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ASTAR Operational Evaluation Final Report Volume II: Study Reports

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ASTAR OPERATIONAL EVALUATION

FINAL REPORT

Volume II: Study Reports

Final Report
CDRL AOO3

April 13, 1990
(Revised May 11, 1990)
Prepared under Contract Number 61339-89-C-0029
for
Naval Training Systems Center

Institute for Simulation and Training
12424 Research Parkway, Suite 300
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University of Central Florida
Division of Sponsored Research

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ASTAR OPERATIONAL EVALUATION

FINAL REPORT

VOLUME II: SUPPORT STUDIES

Final Report

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Michael Companion

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FOREWORD

The research report herein was conducted for the United States Navy by the University of Central Florida, Institute for Simulation and Training under Contract Number 61339-89-C-0029. The Naval Training Systems Center, Orlando, Florida, administered the contract which was sponsored by the Joint Service Committee on Manpower and Training Technology. The contract was to perform an ASTAR Phase III Test and Evaluation, and to produce a Final Report and Transition Plan. The research reported on in this report was performed between the period May 1989 and April 1990.

The Final Report, a three volume set, covers the one year effort to test and evaluate the Automated Simulator Test and Assessment Routine (ASTAR) under operational conditions. ASTAR was compared to a related Device Effectiveness Technique (DET), the Automated Instructional Media Selection (AIMS) system. **Volume I: Project Summary**, contains an overview of the entire evaluation effort which includes summaries of all the studies conducted. **Volume II: Study Reports**, contains a full, comprehensive report of all Operational, Longitudinal and Analytic studies conducted in support of this research effort. **Volume III: Functional Description**, is a comprehensive system specification of the recommended improvements for a new ASTAR, ASTAR II.

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OPERATIONAL STUDY #1

USMC M60A1 Tank Trainer

Technical Interim Report
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OPERATIONAL STUDY # 1:

M60A1 MAIN BATTLE TANK

Technical Interim Report

CDRL A006

Robert Bird

Steven Gibbons

Michael A. Companion

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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 <u>AIMS</u>

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 <u>Study Training Devices</u>

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 **<u>MCTFIST</u>**. 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 Player - provides 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 CRTs 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 CRTs 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 seargeant 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, there should be a significant transfer problem for the GUARD FIST I since it is designed 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

<u>MCTFIST Trainer</u>

Training Problem	32.86	
Acquisition-Efficiency	.91	
Acquisition		36.11
Transfer Problem	20.15	
Transfer Efficiency	.97	
Transfer		20.77
Sum		56.88

<u>GUARD FIST I Trainer</u>

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 visualize 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 there 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 subjects 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 subjects' reactions to the use of the two techniques. The questions addressed the analysts'/SMEs' 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 score 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 of 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 subjects 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: 2.0

Objective: Communicate using intercom/radio

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
- [x] 6. INSTRUCTOR EVALUATION
- [x] 7. PERFORMANCE TIME

*EXTERNAL SCENE
- [x] 8. MOVEMENT
- [x] 9. RATE OF CHANGE
- [x] 10. LOCATION
- [x] 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
- [x] 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
- [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: 3.0

Objective: View/monitor terrain

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
- |x_| 21. NON-VERBAL SIGNAL
- |__| 22. SOUND/NOISE/TONE

*PHYSICAL CUES
- |__| 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: 4.0

Objective: Drive/operate tank

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
- |__| 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
- |x_| 30. DURATION
- |x_| 31. FREQUENCY
- |__|

SELECTION WORKSHEET FOR USE WITH THE FILE : M60

Objective Number: 5.0

Objective: Acquire/identify targets

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
- |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
- |x_| 30. DURATION
- |x_| 31. FREQUENCY
- |__|

SELECTION WORKSHEET FOR USE WITH THE FILE : M60

Objective Number: 6.0

Objective: Conduct direct fire precision 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: 7.0

Objective: Conduct direct fire battlesight 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
|x_| 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: 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 FIST 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

TABLE OF CONTENTS

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

ASTAR

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

ASTAR

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

RIGID — FLEXIBLE
1 2 3 * 5 6 7

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

PRESENTATION OF THE QUESTIONS IS:
CONFUSING — VERY CLEAR

1 * 3 4 5 6 7

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

AIMS

TERMINOLOGY

COMPUTER KEEPS YOU INFORMED ABOUT WHAT IT IS DOING:

NEVER * 2 3 4 5 6 7 ALWAYS

LANGUAGE USED IS:

CONFUSING 1 2 * 4 5 6 7 EASILY UNDERSTOOD

USE OF TERMS THROUGHOUT PROGRAM IS:

INCONSISTENT 1 2 * 4 5 6 7 VERY CONSISTENT

LEARNING AIMS

LEARNING TO OPERATE THE SYSTEM IS:

DIFFICULT 1 * 3 4 5 6 7 EASY

EXPLORING NEW FEATURES BY TRIAL AND ERROR IS:

DIFFICULT * 2 3 4 5 6 7 EASY

INSTRUCTIONAL MATERIALS PROVIDED ARE:

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

INSTRUCTIONAL MATERIALS PROVIDED ARE:

INCOMPLETE 1 2 3 * 5 6 7 VERY THOROUGH

AIMS

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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IST-TR-90-02

OPERATIONAL STUDY #2

Seawolf Internal Auxiliary Launcher

Technical Interim Report
CDRL AOO7

January 19, 1989
(Revised February 14, 1990)
Prepared under Contract Number 61339-89-C-0029
for
Naval Training Systems Center

Institute for Simulation and Training
12424 Research Parkway, Suite 300
Orlando FL 32826

University of Central Florida
Division of Sponsored Research

IST-TR-90-02

OPERATIONAL STUDY #2:

SEAWOLF INTERNAL AUXILIARY LAUNCHER

Technical Interim Report

CDRL A007

Michael A. Companion

Merrell Bailey

January 19, 1990

(Revised February 14, 1990)

Prepared under Contract Number 61339-89-C-0029

for the Naval Training System Center

by

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Institute for Simulation and Training

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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 training analysts from Newport News Shipbuilding, located at Newport News, Virginia. The analysts were asked to use and evaluate ASTAR and AIMS and compare them to the existing methodologies used by Newport News Shipbuilding. The specific subsystem used in the study was the SEAWOLF IAL (Internal Auxiliary Launcher) System. A combination of questionnaires, self-initiated logs and actual results derived from the use of the two device evaluation techniques were used to gather data on ASTAR and AIMS. The findings indicated that while both programs were perceived to have benefits, they both had shortcomings. Of the two AIMS appeared to have higher acceptability than ASTAR. ASTAR was perceived as extremely unfriendly. Both DET were developed several years ago and do not reflect current state-of-the-art software and interface designs. In both cases, almost all of the negative features cited could be corrected by updating the programs to make use of current guidelines in software design and human computer interface design. A number of specific suggestions for changes to the programs which would improve user acceptance were elicited during the study.

1.0 INTRODUCTION

An operational study evaluating the utility of ASTAR (Automated Simulator Test and Assessment Routine) and AIMS (Automated Instructional Media Selection) programs was conducted with the assistance of training analysts from Newport News Shipbuilding, located at Newport News, Virginia. These analysts were asked to evaluate ASTAR and AIMS in terms of their utility in the Instructional System Design (ISD) process. Newport News Shipbuilding is in the process of conducting an extensive training system development activity for the Navy's new SEAWOLF class of submarine. This submarine is under development at this time, so no actual operational systems are currently in the Navy inventory. The specific subsystem used in the study was the SEAWOLF IAL (Internal Auxiliary Launcher) System. The analysts were asked to compare ASTAR and AIMS to the existing methodologies used by Newport News Shipbuilding. A combination of questionnaires, self-initiated logs and actual results derived from the use of the two device evaluation techniques were used to gather data on ASTAR and AIMS.

The main purpose of these studies was to evaluate ASTAR and AIMS in the actual operational environment by individuals (training analysts and/or subject matter experts) who would use such programs once distributed. The objectives of the project were to demonstrate the operational utility of ASTAR, develop a transition plan to implement ASTAR as an operational technique, and compare and contrast ASTAR, AIMS and traditional design methodologies. The subsystem addressed during this operational study is an actual system for which the training requirements will be finalized during the course of the SEAWOLF 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 SEAWOLF IAL

The function of the Seawolf Internal Auxiliary Launcher (IAL) System is to launch both six-inch and three-inch devices for evasion, environmental monitoring, communications or signaling. This system consists of twin launchers for expelling various devices such as torpedo countermeasures ETC-1, NAE beacons MK3, and various signal flares and smokes. Bathythermographs, used to record certain water conditions, and communication buoys also may be launched by the system.

The IAL system consists of the following equipment: IAL barrel assemblies, ram ejection pump (REP) assembly, seawater impulse valve assembly, equalization hull and backup equalization valves, muzzle/shutter combination, firing air regulator/control, impulse air flask and REP service air assembly, the Launcher Control and Display Panel (LCDP) and the Command Control Panel (CCP).

The IAL system can be operated in a semiautomatic mode, with both tethered and non-tethered device launch capabilities. The IAL system can also be operated with a hand pump, manually overridden, or launch a device with a hand rammer. Differing equipment and training requirements are necessary for each method of operation. The training option used for this study was manual operation by a hand pump.

Two alternate types of training devices being considered were selected for the ASTAR analysis. The first potential training device was labeled the 2-D device. This training device would be a flat panel representation of the IAL with actuators and indicators. It would have operable controls and provide feedback to the operator. The second potential training device, labeled the 3-D device, would be a full scale, 3 dimensional mockup of the IAL with operational controls. In addition to the actual shape, depth and dimensions, the 3-D trainer would provide pressures, sounds, movements, doors, latches, and other elements to replicate the actual operational equipment. The 3-D device would also permit the launch items to be loaded into the training device.

2.0 APPROACH

2.1 Subjects

Three subjects from Newport News Shipbuilding participated in the study. One of the subjects was solely a training program developer, while the other two subjects had both ISD and subject matter expertise. The section of the User Attitudes Questionnaire addressing comfort with computers indicated that the subjects were all highly experienced in the use of computers as part of their job and were comfortable in their use.

