/RULES

*MISCELLANEOUS
- |x| 28. CREW COORDINATION
- |x| 29. STANDARD OPERATIONS
- |__| 30. DURATION
- |__| 31. FREQUENCY
- |__|

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APPENDIX C

AIMS MEDIA SELECTION PRINTOUTS

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MEDIA SELECTION FOR OBJECTIVE 1.0

	MEDIUM	SPECIFIC RATING	GENERAL RATING
1.	GUARD FIST I	3.913	3.98
2.	MCTFIST	3.522	3.58

MEDIA SELECTION FOR OBJECTIVE 2.0

	MEDIUM	SPECIFIC RATING	GENERAL RATING
1.	GUARD FlST I	4.000	3.98
2.	MCTFIST	4.000	3.58

MEDIA SELECTION FOR OBJECTIVE 3.0

	MEDIUM	SPECIFIC RATING	GENERAL RATING
1.	GUARD FIST I	3.846	3.98
2.	MCTFIST	3.654	3.58

MEDIA SELECTION FOR OBJECTIVE 4.0

	MEDIUM	SPECIFIC RATING	GENERAL RATING
1.	GUARD FIST I	3.867	3.98
2.	MCTFIST	3.600	3.58

MEDIA SELECTION FOR OBJECTIVE 5.0

	MEDIUM	SPECIFIC RATING	GENERAL RATING
1.	GUARD FIST I	3.889	3.98
2.	MCTFIST	3.593	3.58

MEDIA SELECTION FOR OBJECTIVE 6.0

	MEDIUM	SPECIFIC RATING	GENERAL RATING
1.	GUARD FIST I	3.852	3.98
2.	MCTFIST	3.593	3.58

MEDIA SELECTION FOR OBJECTIVE 7.0

	MEDIUM	SPECIFIC RATING	GENERAL RATING
1.	GUARD FIST I	3.833	3.98
2.	MCTFIST	3.600	3.58

MEDIA SELECTION FOR OBJECTIVE 8.0

	MEDIUM	SPECIFIC RATING	GENERAL RATING
1.	GUARD FIST I	3.852	3.98
2.	MCTFIST	3.593	3.58

MEDIA SELECTION FOR OBJECTIVE 9.0

	MEDIUM	SPECIFIC RATING	GENERAL RATING
1.	GUARD FIST I	3.828	3.98
2.	MCTFIST	3.621	3.58

MEDIA SELECTION FOR OBJECTIVE 10.0

	MEDIUM	SPECIFIC RATING	GENERAL RATING
1.	GUARD FIST I	3.821	3.98
2.	MCTFIST	3.607	3.58

MEDIA SELECTION FOR OBJECTIVE 11.0

	MEDIUM	SPECIFIC RATING	GENERAL RATING
1.	GUARD FIST I	3.913	3.98
2.	MCTFIST	3.522	3.58

MEDIA SELECTIONS FOR OBJECTIVES 1.0 TO 11.0
11 TOTAL OBJECTIVES

	# OF OBJECTIVES	% OF OBJECTIVES	MEDIUM
1.	11	100.00	GUARD FIST I
2.	11	100.00	MCTFIST

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APPENDIX D

USER ATTITUDES QUESTIONNAIRES

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USER ATTITUDES QUESTIONNAIRE

THIS QUESTIONNAIRE WAS DEVELOPED TO ASSESS YOUR REACTIONS TO THE DEVICE EFFECTIVENESS TECHNOLOGIES (DET): ASTAR (THE AUTOMATED SIMULATOR TEST AND ASSESSMENT ROUTINE) AND AIMS (AUTOMATED INSTRUCTIONAL MEDIA SELECTION). THE QUESTIONS WILL ADDRESS YOUR ACCEPTANCE OF AND ATTITUDES ABOUT THE USER FRIENDLINESS, AND OVERALL USEFULNESS OF THE DET AS WELL AS YOUR GENERAL FEELINGS REGARDING COMPUTERS.

YOUR COOPERATION IN COMPLETING THIS QUESTIONNAIRE IS VERY IMPORTANT AND GREATLY APPRECIATED.

NAME: Russ Irvine, Rick Levitt

BRANCH/SERVICE
NAME OF COMPANY: _____

WORK PHONE: (_____)_____-_____X_____

AUTOVON _____-_____X_____

NAME OF TRAINING
SYSTEM(S) ANALYZED: Tank Full Crew Interactive Trainers

_____

_____

_____

POINTS OF CONTACT:

NAVAL TRAINING SYSTEM CENTER

RHONWYN CARSON PHONE 380-4829

INSTITUTE FOR SIMULATION AND TRAINING:

DR. MICHAEL COMPANION PHONE 658-5024

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OVERALL ATTITUDES

PLEASE RANK ORDER ASTAR, AIMS, AND YOUR CONVENTIONAL METHOD OF TRAINING EFFECTIVENESS EVALUATION/MEDIA SELECTION WITH REGARD TO THE FOLLOWING (I.E. 1=HIGHEST, 3=LOWEST):

OVERALL UTILITY

_1__ CONVENTIONAL METHOD

_3__ ASTAR

_2__ AIMS

EASE OF USE

_3__ CONVENTIONAL METHOD

_2__ ASTAR

_1__ AIMS

RELEVANCE

_1__ CONVENTIONAL METHOD

_2__ ASTAR

_3__ AIMS

EFFECTIVENESS

_1__ CONVENTIONAL METHOD

_3__ ASTAR

_2__ AIMS

REACTIONS TO ASTAR

PLEASE CIRCLE THE NUMBER ON THE SCALE THAT REPRESENTS YOUR FEELINGS ABOUT THE SPECIFIED FEATURE IN ASTAR.

OVERALL REACTIONS

NOT AT ALL USEFUL — VERY USEFUL
1 2 * 3 4 5 6 7

DIFFICULT — EASY
* 2 3 4 5 6 7

FRUSTRATING — SATISFYING
* 2 3 4 5 6 7

INADEQUATE POWER — ADEQUATE POWER
1 * 3 4 5 6 7

RIGID — FLEXIBLE
1 * 3 4 5 6 7

UNPRODUCTIVE — VERY PRODUCTIVE
1 * 2 3 4 5 6 7

SCREEN

ORGANIZATION OF THE MENUS IS:
ILLOGICAL — LOGICAL
1 * 3 4 5 6 7

LABELS FOR FUNCTIONS WITHIN THE MENUS ARE:
CONFUSING — VERY CLEAR
* 2 3 4 5 6 7

PRESENTATION OF THE QUESTIONS IS:
CONFUSING — VERY CLEAR
1 2 3 4 5 * 6 7

WRITTEN PROMPTS ARE:
NOT AT ALL HELPFUL — VERY HELPFUL
* 2 3 4 5 6 7

TERMINOLOGY

COMPUTER KEEPS YOU INFORMED ABOUT WHAT IT IS DOING:

NEVER						ALWAYS
1	* 2	3	4	5	6	7

LANGUAGE USED IS:

CONFUSING						EASILY UNDERSTOOD
1	2	3	4	*	6	7

USE OF TERMS THROUGHOUT PROGRAM IS:

INCONSISTENT						VERY CONSISTENT
1	2	3	4	5	* 6	7

LEARNING ASTAR

LEARNING TO OPERATE THE SYSTEM IS:

DIFFICULT						EASY
*	2	3	4	5	6	7

EXPLORING NEW FEATURES BY TRIAL AND ERROR IS:

DIFFICULT						EASY
*	2	3	4	5	6	7

INSTRUCTIONAL MATERIALS PROVIDED ARE:

NOT AT ALL HELPFUL						VERY HELPFUL
1	2	*	4	5	6	7

INSTRUCTIONAL MATERIALS PROVIDED ARE:

INCOMPLETE						VERY THOROUGH
1	2	3	* 4	5	6	7

USING ASTAR

TASKS CAN BE PERFORMED IN A STRAIGHT-FORWARD MANNER:

NEVER ALWAYS

1 * 3 4 5 6 7

AUDIO/VISUAL FEEDBACK IS:

NOT AT ALL HELPFUL VERY HELPFUL

1 * 3 4 5 6 7

USER MEMORY REQUIREMENTS ARE:

TOO HIGH VERY LOW

1 * 2 3 4 5 6 7

ERROR MESSAGES PROVIDED ARE:

NOT AT ALL HELPFUL VERY HELPFUL

1 * 2 3 4 5 6 7

ASTAR OUTPUT

ANALYSIS RESULTS ARE:

NOT AT ALL USEFUL VERY USEFUL

* 2 3 4 5 6 7

ANALYSIS RESULTS ARE:

DIFFICULT TO UNDERSTAND EASY TO UNDERSTAND

* 2 3 4 5 6 7

FORMAT OF THE RESULTS IS:

CONFUSING VERY CLEAR

* 2 3 4 5 6 7

COMMENTS (RE: OUTPUT IN GENERAL):

The output is insufficient, scale is inconsistent, ratings are hard to understand, there is no definition of what the ratings are telling you, and you are not given output that can be applied to or presented for decision making. Terms are not clearly defined: and the format should attempt to represent results in simple, constant terms. (i.e., scale changes avoided, ratings defined, sample normative data provided)

ACCEPTANCE OF ASTAR

1. I AM SURE I COULD DO WORK WITH ASTAR.

STRONGLY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	STRONGLY DISAGREE
( )	( )	(*)	(*)

(Subjects disagreed on rating)

2. I EXPECT TO HAVE LITTLE USE FOR ASTAR IN MY DAILY WORK.

STRONGLY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	STRONGLY DISAGREE
(*)	(*)	( )	( )

(Subjects disagreed on rating)

3. ONCE I START TO WORK WITH ASTAR, I WOULD FIND IT HARD TO STOP.

STRONGLY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	STRONGLY DISAGREE
( )	( )	( )	(*)

4. KNOWING HOW TO WORK WITH ASTAR WILL INCREASE MY JOB EFFECTIVENESS.

STRONGLY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	STRONGLY DISAGREE
( )	( )	( )	(*)

5. ANYTHING THAT ASTAR CAN BE USED FOR, I CAN DO JUST AS WELL SOME OTHER WAY.

STRONGLY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	STRONGLY DISAGREE
(*)	( )	( )	( )

6. I WOULD FEEL COMFORTABLE WORKING WITH ASTAR.

STRONGLY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	STRONGLY DISAGREE
( )	( )	( )	(*)

ASTAR

PLEASE ANSWER THE FOLLOWING AS FULLY AS POSSIBLE.

1. WHAT ASPECT(S) OF ASTAR DO YOU LIKE MOST?

The possibility of having a tool to provide quantitative data which could be used in the decision making process, during the design and development of training system, at some future date.

Computer documentation of user tasks performed and hardware (i.e., trainers and weapons platform) controls and displays on IBM compatible software.

WHAT ASPECT(S) OF ASTAR DO YOU LIKE LEAST?

The requirement for double entries of data, and the lack of meaningful quantitative data provided in ASTAR outputs.

Menus are not organized in logical manners to allow free-flow in and out of the process. The output is not stated in meaningful forms.

3. WHAT DO YOU FEEL COULD BE DONE TO IMPROVE ASTAR?

It should be reprogrammed to make it more user friendly and to provide meaningful output.

Simplify menus and allow exit/save features throughout the process: auto-store on to the hard disk drive and floppy. There is no convenient way to save on to the hard disk or on to a different drive then expected by the program.

4. HOW LONG DID IT TAKE YOU TO BECOME COMFORTABLE USING ASTAR?

__ LESS THAN 1 HR __ 1-2 HRS __ 2-3 HRS _*_ MORE THAN 3 HRS

5. CONSIDER THE ULTIMATE DECISIONS MADE ABOUT THE TRAINING SYSTEM(S) ANALYZED USING ASTAR.

DO YOU FEEL THERE WERE THERE DIFFERENCES IN THESE DECISION(S) FROM THOSE WHICH WERE OR WOULD HAVE BEEN MADE USING YOUR CURRENT APPROACH TO TRAINING EFFECTIVENESS EVALUATION OR MEDIA SELECTION?