2.2 Procedure

Training on the use of ASTAR and AIMS was conducted on-site at Newport News Shipbuilding over a two day period. The two Device Evaluation Techniques (DET) were demonstrated to the subjects with hands on experience provided through a sample exercise. Questions were answered as necessary. The same sample exercise was used in familiarization for both ASTAR and AIMS. In addition to copies of the two DET, the subjects were provided copies of an AIMS user manual, an ASTAR abbreviated user manual, an ASTAR reference user manual and copies of the ASTAR questions.

A period of several weeks lapsed between the initial training and the conduct of the study due to schedule demands at Newport News Shipbuilding. IST personnel were not present during the conduct of the study, though they were available by phone to answer questions as necessary.

Newport News Shipbuilding was asked to choose an area of the IAL for evaluation that was both mission critical and familiar to those involved with the past and current class of submarine. In response, Newport News Shipbuilding chose task identification number C008, "Operate IAL with the Hand Pump". This task would be performed under casualty/degraded/abnormal modes of operation, and requires twenty steps, with six substeps. A copy of the Job Task Analysis Summary is included in Appendix A and a copy of the skills analysis for this task is provided in Appendix B. The subtasks were not used for evaluation purposes. Based on this data, Newport News Shipbuilding with assistance from IST, developed the ASTAR and AIMS data bases for the study.

The operational study was conducted by the Newport News Shipbuilding personnel over a period of several days. They conducted both ASTAR and AIMS analyses during this period of time. The AIMS analysis was conducted as a standard instructional media selection analysis for the IAL task set described below. The ASTAR analysis compared the 2-D and 3-D IAL training devices previously described. During the conduct of the study, the subjects maintained logs documenting their use of the two DET, including any problems encountered. At the end of the study, the subjects filled out User Attitudes Questionnaires. The logs, questionnaires, and resulting ASTAR and AIMS data were forwarded to IST and are described in the subsequent sections of this report.

2.3 Study Materials

A number of data items were developed as part of the study. The first data item developed was an IAL task list that could be used for both the ASTAR and AIMS evaluations. The task list represent the task information necessary for an ASTAR analysis and the training objectives for the AIMS analysis. The number of tasks selected is driven by the limits of ASTAR, which becomes time consuming if the number of tasks and subtasks exceed twenty. The IAL task analysis in Appendix A was used to derive the task list in Table 1. While subtasks are identified in this table, only the top level tasks were used in the analyses. For the ASTAR analysis, the task data was supplemented by the IAL skills analysis, Appendix B, as needed to answer the ASTAR questions. NOTE: Only ASTAR level 1 and 2 analyses were conducted as part of the study due to the stage of system development, i.e., an ASTAR level 3 analysis was inappropriate. Hence, a control and display list was not developed for the training device options and operational system as part of the study materials.

In preparation for the AIMS evaluation on Seawolf IAL, the default AIMS database was updated. A list of twenty-five media was developed representative of current media approaches. The candidate list is presented in Table 2. An updated list of 60 attributes covering ten topic areas was developed. Based on this attribute list the AIMS DET was used to print out worksheets to be used in identifying the critical attributes for each training objective. Table 3 presents the Seawolf IAL AIMS worksheet which lists the total attribute pool by topic area. For each training objective (task), the critical attributes were identified using the worksheets for input into the AIMS instructional media selection routine. The completed set of AIMS worksheets for the Seawolf analysis is provided in Appendix D. Since both the media pool and attribute pool were modified, a new AIMS Media/Attribute Rating Matrix was develop which is included as Appendix C of this report.

TABLE 1

IAL TASK LIST

1.0 Prepare IAL for manual hydraulic operation
- 1.1 Establish communication with Command and Control Center
- 1.2 Energize LCDP, position Power On Switch to "ON"
- 1.3 Position Manned/Off Switch to "MANNED"
- 1.4 Position Station Control Switch to "CCP"
- 1.5 Position Device Type Knob to appropriate position
- 1.6 Position Launch Mode Switch to "QUIET" or "NORMAL"

2.0 LCDP: Ensure Vent and Drain Valve "SHUT" Lights are "ON"
- 2.1 LCDP: If not, override Hydraulic Valve Actuator, Shut Handpump Valve

3.0 Open Breech Door and inspect barrel
- 3.1 Prepare device for launch in accordance with appropriate NWP

4.0 Load device and shut Breech Door

5.0 Position Load/Loaded Switch to "LOADED"

6.0 Hydraulic Valve Actuator: Override and handpump "OPEN" RAM Eject Pump Door
- 6.1 Ensure Eject Pump Door Open Light is "ON"

7.0 At Flood Valve, open valve until solid stream of water is vented
- 7.1 Ensure Barrel Flooded Valve Light is "ON"

8.0 Override and handpump shut the IAL Flood Valve

9.0 Handpump "OPEN" the Equalization Valve and ensure Equalization Valve Light is "ON"

10.0 Check Equalization and Flood Line Pressure Gauges to ensure same pressure

11.0 Handpump "OPEN" the Muzzle Door
- 11.1 Pin lock "OPEN" the Muzzle Door Control Valve
- 11.2 Handpump "OPEN" the Muzzle Door and ensure its light is "ON"

12.0 Ensure Impulse Isolation Door opens to appropriate launcher and light is "ON"

13.0 LCDP: Ensure RAM Position Light is on "BATTERY"

14.0 Position Load/Loaded Switch to "LOADED" and ensure light is "ON"

15.0 Manually override Firing Valve Hydraulic Interlocks

16.0 Launch device using Launch Switch

17.0 Monitor Indicators for "LAUNCHED" indicators

18.0 Handpump Muzzle Door to "SHUT" and ensure Shut Door Light is "ON"

19.0 Handpump shut the Seawater Impulse Isolation Valve and ensure light is "ON"

20.0 Handpump Open Vent/Drain Valves and drain barrel to Gravity System

TABLE 2

AIMS MEDIA LIST FOR SEAWOLF

1. Interactive Lecture
2. Mediated Interactive Lecture
3. Chalkboard
4. Poster
5. Wall Chart
6. Printed Handout
7. Programmed Text
8. Workbook
9. Checklist
10. Technical Manual
11. Overhead Transparency
12. Audiotape
13. Film
14. Videotape
15. Slides
16. Slide/tape
17. Random Access Slide
18. Computer Aided Instruction
19. Computer Managed Instruction
20. Interactive Video Disk
21. Model
22. Mockup
23. Part Task Trainer
24. Whole Task Trainer
25. Operational Equipment

TABLE 3

AIMS WORKSHEET/ATTRIBUTES LIST FOR SEAWOLF

SELECTION WORKSHEET FOR USE WITH THE FILE : seawolf

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.

*TYPE OF LEARNING
|__| 1. PSYCHOMOTOR
|__| 2. AFFECTIVE(ATTITUDINAL)
|__| 3. CONCEPTUAL
|__| 4. PROCEDURAL
|__| 5. DECISION MAKING

*DISPLAY CHARACTERISTICS
|__| 6. VERBAL/TEXT
|__| 7. PHOTOGRAPHS
|__| 8. DRAWINGS
|__| 9. DIAGRAMS
|__| 10. GRAPHICS
|__| 11. ANIMATION
|__| 12. COLORS
|__| 13. VISUAL MOTION(CONSTANT)
|__| 14. VISUAL MOTION(VARIABLE)
|__| 15. AUDIO(VOICE)
|__| 16. FIELD OF VIEW
|__| 17. PHYSICAL SIMILARITY
|__| 18. FUNCTIONAL SIMILARITY
|__| 19. FIDELITY/REALISM
|__| 20. INDICATORS/GAUGES
|__| 21. TACTILE CUES
|__| 22. KINESTHETIC CUES

*RESPONSE MODE
|__| 23. VERBAL/WRITTEN RESPONSE
|__| 24. VOICE RESPONSE
|__| 25. DECISION INDICATORS
|__| 26. FINE MOTOR RESPONSE
|__| 27. GROSS MOTOR RESPONSE
|__| 28. TRACKING RESPONSE
|__| 29. MANIPULATIVE RESPONSE
|__| 30. PHYSICAL SIMILARITY
|__| 31. FUNCTIONAL SIMILARITY
|__| 32. FIDELITY/REALISM
|__| 33. CONTINUOUS RESPONSE

*EVALUATION MODE
|__| 34. INSTRUCTOR EVALUATION
|__| 35. SELF EVALUATION
|__| 36. PEER EVALUATION
|__| 37. AUTOMATED EVALUATION
|__| 38. VERBAL/WRITTEN EVALUATI
|__| 39. IMMEDIATE ON RESPONSE
|__| 40. IMMEDIATE ON ERROR
|__| 41. POST-SESSION EVALUATION
|__| 42. FAULT INSERTION

*ENVIRONMENTAL CONDITIONS
|__| 43. PHYSICAL MOTION
|__| 44. NOISE
|__| 45. LIGHTING
|__| 46. VIBRATION
|__| 47. RESTRICTIVE CLOTHING

*LEARNING LEVELS
|__| 48. A. FAMILIARITY
|__| 49. B. PERFORM PROCEDURE
|__| 50. C. PERFORM JOB
|__| 51. D. PERFORM MISSION

*SPECIAL REQUIREMENTS
|__| 52. CREW/TEAM INTERACTION
|__| 53. RANDOM ACCESS LOGIC

*COMMUNICATIONS
|__| 54. VERBAL/VOICE
|__| 55. NON-VERBAL/SIGNAL
|__| 56. SOUND/NOISE/SIGN

*PERFORMANCE CRITERIA
|__| 57. SOP'S
|__| 58. TIME
|__| 59. ACCURACY

*SCENARIO DEVELOPMENT
|__| 60. INTERACTIVE

3.0 **RESULTS**

3.1 ASTAR Evaluation

Two potential training devices, a 2-D and 3-D training devices as previously described, were evaluated by the analysts. The subjects conducted both ASTAR level 1 and 2 analyses for the two potential training devices comparing them to the projected operational Seawolf IAL system. The subjects assigned consensus ratings to each of the ASTAR questions. The ratings were used as input into the ASTAR program. Evaluation summaries were produced for each of the two trainer options. For the ASTAR level 2 analysis an evaluation summary was computed only at the task level, since subtask were not included in the ASTAR data base. The resulting evaluation summaries from the ASTAR level 1 and ASTAR level 2 analyses are presented in Figures 1 and 2 respectively.

Overall, both ASTAR level evaluations indicate that the 3-D trainer has a better predicted training effectiveness than the 2-D trainer. The difference in the composite scores for the two training device appears small on an absolute basis, though about 20 percent on a relative basis. However, both trainer alternatives achieved apparently good scores based on the ASTAR metrics.

A examination of the ASTAR level 1 evaluation summaries shows that the summary score of training effectiveness for the two dimensional trainer is 26.23, and for the three dimensional trainer, 22.55. Therefore, at an ASTAR level 1, a three dimensional trainer is predicted to be more effective in this situation than a two dimensional trainer. The training problem subscore is identical for both devices, which is normal for most situations. This score is relatively low because the trainees are expected to enter the training environment with a small performance deficit and it is predicted that the learning difficulty of the task is low. The 3-D device is predicted to have both a higher acquisition efficiency and transfer efficiency as a result of the higher fidelity of the trainer. The 2-D training device, in comparison to the 3-D training device, received higher scores in both acquisition effectiveness (26.21 vs. 22.54) and transfer effectiveness (.02 vs. .01). These two factors are responsible for the overall advantage that ASTAR projects for the 3-D training device over the 2-D training device. Though the 2-D training device was rated considerably lower than the 3-D training device on both functional and physical similarity, the ASTAR metrics for the transfer problem did not reflect a difference as a result of the low residual deficit and residual learning difficulty.

The same overall result was found using ASTAR level 2. The 2-D training received an overall score of 25.95 and the 3-D training device received an overall score of 22.31. The composite scores are slightly lower than the ASTAR 1 scores because input of ratings on a task by task basis in ASTAR 2 provides a higher degree of granularity in the assessment. The

ASTAR 1 EVALAUTIONS

IAL 2D TRAINER

Performance Deficit	98		
Learning Difficulty	23		
Training Problem		22.54	
Quality of Training-Acquisition	75		
Acquisition-Efficiency		.86	
Acquisition			26.21
Residual Deficit	1		
Residual Learning Difficulty	1		
Physical Similarity	8		
Functional Similarity	48		
Transfer Problem		.01	
Quality of Training-Transfer	33		
Transfer Efficiency		.57	
Transfer			.02
sum			26.23

IAL 3D TRAINER

Performance Deficit	98		
Learning Difficulty	23		
Training Problem		22.54	
Quality of Training-Acquisition	100		
Acquisition-Efficiency		1.00	
Acquisition			22.54
Residual Deficit	1		
Residual Learning Difficulty	1		
Physical Similarity	73		
Functional Similarity	98		
Transfer Problem		.01	
Quality of Training-Transfer	67		
Transfer Efficiency		.81	
Transfer			.01
sum			22.55

Figure 1. Evaluation summary for the ASTAR 1 analysis.

ASTAR 2 EVALUATIONS

IAL 2D TRAINER

Training Problem	22.30	
Acquisition-Efficiency	.86	
Acquisition		25.93
Transfer Problem	.01	
Transfer Efficiency	.57	
Transfer		.02
sum		25.95

IAL 3D TRAINER

Training Problem	22.30	
Acquisition-Efficiency	1.00	
Acquisition		22.30
Transfer Problem	.01	
Transfer Efficiency	.81	
Transfer		.01
sum		22.31

Figure 2. Evaluation summary for the ASTAR 2 analysis.

difference in ASTAR level 1 and level 2 scores in this study is a function of changes in the training problem subscore. The subscores for acquisition efficiency, transfer problem and transfer efficiency are the same for both the ASTAR level 1 and level 2 analyses.

3.2 AIMS Evaluation

The AIMS analysis was conducted with a pool of 25 media and 60 attributes presented in Tables 2 and 3 of Section 2.3, Study Materials, the media/attribute rating matrix in Appendix C and the critical attributes worksheets in Appendix D. The analysts completed a critical attributes worksheet for each of the 20 objectives, i.e., top level tasks, in Table 1 of Section 2.3, Study Materials.

The worksheet data was entered into the AIMS instructional media selection routine. Table 4 presents the summary output from the AIMS analysis. Of the potential pool of 25 media, only a subset of eight were selected as acceptable media for the Seawolf training objectives. Of the eight, five were selected as possible media for all twenty of the learning objectives, while one was selected for nineteen of the objectives and the remaining two were selected as acceptable for thirteen of the objectives. Overall, a combination of classroom and equipment type trainers were selected.

TABLE 4

SUMMARY TABLE OF AIMS SELECTED MEDIA

MEDIA SELECTIONS FOR OBJECTIVES 1.0 TO 20.0
20 TOTAL OBJECTIVES

	# OF OBJECTIVES	% OF OBJECTIVES	MEDIUM
1.	20	100.0	PART TASK TRAINER
2.	20	100.0	INTERACTIVE VIDEO DISK
3.	20	100.0	COMPUTER MANAGED INSTRUCTION
4.	20	100.0	COMPUTER AIDED INSTRUCTION
5.	20	100.0	MEDIATED INTERACTIVE LECTURE
6.	19	95.0	WHOLE TASK TRAINER
7.	13	65.0	OPERATIONAL EQUIPMENT
8.	13	65.0	MOCKUP

Table 5 presents several instructional media selections for individual objectives. The total set of media selections by objective is included in Appendix E. For each objective the media which met all of the critical attributes were selected as candidate media. The AIMS program computes two ratings; a specific rating which is the average rating on the critical attributes for that objective and a general rating with is the average rating on all sixty attributes. The ratings vary between 0.0 and 5.0. The AIMS program sorts and prints the selected media in descending order based on the specific rating. Between five and eight media were selected for each objective.

The media selections for the three objectives presented in Table 5 are representative of the outcomes across all twenty objectives. They show that the selected set of media, order of selected media and specific ratings vary across objectives based on the critical attributes for that objective. The one anomalous selection is Mediated Interactive Lecture (MIL) which was always selected as the best choice. This results from the definition of MIL used in the study. MIL was lecture combined with any of the other media. Hence, this combination of two media always had an advantage. After MIL, all but one of the second choices were either whole task trainer or operational equipment. The only exception was the selection of Interactive Video Disk as the second choice for Objective 1.0.

In relation to the ASTAR analysis conducted as part of this operational study, the 2-D and 3-D basically correspond to the mockup and part-task trainers respectively in the AIMS media pool. The 2-D configuration used for the ASTAR analysis has slightly higher realism than the definition of mockup in the AIMS media pool. In the AIMS analysis, the part-task trainer was selected for all twenty of the training objectives, while the mockup was selected as acceptable for only thirteen of the Seawolf training objectives for the manual IAL. The mockup was never rated higher than fifth within the set of selected media and was always rated lower than the part task trainer. Therefore, the AIMS analysis agrees with the ASTAR analysis that the 3-D training device is a better option for training the manual operation of the Seawolf IAL.

3.3 <u>User Attitudes Questionnaire</u>

A user attitudes questionnaire was developed to assess the analysts reactions to the DET for both ASTAR and AIMS. The questions addressed the analysts' acceptance of and attitudes about the user friendliness and overall usefulness of the DET as well as the analysts general feelings regarding computers. A copy of the questionnaire with the composite ratings and comments for the Seawolf Operational Study can be found in Appendix F.

3.3.1 **<u>OVERALL ATTITUDES</u>**. The two systems were evaluated against each other and also against the analysts' conventional methods of evaluating training effectiveness and selecting media. Overall attitudes were assessed in four categories: "overall utility", "ease of use", "relevance", and "effectiveness". The analysts were asked to rank-order ASTAR, AIMS, and the conventional method by assigning either a one, a two, or a three to each method, with one equal to the highest rating, and three equal to the lowest.

TABLE 5

SAMPLE MEDIA SELECTIONS
FOR
SEAWOLF TRAINING OBJECTIVES

MEDIA SELECTION FOR OBJECTIVE 1.0
[Prepare IAL for Manual Hydraulic Operation]

	MEDIUM	SPECIFIC RATING	GENERAL RATING
1.	MEDIATED INTERACTIVE LECTU	4.933	4.91
2.	INTERACTIVE VIDEO DISK	3.600	3.15
3.	COMPUTER AIDED INSTRUCTION	3.400	2.81
4.	PART TASK TRAINER	3.333	3.35
5.	COMPUTER MANAGED INSTRUCTI	3.267	2.58

MEDIA SELECTION FOR OBJECTIVE 2.0
[LCDP: Ensure Vent & Drain VLV Shut Lights are ON]

	MEDIUM	SPECIFIC RATING	GENERAL RATING
1.	MEDIATED INTERACTIVE LECTU	5.000	4.91
2.	WHOLE TASK TRAINER	4.500	3.86
3.	PART TASK TRAINER	3.600	3.35
4.	INTERACTIVE VIDEO DISK	3.400	3.15
5.	COMPUTER AIDED INSTRUCTION	3.300	2.81
6.	COMPUTER MANAGED INSTRUCTI	3.100	2.58

MEDIA SELECTION FOR OBJECTIVE 3.0
[Open Breech Door and Inspect Barrel]

	MEDIUM	SPECIFIC RATING	GENERAL RATING
1.	MEDIATED INTERACTIVE LECTU	5.000	4.91
2.	OPERATIONAL EQUIPMENT	4.909	4.03
3.	WHOLE TASK TRAINER	4.273	3.86
4.	PART TASK TRAINER	3.364	3.35
5.	MOCKUP	3.364	2.35
6.	INTERACTIVE VIDEO DISK	3.273	3.15
7.	COMPUTER AIDED INSTRUCTION	3.091	2.81
8.	COMPUTER MANAGED INSTRUCTI	3.000	2.58

The users' attitudes were identical in the areas of overall utility, ease of use, and relevance. The conventional method was given the highest ranking in these areas. AIMS was considered second best; ASTAR was ranked lowest in all three categories.

In the effectiveness category, however, the results were markedly different. In this category, AIMS achieved the highest ranking. ASTAR was considered the next most effective method. The conventional method was ranked as least effective of the three methods. The rating of AIMS and ASTAR as more effective than the conventional method is a positive finding. The rankings in the other categories appear to reflect the perceived shortcomings of the two DET in their current format.