____YES __*__NO ____UNABLE TO ANSWER

IF YES, TO WHAT EXTENT WAS THE OUTCOME(S) DIFFERENT?

____EXTREMELY DIFFERENT ____VERY DIFFERENT

____MODERATELY DIFFERENT ____ONLY SLIGHTLY DIFFERENT

PLEASE EXPLAIN:

Output data is not presented in a fashion that lends itself to decision making.

Scales not articulated in output: the results would be unclear even if a second trainer were used for comparison (e.g., MCTFIST transfer problem = 10.2, is a lower number representative of a greater problem ? What represents a significant difference?).

REACTIONS TO AIMS

PLEASE CIRCLE THE NUMBER ON THE SCALE THAT REPRESENTS YOUR FEELINGS ABOUT THE SPECIFIED FEATURE IN AIMS.

OVERALL REACTIONS

NOT AT ALL USEFUL — VERY USEFUL
1 2 * 4 5 6 7

DIFFICULT — EASY
1 2 * 4 5 6 7

FRUSTRATING — SATISFYING
1 2 * 4 5 6 7

INADEQUATE POWER — ADEQUATE POWER
1 2 * 4 5 6 7

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ORGANIZATION OF THE MENUS IS:
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LABELS FOR FUNCTIONS WITHIN THE MENUS ARE:
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1 * 3 4 5 6 7

WRITTEN PROMPTS ARE:
NOT AT ALL HELPFUL — VERY HELPFUL
* 2 3 4 5 6 7

TERMINOLOGY

COMPUTER KEEPS YOU INFORMED ABOUT WHAT IT IS DOING:

NEVER						ALWAYS
*	2	3	4	5	6	7

LANGUAGE USED IS:

CONFUSING						EASILY UNDERSTOOD
1	2	*	4	5	6	7

USE OF TERMS THROUGHOUT PROGRAM IS:

INCONSISTENT						VERY CONSISTENT
1	2	*	4	5	6	7

LEARNING AIMS

LEARNING TO OPERATE THE SYSTEM IS:

DIFFICULT						EASY
1	*	3	4	5	6	7

EXPLORING NEW FEATURES BY TRIAL AND ERROR IS:

DIFFICULT						EASY
*	2	3	4	5	6	7

INSTRUCTIONAL MATERIALS PROVIDED ARE:

NOT AT ALL HELPFUL						VERY HELPFUL
1	2	3	*	5	6	7

INSTRUCTIONAL MATERIALS PROVIDED ARE:

INCOMPLETE						VERY THOROUGH
1	2	3	*	5	6	7

USING AIMS

TASKS CAN BE PERFORMED IN A STRAIGHT-FORWARD MANNER:

NEVER						ALWAYS
1	*	3	4	5	6	7

AUDIO/VISUAL FEEDBACK IS:

NOT AT ALL HELPFUL						VERY HELPFUL
*	2	3	4	5	6	7

DEMANDS ON USER MEMORY ARE:

TOO HIGH						VERY LOW
1	*	3	4	5	6	7

ERROR MESSAGES PROVIDED ARE:

NOT AT ALL HELPFUL						VERY HELPFUL
*	2	3	4	5	6	7

AIMS OUTPUT

ANALYSIS RESULTS ARE:

NOT AT ALL USEFUL						VERY USEFUL
*	2	3	4	5	6	7

ANALYSIS RESULTS ARE:

DIFFICULT TO UNDERSTAND						EASY TO UNDERSTAND
*	2	3	4	5	6	7

FORMAT OF THE RESULTS IS:

CONFUSING						VERY CLEAR
1	*	3	4	5	6	7

COMMENTS (RE: SPECIFIC RESULTS SCREENS):

Cannot edit out, change the media or attributes. The specific and general ratings in the results are not explained. How are media rank-ordered when rating results are the same?