3.3.2 **REACTIONS TO ASTAR**. The following sections summarize the analysts' reactions to ASTAR in seven areas. In each section a synopsis of the ratings is provided followed by the actual rating scales for that area. The analysts' composite rating is indicated by an "*" on the rating scale.

3.3.2.1 Overall Reactions. The analysts' overall reactions to ASTAR were that ASTAR is difficult, frustrating, and unproductive. Ratings were achieved only after much effort. ASTAR was perceived as rather rigid because, after the model was built, the analysts could not edit it without crashing the file. A positive finding was that ASTAR was believed to have adequate power; however, the analysts suggested the addition of an interface to a word processor and a database package. The overall ratings reflect that ASTAR is not a user friendly program. It is relatively old and does not reflect current software practices. That users still feel that there is something there suggests that if ASTAR was updated to incorporate a better user interface, then it might be accepted by analysts. For example, it was suggested to interface ASTAR to a wordprocessor or standard data base package to aid in the data base development.

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

UNPRODUCTIVE VERY PRODUCTIVE
* 2 3 4 5 6 7

3.3.2.2 Screen. The analysts also evaluated ASTAR's screens. They gave average ratings to the menus organization, the clarity of the questions, and clarity of the function labels. The analysts indicated that overall the written prompts are helpful, but prompts associated with the build function and the entry of tasks are confusing, especially when the user is prompted to enter a title.

ORGANIZATION OF THE MENUS IS:
ILLOGICAL LOGICAL
1 2 3 4 * 6 7

LABELS FOR FUNCTIONS WITHIN THE MENUS ARE:
CONFUSING VERY CLEAR
1 2 3 4 * 6 7

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

WRITTEN PROMPTS ARE:
NOT AT ALL HELPFUL VERY HELPFUL
1 2 3 * 5 6 7

3.3.2.3 Terminology. The analysts did not prefer ASTAR's terminology. They indicated that the computer does not inform the user of what it is doing, the language used is confusing (especially the use of jargon), and the use of terms throughout the program is inconsistent. Terminology is a general problem, since each application environment tends to have its own jargon. Creation of a generic terminology is difficult.

COMPUTER KEEPS YOU INFORMED ABOUT WHAT IT IS DOING:
NEVER ALWAYS
1 * 3 4 5 6 7

LANGUAGE USED IS:
CONFUSING EASILY UNDERSTOOD
1 * 3 4 5 6 7

USE OF TERMS THROUGHOUT PROGRAM IS:
INCONSISTENT VERY CONSISTENT
1 * 3 4 5 6 7

3.3.2.4 Learning ASTAR. The analysts believe that learning ASTAR is difficult. The instructional materials provided were considered incomplete and not helpful. Exploring new features by trial and error was considered difficult, and resulted in lost data. The complexity of ASTAR and programming conventions have a large influence in this evaluation. In addition, as noted previously, a lengthy period of time lapsed between the original training on ASTAR and the conduct of the operational study which may also have influenced this evaluation.

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
*	2	3	4	5	6	7

INSTRUCTIONAL MATERIALS PROVIDED ARE:

INCOMPLETE						VERY THOROUGH
*	2	3	4	5	6	7

3.3.2.5 Using ASTAR. The analysts felt that ASTAR usually allows tasks to be performed in a straightforward manner, and that the audio/visual feedback is relatively helpful. However, the user memory requirements are believed to be too high, and the error messages provided were not particularly helpful.

TASKS CAN BE PERFORMED IN A STRAIGHTFORWARD MANNER:

NEVER						ALWAYS
1	2	3	4	*	6	7

AUDIO/VISUAL FEEDBACK IS:

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

USER MEMORY REQUIREMENTS ARE:

TOO HIGH						VERY LOW
*	2	3	4	5	6	7

ERROR MESSAGES PROVIDED ARE:

NOT AT ALL HELPFUL						VERY HELPFUL
1	*	3	4	5	6	7

3.3.2.6 ASTAR Output. Although the format of the results provided by ASTAR was considered clear, the analyses were not considered very useful. The analysts requested that more interpretation on how the ratings were achieved be available. This particular rating reflects the users desire to have a better understanding of what ASTAR is doing, i.e., what are the metrics and how do they work? It was also suggested that graphic outputs would ease interpretation.

ANALYSIS RESULTS ARE:

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

3.3.2.7 Acceptance of ASTAR. The analysts were also asked to discuss their acceptance of ASTAR. They expect to have little use for ASTAR in their daily work. They would not feel comfortable working with ASTAR, and do not believe that ASTAR would increase their job effectiveness. However, they believe that ASTAR can be used for solutions to problems that cannot currently be solved (question 5). The unwillingness to work with ASTAR even though it is perceived to have a benefit is driven by the poor user interface in the current version.

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

STRONGLY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	STRONGLY DISAGREE
( )	( )	(X)	( )

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

STRONGLY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	STRONGLY DISAGREE
(X)	( )	( )	( )

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

STRONGLY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	STRONGLY DISAGREE
( )	( )	( )	(X)

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

STRONGLY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	STRONGLY DISAGREE
( )	( )	(X)	( )

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
( )	( )	( )	(X)

6. I WOULD FEEL COMFORTABLE WORKING WITH ASTAR.

STRONGLY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	STRONGLY DISAGREE
( )	( )	( )	(X)

3.3.2.8 General Comments on ASTAR. The analysts most liked ASTAR's thorough analysis of the training aspects of the training device. They least preferred the tedious data entry capabilities available in ASTAR and the inflexibility of the model once the data is entered. They also disliked ASTAR's focus on one device, and that ASTAR does not allow comparisons of multiple systems simultaneously within the program.

The analysts took more than three hours to become comfortable using ASTAR. They believe that the ultimate decisions made about the training systems analyzed using ASTAR were very different from those which were or would have been made using their current approach to training effectiveness or instructional media selection. ASTAR gives specific requirements for simulator class trainers which are not always considered. The analysts' specific recommendations for improving ASTAR include:

1. Provide input/output capabilities from database and spreadsheet programs;
2. Allow revision of data base;
3. Allow input to be duplicated;
4. Upgrade to mouse input;
5. Allow side-by-side comparison of two systems rather than the current practice of producing output for one system followed by output for the next, and;
6. Offer graphics capabilities.

3.3.3 **REACTIONS TO AIMS**. The following sections summarize the analysts's reactions to AIMS seven areas. In each section a synopsis of the ratings is provided followed by the actual rating scales for that area. The analysts' composite rating is indicated by an "*" on the rating scale.

3.3.3.1 Overall Reactions. Overall, the analysts believed that AIMS is useful and productive. Alternatively, AIMS was considered to have inadequate power due to its lack of a data base and/or spreadsheet software interface for creating and editing the rating matrix. AIMS was also considered rigid for the same reason.

NOT AT ALL USEFUL								VERY USEFUL
	1	2	3	4	*	6	7	
DIFFICULT								EASY
	1	2	*	4	5	6	7	
FRUSTRATING								SATISFYING
	1	2	3	*	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	*	6	7	

3.3.3.2 Screen. When reviewing the screens, the analysts denoted that the organization of the menus is logical, the labels for functions within the menus are clear, and the written prompts are somewhat helpful. However, the presentation of the questions is confusing because AIMS prompts use the media or attribute number rather than name at various points in the program. This requires that you have a print out or remember the number associated with each media or attribute. The analysts recommend that the number codes for media, attribute, and objective be be replaced by the appropriate label. 22

ORGANIZATION OF THE MENUS IS:

ILLOGICAL								LOGICAL
	1	2	3	4	*	6	7	

LABELS FOR FUNCTIONS WITHIN THE MENUS ARE:

CONFUSING								VERY CLEAR
	1	2	3	4	*	6	7	

PRESENTATION OF THE QUESTIONS IS:

CONFUSING								VERY CLEAR
	1	*	3	4	5	6	7	

WRITTEN PROMPTS ARE:

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

3.3.3.3 Terminology. The analysts indicated that the computer almost always kept them informed about what it was doing. They also reported that the language used in AIMS is understandable, and consistent terms were used throughout the program. While the ratings on this attribute were not high, they were consistently positive.

COMPUTER KEEPS YOU INFORMED ABOUT WHAT IT IS DOING:
NEVER ALWAYS
1 2 3 4 * 6 7

LANGUAGE USED IS:
CONFUSING EASILY UNDERSTOOD
1 2 3 * 5 6 7

USE OF TERMS THROUGHOUT PROGRAM IS:
INCONSISTENT VERY CONSISTENT
1 2 3 4 * 6 7

3.3.3.4 Learning AIMS. The analysts considered AIMS relatively easy to learn to operate, becoming comfortable using AIMS within one to two hours. They were aided by the instructional materials, which they reported were both helpful and thorough. The analysts would appreciate the addition of an escape function to allow the user to return to the previous menu; such a feature would increase the ease of new feature exploration by trial and error.

LEARNING TO OPERATE THE SYSTEM IS:
DIFFICULT EASY
1 2 3 4 * 6 7

EXPLORING NEW FEATURES BY TRIAL AND ERROR IS:
DIFFICULT EASY
1 2 3 * 5 6 7

INSTRUCTIONAL MATERIALS PROVIDED ARE:
NOT AT ALL HELPFUL VERY HELPFUL
1 2 3 4 5 * 7

INSTRUCTIONAL MATERIALS PROVIDED ARE:
INCOMPLETE VERY THOROUGH
1 2 3 4 5 * 7

3.3.3.5 Using AIMS. Although the analysts believe that AIMS nearly always allows tasks to be performed in a straightforward manner, they also found that the error messages provided do not include helpful information for error correction. This is apparently due to the feature that AIMS often defaults back to BASIC when an error is made. They believe that the audio/visual feedback is insufficient, and more information should be displayed. Additionally, the analysts perceive the demands on user memory as too high for the reasons cited in the discussion of the screen. The analysts suggested the addition of a help screen for pertinent information such as media or attribute names and numbers.

TASKS CAN BE PERFORMED IN A STRAIGHTFORWARD MANNER:

NEVER 1 2 3 4 5 * 7 ALWAYS

AUDIO/VISUAL FEEDBACK IS:

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

DEMANDS ON USER MEMORY ARE:

TOO HIGH 1 * 3 4 5 6 7 VERY LOW

ERROR MESSAGES PROVIDED ARE:

NOT AT ALL HELPFUL 1 * 3 4 5 6 7 VERY HELPFUL

3.3.3.6 AIMS Output. The analysts rated the AIMS outputs as average or slightly below average. They would prefer that the AIMS output be enhanced with graphics and more interpretative information, in addition to a summary for all objectives.