AIMS

ACCEPTANCE OF AIMS

PLEASE PLACE AN X IN THE PARENTHESES UNDER THE LABEL WHICH IS CLOSEST TO YOUR AGREEMENT OR DISAGREEMENT WITH THE STATEMENTS

1. I AM SURE I COULD DO WORK WITH AIMS.

STRONGLY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	STRONGLY DISAGREE
( )	(*)	( )	( )

2. I EXPECT TO HAVE LITTLE USE FOR AIMS IN MY DAILY WORK.

STRONGLY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	STRONGLY DISAGREE
( )	( )	(*)	( )

3. ONCE I START TO WORK WITH AIMS, I WOULD FIND IT HARD TO STOP.

STRONGLY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	STRONGLY DISAGREE
( )	(*)	( )	( )

4. KNOWING HOW TO WORK WITH AIMS WILL INCREASE MY JOB EFFECTIVENESS.

STRONGLY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	STRONGLY DISAGREE
( )	(*)	( )	( )

5. ANYTHING THAT AIMS CAN BE USED FOR, I CAN DO JUST AS WELL SOME OTHER WAY.

STRONGLY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	STRONGLY DISAGREE
( )	( )	(*)	( )

6. I WOULD FEEL COMFORTABLE WORKING WITH AIMS.

STRONGLY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	STRONGLY DISAGREE
( )	(*)	( )	( )

AIMS

PLEASE ANSWER THE FOLLOWING AS FULLY AS POSSIBLE.

1. WHAT ASPECT(S) OF AIMS DO YOU LIKE MOST?

The task worksheet of AIMS provides attributes matrix which is a good checklist for building a media pool.

2. WHAT ASPECT(S) OF AIMS DO YOU LIKE LEAST?

The output is not clear or useful; what do the numbers mean?

3. WHAT DO YOU FEEL COULD BE DONE TO IMPROVE AIMS?

There could be a established list of selectable attributes that have ratings already in the pool.

4. HOW LONG DID IT TAKE YOU TO BECOME COMFORTABLE USING AIMS?

___ LESS THAN 1 HR ___ 1-2 HRS ___ 2-3 HRS _*__ 3 OR MORE HRS

5. CONSIDER THE ULTIMATE DECISIONS MADE ABOUT THE TRAINING SYSTEM(S) ANALYZED USING AIMS. WERE THERE DIFFERENCES IN THESE DECISION(S) FROM THOSE WHICH WERE OR WOULD HAVE BEEN MADE USING YOUR CURRENT APPROACH TO TRAINING EFFECTIVENESS EVALUATION OR MEDIA SELECTION?

____YES __*__NO ____UNABLE TO ANSWER

IF YES, TO WHAT EXTENT WAS THE OUTCOME(S) DIFFERENT?

____EXTREMELY DIFFERENT ____VERY DIFFERENT

____MODERATELY DIFFERENT ____ONLY SLIGHTLY DIFFERENT

PLEASE EXPLAIN:

Significant differences in specific/generic ratings not clear.

COMFORT WITH COMPUTERS

BELOW ARE A SERIES OF STATEMENTS. PLACE AN X IN THE PARENTHESES UNDER THE LABEL WHICH IS CLOSEST TO YOUR AGREEMENT OR DISAGREEMENT TO THE STATEMENTS.

1. MY PAST EXPERIENCE WITH COMPUTERS HAS NOT BEEN VERY GOOD.

STRONGLY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	STRONGLY DISAGREE
( )	( )	( )	(*)

2. I LIKE TO WORK WITH COMPUTERS.

STRONGLY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	STRONGLY DISAGREE
(*)	( )	( )	( )

3. I USE COMPUTERS MANY WAYS IN MY WORK.

STRONGLY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	STRONGLY DISAGREE
(*)	( )	( )	( )

4. WORKING WITH A COMPUTER MAKES ME VERY NERVOUS.

STRONGLY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	STRONGLY DISAGREE
( )	( )	( )	(*)

5. I WOULD FEEL OKAY ABOUT TRYING A NEW PROBLEM ON A COMPUTER.

STRONGLY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	STRONGLY DISAGREE
(*)	( )	( )	( )

6. I HAVE A LOT OF SELF-CONFIDENCE WHEN WORKING WITH COMPUTERS.

STRONGLY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	STRONGLY DISAGREE
(*)	( )	( )	( )

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