ANALYSIS RESULTS ARE:

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

ANALYSIS RESULTS ARE:

DIFFICULT TO UNDERSTAND 1 2 * 4 5 6 7 EASY TO UNDERSTAND

FORMAT OF THE RESULTS IS:

CONFUSING 1 2 * 4 5 6 7 VERY CLEAR

3.3.3.7 Acceptance of AIMS. The analysts denote a somewhat positive acceptance of AIMS. They expect that they could use AIMS occasionally for planning and proposals, and agree that they could do work with AIMS. They believe that they would feel comfortable working with AIMS, and slightly agree that knowing how to work with AIMS will increase their job effectiveness. They do indicate, however, that the services provided by AIMS could be replicated with the use of a spreadsheet, and that it would be very easy to stop using AIMS. AIMS is effectively a specialized spreadsheet as presently implemented, so this is a natural response.

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

STRONGLY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	STRONGLY DISAGREE
( )	(X)	( )	( )

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

STRONGLY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	STRONGLY DISAGREE
(X)	( )	( )	( )

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

STRONGLY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	STRONGLY DISAGREE
( )	( )	( )	(X)

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

STRONGLY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	STRONGLY DISAGREE
( )	(X)	( )	( )

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
( )	( )	(X)	( )

6. I WOULD FEEL COMFORTABLE WORKING WITH AIMS.

STRONGLY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	STRONGLY DISAGREE
( )	(X)	( )	( )

3.3.3.8 General Comments on AIMS. A final assessment of AIMS indicates that the analysts most preferred the flexibility of AIMS' model for adaptation. They most disliked that the text for media, attributes, and objectives was not on the screen. They would like to see more flexible control, especially regarding the jump to basic. The analysts believe that the interface could be fast if it were done correctly on a spreadsheet. AIMS is structured to input the data in a structured serial manner, whereas a spreadsheet type of interface permits more flexible input and editing. In addition, the analysts did not appreciate the tedious decision making required in the rating of attributes. The creation of the rating matrix is unavoidably tedious if there are a large number of media and attributes. However, for a given application the basic rating matrix should only have to be done once and then be used for all training subsystems within that application. On final problem cited with AIMS is that when some errors occur it exits the program back to Basic rather than simply giving an error message. This problem is a function of the Basic program language.

Specifically, the analysts recommend:

1. Replace subjective rating with decision support about the appropriate use of media;
2. Do not rely on user to know best application of media;
3. Allow for output to spreadsheet and graphics;
4. Provide for input of objectives from word processor and/or database.

3.4 User Log

A user log was maintained by the analysts as part of the study. The analysts were asked to record their experiences while working with ASTAR and AIMS, and to provide a summary of their daily working logs upon completion of the project. The objective of the user log was to obtain a running account of how ASTAR and AIMS were used. A synopsis of the Newport News Shipbuilding user log is provided in Appendix A. It is clear from an examination of the log that lengthy interval between initial training and the conduct of the study had a significant negative effect on their ability to use the programs. It would also appear that the analysts did not make use of the manuals to resolve problems.

4.0 CONCLUSIONS

The operational study of ASTAR and AIMS conducted by personnel at Newport News Shipbuilding provided an appropriate test environment. The test case, Seawolf IAL, provided a good application of the two techniques and permitted the analysts the opportunity to determine whether the two DET had sufficient merit to be used on other areas of the Seawolf ISD process.

Overall, the user acceptance of the two techniques was rather low. In both cases the users perceived benefits from use of the two programs, but the unfriendly nature of the interfaces made them unacceptable. Users would not use the techniques if given the option. They would rather use their conventional methods. Of the two DET AIMS was preferred over ASTAR. However, this appears attributable to the perception that AIMS is easier to learn and use than ASTAR. The user interface is clearly the major factor in determining user acceptance of the routine. This conclusion is not unexpected. This does not imply that it is the only factor influencing user acceptance. In the case of ASTAR, the lack of understanding about how the program internally works, i.e., the formulas and metrics, also caused concern among the subject analysts.

ASTAR and AIMS are both relatively old programs. They were developed before much of the recent advancements in software design/technology and human computer interface design. AIMS is generally acceptable, but certain features would still need to be updated to ensure wide spread adoption. The primary needs in AIMS are an improved data base structure, data entry, and data editing. The power of AIMS could also be increased by providing more flexible analysis options. ASTAR requires much more extensive enhancements, though they involve the same basic areas as AIMS. ASTAR's greatest need is a better data base development and editing capability. ASTAR also needs to permit multiple devices to be analyzed simultaneously to reduce the time requirements for using ASTAR. Finally, ASTAR needs better data output options to make it easier for the analyst to visualize the data, e.g. graphics.

The findings of this operational study indicate that both ASTAR and AIMS would require modifications before implementation as a standard evaluation technique. Without these modifications, user acceptance would be poor. The comments analysts made during this study indicate that user acceptance of these DET will be proportional to the perceived friendliness, i.e., ease of use, and flexibility of the programs. The encouraging factor is that most of the shortcomings could be alleviated by modifying the programs to incorporate current software practices, data base techniques and user interface standards. The analysts who participated in the study made a number of specific recommendations for improvements to the ASTAR and AIMS interfaces. Given the nature of the required modifications, an acceptable version of the programs should be achievable with moderate resources. Some areas of concern would be more difficult to alleviate. For example, terminology tends to be application specific, so it would be difficult to use generic terminology in the ASTAR questions and prompts. In addition, the concerns which involve the basic ASTAR computations could not be updated without negating previously established validity. Hence, shortcomings associated with the mechanics of ASTAR could be corrected, while content related shortcomings can not be easily addressed.

Finally, from the questionnaires and discussions an attempt was made to assess where and how the users would employ ASTAR and AIMS within the ISD process. Comments concerning AIMS indicated that it would most likely be used to support planning and developing proposals. ASTAR on the other would be used at a level 1 during the front end analysis/task analysis. After the need was established, ASTAR, levels 2 and 3, would be used again during the initial and middle stages of the device development.

5.0 **APPENDICES**

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APPENDIX A

SEAWOLF IAL TASK ANALYSIS

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5.1 Internal Auxiliary Launcher System

TASK IDENT	TASK DESC.	STEP NO.	STEP DESCRIPTION	EQUIP	TRNG REQ.
C008	Operate IAL with the hand pump	1	Prepare IAL for manual hydraulic operation.	Yes	Yes
		1a	Establish communications with Command and Control Center personnel	None	No
			NOTE On the Launch Control and Display Panel(LCDP) perform the following steps for the launcher to be fired and all actions will be taken for the primary (secondary) launcher.	None	No
		1b	Energize LCDP; position the POWER ON switch to ON and observe that the POWER indicator illuminates	Yes	Yes
		1c	Position the MANNED/OFF switch to MANNED and observe the MANNED indicator illuminates.	Yes	Yes
		1d	Position the STATION CONTROL switch to CCP and observe the CCP indicator illuminates.	Yes	Yes
		1e	Position the DEVICE TYPE knob to the appropriate device position.	Yes	No
		1f	Position the launch mode switch to either QUIET or NORMAL and ensure its indicator light is illuminated.	Yes	No
		2	At the LCDP ensure the shut indicator lights for the VENT VALVE and DRAIN VALVE are illuminated. If not, override the hydraulic valve actuators. Hand-pump valves shut.	Yes	Yes

TASK IDENT	TASK DESC.	STEP NO.	STEP DESCRIPTION	EQUIP	TRNG REQ.
		3	Open breech door and inspect barrel.	Yes	Yes
			NOTE Prepare device for launch IAW appropriate NWP.		
		4	Load selected device and then operate the primary (secondary) launcher breech door operating lever to shut the breech door.	Yes	Yes
		5	When the selected device is loaded into the appropriate launcher, position the LOAD\LOADED switch to LOADED and ensure its indicator light illuminates.	None	No
		6	At the hydraulic value actuator for the ram ejection pump door, override and hand-pump open the ram ejection pump door. Ensure the EJECTION PUMP DOOR open indicator light illuminates.	Yes	Yes
		7	At the hydraulic valve actuator for the FLOOD VALVE for the primary (secondary) launcher override and hand-pump open the valve until a solid stream of water issues from the vent valve of the selected launcher. Ensure the BARREL FLOODED indicator is illuminated for that launcher.	Yes	Yes
		8	Override and hand-pump shut the IAL flood valve.	Yes	Yes
		9	Hand-pump open the equalization valve and ensure that it's indication, EQUALIZE VALVE is illuminated.	Yes	Yes

TASK IDENT	TASK DESC.	STEP NO.	STEP DESCRIPTION	EQUIP	TRNG REQ.
		10	Check equalization line pressure gauge and flood line pressure gauge to ensure both gauges indicate the same pressure.		
		11	At the hydraulic valve actuator for the muzzle door for the primary (secondary) launcher override and hand-pump open the muzzle door and pin lock OPEN the muzzle door control valve. Hand-pump open the muzzle door and ensure its muzzle door open indicator illuminates.	Yes	Yes
		12	At the hydraulic valve actuator for the seawater impulse isolation valve override and hand-pump open to desired position the seawater impulse isolation valve. Ensure it opens to the appropriate launcher and its position indicator light is illuminated.	Yes	Yes
		13	Check RAM position indicator on the LCDP at the BATTERY position with its indicator illuminated.	Yes	Yes
		14	Position the LOAD/LOADED switch to LOADED and ensure the LOADED indicator illuminates.	None	No
		15	Manually override firing valve hydraulic interlocks.	Yes	Yes
		16	Launch device using LAUNCH switch.	None	No
		17	Monitor indicators for launched indications.	None	No
		18	Hand-pump the primary (secondary) launcher muzzle door to shut and ensure the SHUT DOOR indicator light illuminates.	Yes	Yes

TASK IDENT	TASK DESC.	STEP NO.	STEP DESCRIPTION	EQUIP	TRNG REQ.
		19	At the hydraulic control valve for the seawater impulse isolation valve override and hand-pump shut the seawater impulse isolation valve. Ensure the shut indicator illuminates.	Yes	Yes
		20	At the hydraulic valve actuator for the primary (secondary) launcher vent and drain valves override and hand-pump the valves open (verify valve opens) to vent and drain the primary (secondary) launcher barrel to the gravity drain system.	Yes	Yes

APPENDIX B

SEAWOLF IAL SKILLS ANALYSIS

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Internal Auxiliary Launcher (IAL) System

(Skills)

Operational procedures

1. Perform operational tasks for the IAL including:

    a. Pre-operational procedures
        (1) Tethered device
        (2) Non-tethered device
    b. Operational procedures
        (1) Tethered device
        (2) Non-tethered device
    c. Post operational procedures
        (1) Tethered device
        (2) Non-tethered device

2. Perform casualty/degraded/abnormal (not full mission capable) modes of operation.

    a. Hand pump
        (1) Tethered device
        (2) Non-tethered device
    b. Manual override
        (1) Tethered device
        (2) Non-tethered device
    c. Hand rammer

3. Recognize and interpret all indications occurring during the performance of all operational procedures of the IAL and perform appropriate operator actions in their proper sequence.

    a. Tethered device
    b. Non-tethered device

4. Perform data logging requirements as appropriate for the IAL.

    a. Tethered device
    b. Non-tethered device

5. Adhere to personnel and equipment safety requirements during operational procedures.

    a. Tethered device
    b. Non-Tethered device

Preventive Maintenance procedures

1. Perform preventive maintenance procedures, including quality assurance procedures, on the IAL as scheduled by the Planned Maintenance System (PMS) and presented on Maintenance Requirement Card(s) (MRC).

2. Adhere to personnel and equipment safety precautions when performing preventive maintenance procedures of the IAL.

Basic Corrective Maintenance Procedures

1. Use special tools and test equipment required to perform basic corrective maintenance procedures on the IAL.

2. Perform alignment, adjustment and calibration procedures as required for basic corrective maintenance on the IAL.

3. Perform operational tests and diagnostic programs, as applicable, for basic corrective maintenance of the IAL.

4. Recognize and interpret all malfunction indications for the IAL.

5. Perform systematic fault isolation procedures contained in prescribed maintenance documentation for the IAL during basic corrective maintenance.

6. Disassemble, repair and reassemble the IAL to the authorized maintenance level for basic corrective maintenance.

7. Perform post-repair procedures, including quality assurance procedures, on the IAL during basic corrective maintenance.

8. Adhere to personnel and equipment safety precautions when performing basic corrective maintenance procedures.

Advanced Corrective Maintenance Procedures

1. Use special tools and test equipment required to perform advanced corrective maintenance procedures on the IAL.

2. Perform alignment, adjustment and calibration procedures as required for advanced corrective maintenance on the IAL.

3. Perform operational tests and diagnostic programs, as applicable, for advanced corrective maintenance of the IAL.

4. Recognize and interpret all malfunction indications for the IAL.

5. Perform systematic fault isolation procedures contained in prescribed maintenance documentation for the IAL during advanced corrective maintenance.

6. Disassemble, repair and reassemble the IAL to the authorized maintenance level for advanced corrective maintenance.

7. Perform post-repair procedures, including quality assurance procedures, on the IAL during advanced corrective maintenance.

8. Adhere to personnel and equipment safety precautions when performing advanced corrective maintenance procedures.

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APPENDIX C

AIMS MEDIA/ATTRIBUTE RATING MATRIX

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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. INTERACTIVE LECTURE	0	5	4	3	2	0	0	0	0	0	0	0	0	0
2. MEDIATED INTERACTIV	5	5	5	5	5	4	5	4	4	4	5	5	5	5
3. CHALKBOARD	0	2	3	2	1	1	0	3	3	4	0	2	0	0
4. POSTER	0	2	3	3	1	4	4	4	4	4	0	2	0	0
5. WALL CHART	0	1	3	3	1	4	4	4	4	4	0	2	0	0
6. PRINTED HANDOUT	0	2	3	3	1	4	4	4	4	4	0	2	0	0
7. PROGRAMMED TEXT	0	1	3	3	1	4	2	3	3	3	0	2	0	0
8. WORKBOOK	0	1	3	3	2	4	4	4	4	4	0	2	0	0
9. CHECKLIST	0	1	3	4	1	4	1	1	1	2	0	2	0	0
10. TECHNICAL MANUAL	0	2	3	4	1	4	4	5	5	4	0	3	0	0
11. OVERHEAD TRANSPAREN	0	2	3	3	1	4	3	4	4	4	0	2	0	0
12. AUDIOTAPE	0	2	2	2	1	1	0	0	0	0	0	0	0	0
13. FILM	0	4	4	4	3	3	2	2	2	3	5	5	5	5
14. VIDEOTAPE	0	4	4	4	3	2	4	3	3	4	5	5	5	5
15. SLIDES	0	2	3	3	1	2	5	4	4	4	2	5	1	1
16. SLIDE/TAPE	0	3	4	3	2	4	5	4	4	4	2	5	1	1
17. RANDOM ACCESS SLIDE	0	2	3	3	3	3	5	4	4	4	1	5	1	1
18. COMPUTER AIDED INST	1	4	4	4	4	4	4	3	3	4	5	4	4	3
19. COMPUTER MANAGED IN	1	4	4	4	4	4	4	3	3	4	5	4	4	4
20. INTERACTIVE VIDEO D	2	5	0	5	5	4	4	4	4	4	5	5	5	5
21. MODEL	3	0	5	5	3	2	0	0	0	0	0	5	0	0
22. MOCK-UP	4	0	5	5	4	2	1	2	2	0	0	5	0	0
23. PART TASK TRAINER	5	0	4	4	4	2	0	0	2	3	4	5	3	3
24. WHOLE TASK TRAINER	5	0	5	5	2	0	0	0	0	0	4	5	5	5
25. OPERATIONAL EQUIPME	5	0	5	5	5	2	0	0	0	0	5	5	5	5

MEDIA X ATTRIBUTES TABLE ** CONTINUED **

ATTRIBUTE NUMBER ----> MEDIA	15	16	17	18	19	20	21	22	23	24	25	26	27	28
1. INTERACTIVE LECTURE	0	0	0	0	0	0	0	0	2	5	0	0	0	0
2. MEDIATED INTERACTIV	5	5	5	5	5	5	5	5	4	5	5	5	5	5
3. CHALKBOARD	0	2	1	0	0	1	0	0	1	0	0	0	0	0
4. POSTER	0	2	3	0	0	1	0	0	0	0	0	0	0	0
5. WALL CHART	0	2	2	0	0	1	0	0	0	0	0	0	0	0
6. PRINTED HANDOUT	0	2	1	0	0	1	0	0	1	0	0	0	0	0
7. PROGRAMMED TEXT	0	2	1	0	0	1	0	0	3	0	2	0	0	0
8. WORKBOOK	0	2	1	0	1	1	0	0	2	0	2	0	0	0
9. CHECKLIST	0	2	0	0	0	1	0	0	1	0	2	0	0	0
10. TECHNICAL MANUAL	0	2	2	0	0	1	0	0	0	0	0	0	0	0
11. OVERHEAD TRANSPAREN	0	2	1	0	0	1	0	0	0	0	0	0	0	0
12. AUDIOTAPE	5	0	0	0	0	1	0	0	0	0	0	0	0	0
13. FILM	5	5	1	0	3	2	0	0	0	0	0	0	0	0
14. VIDEOTAPE	5	5	1	0	2	0	0	0	0	0	0	0	0	0
15. SLIDES	0	4	2	0	2	1	0	0	0	0	0	0	0	0
16. SLIDE/TAPE	5	3	2	0	3	2	0	0	1	0	0	0	0	0
17. RANDOM ACCESS SLIDE	4	3	2	0	3	1	0	0	0	0	0	0	0	0
18. COMPUTER AIDED INST	1	3	4	4	3	3	0	0	4	0	3	0	0	0
19. COMPUTER MANAGED IN	1	3	4	4	3	3	0	0	4	0	3	0	0	0
20. INTERACTIVE VIDEO D	5	5	5	4	4	4	3	3	4	0	3	0	0	0
21. MODEL	0	0	3	3	3	2	0	0	0	0	0	0	0	0
22. MOCK-UP	3	3	4	4	4	3	0	5	0	0	1	0	0	0
23. PART TASK TRAINER	4	4	3	3	3	4	5	5	0	0	4	5	5	5
24. WHOLE TASK TRAINER	5	5	4	4	4	4	5	5	0	0	5	5	5	5
25. OPERATIONAL EQUIPME	5	5	5	5	5	5	5	5	0	0	5	5	5	5

MEDIA X ATTRIBUTES TABLE ** CONTINUED **

ATTRIBUTE NUMBER ----> MEDIA	29	30	31	32	33	34	35	36	37	38	39	40	41	42
1. INTERACTIVE LECTURE	0	0	0	0	1	5	5	5	0	2	3	3	4	2
2. MEDIATED INTERACTIV	5	5	5	5	5	5	5	5	5	5	5	5	5	5
3. CHALKBOARD	0	0	0	0	0	0	1	0	0	0	0	0	0	0
4. POSTER	0	0	0	0	0	0	1	0	0	0	0	0	0	0
5. WALL CHART	0	0	0	0	0	0	1	0	0	0	0	0	0	0
6. PRINTED HANDOUT	0	0	0	0	0	0	1	0	0	0	0	0	0	0
7. PROGRAMMED TEXT	0	0	0	0	0	0	5	0	0	3	3	3	4	2
8. WORKBOOK	0	0	0	0	0	0	3	0	0	2	2	2	3	1
9. CHECKLIST	0	0	0	0	0	0	1	5	0	0	0	0	0	0
10. TECHNICAL MANUAL	0	0	0	0	0	0	1	0	0	0	0	0	0	0
11. OVERHEAD TRANSPAREN	0	0	0	0	0	5	1	0	0	0	0	0	0	0
12. AUDIOTAPE	0	0	0	0	0	0	2	0	0	0	0	0	0	0
13. FILM	0	0	0	0	0	0	2	0	0	0	0	0	0	0
14. VIDEOTAPE	0	0	0	0	0	0	2	0	0	0	0	0	0	0
15. SLIDES	0	0	0	0	0	0	1	0	0	0	0	0	0	0
16. SLIDE/TAPE	0	0	0	0	0	0	2	0	0	0	0	0	0	0
17. RANDOM ACCESS SLIDE	0	0	0	0	0	0	1	0	0	0	0	0	0	0
18. COMPUTER AIDED INST	3	2	3	3	1	0	4	0	4	4	5	5	5	5
19. COMPUTER MANAGED IN	3	2	3	3	1	0	2	0	5	4	3	4	4	4
20. INTERACTIVE VIDEO D	3	2	3	3	1	0	4	0	4	4	4	4	4	4
21. MODEL	0	0	0	0	0	0	1	1	0	0	0	0	0	0
22. MOCK-UP	5	2	3	3	0	0	4	4	0	3	0	0	4	4
23. PART TASK TRAINER	5	3	3	4	3	0	5	5	3	3	4	4	4	4
24. WHOLE TASK TRAINER	5	5	5	5	5	5	5	5	4	3	5	5	5	5
25. OPERATIONAL EQUIPME	5	5	5	5	5	5	4	5	0	0	5	0	5	3

MEDIA X ATTRIBUTES TABLE ** CONTINUED **

ATTRIBUTE NUMBER ----> MEDIA	43	44	45	46	47	48	49	50	51	52	53	54	55	56
1. INTERACTIVE LECTURE	0	1	1	0	0	5	0	0	0	1	3	4	2	4
2. MEDIATED INTERACTIV	5	5	5	5	5	5	5	5	5	5	5	5	5	5
3. CHALKBOARD	0	0	0	0	0	3	1	0	0	1	2	0	2	0
4. POSTER	0	0	0	0	0	3	1	0	0	1	2	0	2	0
5. WALL CHART	0	0	0	0	0	3	1	0	0	1	2	0	3	0
6. PRINTED HANDOUT	0	0	0	0	0	3	1	0	0	1	2	0	3	0
7. PROGRAMMED TEXT	0	0	0	0	0	4	2	0	0	2	1	0	3	0
8. WORKBOOK	0	0	0	0	0	5	2	0	0	2	2	0	3	0
9. CHECKLIST	0	0	0	0	0	3	1	0	0	1	2	0	3	0
10. TECHNICAL MANUAL	0	0	0	0	0	3	1	0	0	1	2	0	2	0
11. OVERHEAD TRANSPAREN	0	0	0	0	0	3	1	0	0	1	1	0	2	0
12. AUDIOTAPE	0	4	0	0	0	5	1	1	0	1	0	5	0	3
13. FILM	1	4	4	0	0	5	2	2	0	2	0	5	2	5
14. VIDEOTAPE	1	4	2	0	0	5	2	2	0	2	0	5	2	5
15. SLIDES	0	0	2	0	0	3	2	2	0	2	1	0	2	3
16. SLIDE/TAPE	1	4	2	0	0	5	2	2	0	2	0	5	2	5
17. RANDOM ACCESS SLIDE	0	0	2	0	0	5	2	2	0	2	5	0	2	3
18. COMPUTER AIDED INST	2	2	2	0	0	5	3	2	0	3	4	4	4	5
19. COMPUTER MANAGED IN	2	0	0	0	0	4	2	2	0	2	5	4	4	2
20. INTERACTIVE VIDEO D	2	4	2	0	0	5	3	2	0	3	5	4	4	5
21. MODEL	0	0	3	0	0	3	1	1	0	1	2	4	1	1
22. MOCK-UP	3	3	3	0	3	5	5	3	3	4	3	4	1	3
23. PART TASK TRAINER	4	4	4	0	3	4	4	3	4	3	5	4	2	4
24. WHOLE TASK TRAINER	4	4	4	3	4	5	4	4	5	4	5	4	4	5
25. OPERATIONAL EQUIPME	5	5	5	5	5	5	5	5	5	5	4	5	5	5

MEDIA X ATTRIBUTES TABLE ** CONTINUED **

ATTRIBUTE NUMBER ----> MEDIA	57	58	59	60
1. INTERACTIVE LECTURE	5	3	4	5
2. MEDIATED INTERACTIV	5	5	5	5
3. CHALKBOARD	3	1	2	5
4. POSTER	3	1	2	1
5. WALL CHART	3	1	2	1
6. PRINTED HANDOUT	3	1	0	3
7. PROGRAMMED TEXT	3	1	5	1
8. WORKBOOK	3	2	5	1
9. CHECKLIST	3	2	2	2
10. TECHNICAL MANUAL	3	1	2	1
11. OVERHEAD TRANSPAREN	3	1	2	3
12. AUDIOTAPE	4	1	2	1
13. FILM	4	1	2	1
14. VIDEOTAPE	4	1	2	2
15. SLIDES	3	1	2	2
16. SLIDE/TAPE	3	1	3	1
17. RANDOM ACCESS SLIDE	3	1	2	2
18. COMPUTER AIDED INST	4	3	3	3
19. COMPUTER MANAGED IN	4	3	3	3
20. INTERACTIVE VIDEO D	4	3	3	3
21. MODEL	0	1	0	0
22. MOCK-UP	2	1	3	3
23. PART TASK TRAINER	4	4	3	3
24. WHOLE TASK TRAINER	4	4	3	3
25. OPERATIONAL EQUIPME	5	5	5	4

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APPENDIX D

AIMS MEDIA SELECTION WORKSHEETS

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SELECTION WORKSHEET FOR USE WITH THE FILE : seawolf

Objective Number: 1.0

Objective: Prepare IAL for manual hydraulic operation

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

*TYPE OF LEARNING

|__| 1. PSYCHOMOTOR
|__| 2. AFFECTIVE(ATTITUDINAL)
|__| 3. CONCEPTUAL
|x_| 4. PROCEDURAL
|__| 5. DECISION MAKING

*DISPLAY CHARACTERISTICS

|__| 6. VERBAL/TEXT
|__| 7. PHOTOGRAPHS
|__| 8. DRAWINGS
|x_| 9. DIAGRAMS
|__| 10. GRAPHICS
|__| 11. ANIMATION
|__| 12. COLORS
|__| 13. VISUAL MOTION(CONSTANT)
|__| 14. VISUAL MOTION(VARIABLE)
|__| 15. AUDIO(VOICE)
|__| 16. FIELD OF VIEW
|x_| 17. PHYSICAL SIMILARITY
|x_| 18. FUNCTIONAL SIMILARITY
|x_| 19. FIDELITY/REALISM
|__| 20. INDICATORS/GAUGES
|__| 21. TACTILE CUES
|__| 22. KINESTHETIC CUES

*RESPONSE MODE

|__| 23. VERBAL/WRITTEN RESPONSE
|__| 24. VOICE RESPONSE
|__| 25. DECISION INDICATORS
|__| 26. FINE MOTOR RESPONSE
|__| 27. GROSS MOTOR RESPONSE
|__| 28. TRACKING RESPONSE
|x_| 29. MANIPULATIVE RESPONSE
|x_| 30. PHYSICAL SIMILARITY
|x_| 31. FUNCTIONAL SIMILARITY
|x_| 32. FIDELITY/REALISM
|__| 33. CONTINUOUS RESPONSE

*EVALUATION MODE

|__| 34. INSTRUCTOR EVALUATION
|__| 35. SELF EVALUATION
|__| 36. PEER EVALUATION
|__| 37. AUTOMATED EVALUATION
|__| 38. VERBAL/WRITTEN EVALUATI
|__| 39. IMMEDIATE ON RESPONSE
|x_| 40. IMMEDIATE ON ERROR
|__| 41. POST-SESSION EVALUATION
|__| 42. FAULT INSERTION

*ENVIRONMENTAL CONDITIONS

|__| 43. PHYSICAL MOTION
|__| 44. NOISE
|__| 45. LIGHTING
|__| 46. VIBRATION
|__| 47. RESTRICTIVE CLOTHING

*LEARNING LEVELS

|__| 48. A. FAMILIARITY
|x_| 49. B. PERFORM PROCEDURE
|__| 50. C. PERFORM JOB
|__| 51. D. PERFORM MISSION

*SPECIAL REQUIREMENTS

|__| 52. CREW/TEAM INTERACTION
|__| 53. RANDOM ACCESS LOGIC

*COMMUNICATIONS

|x_| 54. VERBAL/VOICE
|x_| 55. NON-VERBAL/SIGNAL
|__| 56. SOUND/NOISE/SIGN

*PERFORMANCE CRITERIA

|__| 57. SOP'S
|__| 58. TIME
|x_| 59. ACCURACY

*SCENARIO DEVELOPMENT

|x_| 60. INTERACTIVE

SELECTION WORKSHEET FOR USE WITH THE FILE : seawolf

Objective Number: 2.0

Objective: LCDP: Ensure Vent and Drain Valve "SHUT" Lights are "ON"

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

*TYPE OF LEARNING
- |__| 1. PSYCHOMOTOR
- |__| 2. AFFECTIVE(ATTITUDINAL)
- |__| 3. CONCEPTUAL
- |x_| 4. PROCEDURAL
- |__| 5. DECISION MAKING

*DISPLAY CHARACTERISTICS
- |__| 6. VERBAL/TEXT
- |__| 7. PHOTOGRAPHS
- |__| 8. DRAWINGS
- |__| 9. DIAGRAMS
- |__| 10. GRAPHICS
- |__| 11. ANIMATION
- |__| 12. COLORS
- |__| 13. VISUAL MOTION(CONSTANT)
- |__| 14. VISUAL MOTION(VARIABLE)
- |__| 15. AUDIO(VOICE)
- |__| 16. FIELD OF VIEW
- |__| 17. PHYSICAL SIMILARITY
- |__| 18. FUNCTIONAL SIMILARITY
- |__| 19. FIDELITY/REALISM
- |x_| 20. INDICATORS/GAUGES
- |__| 21. TACTILE CUES
- |__| 22. KINESTHETIC CUES

*RESPONSE MODE
- |__| 23. VERBAL/WRITTEN RESPONSE
- |__| 24. VOICE RESPONSE
- |__| 25. DECISION INDICATORS
- |__| 26. FINE MOTOR RESPONSE
- |__| 27. GROSS MOTOR RESPONSE
- |__| 28. TRACKING RESPONSE
- |x_| 29. MANIPULATIVE RESPONSE
- |x_| 30. PHYSICAL SIMILARITY
- |x_| 31. FUNCTIONAL SIMILARITY
- |x_| 32. FIDELITY/REALISM
- |__| 33. CONTINUOUS RESPONSE

*EVALUATION MODE
- |__| 34. INSTRUCTOR EVALUATION
- |__| 35. SELF EVALUATION
- |__| 36. PEER EVALUATION
- |__| 37. AUTOMATED EVALUATION
- |__| 38. VERBAL/WRITTEN EVALUATION
- |__| 39. IMMEDIATE ON RESPONSE
- |x_| 40. IMMEDIATE ON ERROR
- |__| 41. POST-SESSION EVALUATION
- |__| 42. FAULT INSERTION

*ENVIRONMENTAL CONDITIONS
- |__| 43. PHYSICAL MOTION
- |__| 44. NOISE
- |__| 45. LIGHTING
- |__| 46. VIBRATION
- |__| 47. RESTRICTIVE CLOTHING

*LEARNING LEVELS
- |__| 48. A. FAMILIARITY
- |x_| 49. B. PERFORM PROCEDURE
- |__| 50. C. PERFORM JOB
- |__| 51. D. PERFORM MISSION

*SPECIAL REQUIREMENTS
- |__| 52. CREW/TEAM INTERACTION
- |__| 53. RANDOM ACCESS LOGIC

*COMMUNICATIONS
- |__| 54. VERBAL/VOICE
- |x_| 55. NON-VERBAL/SIGNAL
- |__| 56. SOUND/NOISE/SIGN

*PERFORMANCE CRITERIA
- |__| 57. SOP'S
- |__| 58. TIME
- |__| 59. ACCURACY

*SCENARIO DEVELOPMENT
- |x_| 60. INTERACTIVE

SELECTION WORKSHEET FOR USE WITH THE FILE : seawolf

Objective Number: 3.0

Objective: Open Breech Door and inspect barrel

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

*TYPE OF LEARNING

|__| 1. PSYCHOMOTOR
|__| 2. AFFECTIVE(ATTITUDINAL)
|__| 3. CONCEPTUAL
|x_| 4. PROCEDURAL
|__| 5. DECISION MAKING

*DISPLAY CHARACTERISTICS

|__| 6. VERBAL/TEXT
|__| 7. PHOTOGRAPHS
|__| 8. DRAWINGS
|__| 9. DIAGRAMS
|__| 10. GRAPHICS
|__| 11. ANIMATION
|__| 12. COLORS
|__| 13. VISUAL MOTION(CONSTANT)
|__| 14. VISUAL MOTION(VARIABLE)
|__| 15. AUDIO(VOICE)
|__| 16. FIELD OF VIEW
|x_| 17. PHYSICAL SIMILARITY
|__| 18. FUNCTIONAL SIMILARITY
|x_| 19. FIDELITY/REALISM
|__| 20. INDICATORS/GAUGES
|__| 21. TACTILE CUES
|__| 22. KINESTHETIC CUES

*RESPONSE MODE

|__| 23. VERBAL/WRITTEN RESPONSE
|__| 24. VOICE RESPONSE
|__| 25. DECISION INDICATORS
|__| 26. FINE MOTOR RESPONSE
|__| 27. GROSS MOTOR RESPONSE
|__| 28. TRACKING RESPONSE
|__| 29. MANIPULATIVE RESPONSE
|x_| 30. PHYSICAL SIMILARITY
|x_| 31. FUNCTIONAL SIMILARITY
|x_| 32. FIDELITY/REALISM
|__| 33. CONTINUOUS RESPONSE

*EVALUATION MODE

|__| 34. INSTRUCTOR EVALUATION
|__| 35. SELF EVALUATION
|__| 36. PEER EVALUATION
|__| 37. AUTOMATED EVALUATION
|__| 38. VERBAL/WRITTEN EVALUATI
|__| 39. IMMEDIATE ON RESPONSE
|__| 40. IMMEDIATE ON ERROR
|x_| 41. POST-SESSION EVALUATION
|__| 42. FAULT INSERTION

*ENVIRONMENTAL CONDITIONS

|x_| 43. PHYSICAL MOTION
|__| 44. NOISE
|__| 45. LIGHTING
|__| 46. VIBRATION
|__| 47. RESTRICTIVE CLOTHING

*LEARNING LEVELS

|__| 48. A. FAMILIARITY
|__| 49. B. PERFORM PROCEDURE
|x_| 50. C. PERFORM JOB
|__| 51. D. PERFORM MISSION

*SPECIAL REQUIREMENTS

|__| 52. CREW/TEAM INTERACTION
|__| 53. RANDOM ACCESS LOGIC

*COMMUNICATIONS

|__| 54. VERBAL/VOICE
|__| 55. NON-VERBAL/SIGNAL
|__| 56. SOUND/NOISE/SIGN

*PERFORMANCE CRITERIA

|__| 57. SOP'S
|__| 58. TIME
|x_| 59. ACCURACY

*SCENARIO DEVELOPMENT

|x_| 60. INTERACTIVE

SELECTION WORKSHEET FOR USE WITH THE FILE : seawolf

Objective Number: 4.0

Objective: Load device and shut Breech Door

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

*TYPE OF LEARNING
- |__| 1. PSYCHOMOTOR
- |__| 2. AFFECTIVE(ATTITUDINAL)
- |__| 3. CONCEPTUAL
- |x_| 4. PROCEDURAL
- |__| 5. DECISION MAKING

*DISPLAY CHARACTERISTICS
- |__| 6. VERBAL/TEXT
- |__| 7. PHOTOGRAPHS
- |__| 8. DRAWINGS
- |__| 9. DIAGRAMS
- |__| 10. GRAPHICS
- |__| 11. ANIMATION
- |__| 12. COLORS
- |__| 13. VISUAL MOTION(CONSTANT)
- |__| 14. VISUAL MOTION(VARIABLE)
- |__| 15. AUDIO(VOICE)
- |__| 16. FIELD OF VIEW
- |x_| 17. PHYSICAL SIMILARITY
- |__| 18. FUNCTIONAL SIMILARITY
- |x_| 19. FIDELITY/REALISM
- |__| 20. INDICATORS/GAUGES
- |__| 21. TACTILE CUES
- |__| 22. KINESTHETIC CUES

*RESPONSE MODE
- |__| 23. VERBAL/WRITTEN RESPONSE
- |__| 24. VOICE RESPONSE
- |__| 25. DECISION INDICATORS
- |__| 26. FINE MOTOR RESPONSE
- |__| 27. GROSS MOTOR RESPONSE
- |__| 28. TRACKING RESPONSE
- |__| 29. MANIPULATIVE RESPONSE
- |x_| 30. PHYSICAL SIMILARITY
- |x_| 31. FUNCTIONAL SIMILARITY
- |x_| 32. FIDELITY/REALISM
- |__| 33. CONTINUOUS RESPONSE

*EVALUATION MODE
- |__| 34. INSTRUCTOR EVALUATION
- |__| 35. SELF EVALUATION
- |__| 36. PEER EVALUATION
- |__| 37. AUTOMATED EVALUATION
- |__| 38. VERBAL/WRITTEN EVALUATION
- |__| 39. IMMEDIATE ON RESPONSE
- |__| 40. IMMEDIATE ON ERROR
- |x_| 41. POST-SESSION EVALUATION
- |__| 42. FAULT INSERTION

*ENVIRONMENTAL CONDITIONS
- |x_| 43. PHYSICAL MOTION
- |__| 44. NOISE
- |__| 45. LIGHTING
- |__| 46. VIBRATION
- |__| 47. RESTRICTIVE CLOTHING

*LEARNING LEVELS
- |__| 48. A. FAMILIARITY
- |__| 49. B. PERFORM PROCEDURE
- |x_| 50. C. PERFORM JOB
- |__| 51. D. PERFORM MISSION

*SPECIAL REQUIREMENTS
- |__| 52. CREW/TEAM INTERACTION
- |__| 53. RANDOM ACCESS LOGIC

*COMMUNICATIONS
- |__| 54. VERBAL/VOICE
- |__| 55. NON-VERBAL/SIGNAL
- |__| 56. SOUND/NOISE/SIGN

*PERFORMANCE CRITERIA
- |__| 57. SOP'S
- |__| 58. TIME
- |x_| 59. ACCURACY

*SCENARIO DEVELOPMENT
- |x_| 60. INTERACTIVE

SELECTION WORKSHEET FOR USE WITH THE FILE : seawolf

Objective Number: 5.0

Objective: Position Load/Loaded Switch to "LOADED"

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

*TYPE OF LEARNING
|__| 1. PSYCHOMOTOR
|__| 2. AFFECTIVE(ATTITUDINAL)
|__| 3. CONCEPTUAL
|x_| 4. PROCEDURAL
|__| 5. DECISION MAKING
*DISPLAY CHARACTERISTICS
|__| 6. VERBAL/TEXT
|__| 7. PHOTOGRAPHS
|__| 8. DRAWINGS
|__| 9. DIAGRAMS
|__| 10. GRAPHICS
|__| 11. ANIMATION
|__| 12. COLORS
|__| 13. VISUAL MOTION(CONSTANT)
|__| 14. VISUAL MOTION(VARIABLE)
|__| 15. AUDIO(VOICE)
|__| 16. FIELD OF VIEW
|__| 17. PHYSICAL SIMILARITY
|__| 18. FUNCTIONAL SIMILARITY
|__| 19. FIDELITY/REALISM
|x_| 20. INDICATORS/GAUGES
|__| 21. TACTILE CUES
|__| 22. KINESTHETIC CUES
*RESPONSE MODE
|__| 23. VERBAL/WRITTEN RESPONSE
|__| 24. VOICE RESPONSE
|__| 25. DECISION INDICATORS
|__| 26. FINE MOTOR RESPONSE
|__| 27. GROSS MOTOR RESPONSE
|__| 28. TRACKING RESPONSE
|__| 29. MANIPULATIVE RESPONSE
|__| 30. PHYSICAL SIMILARITY
|__| 31. FUNCTIONAL SIMILARITY
|x_| 32. FIDELITY/REALISM
|__| 33. CONTINUOUS RESPONSE
*EVALUATION MODE
|__| 34. INSTRUCTOR EVALUATION
|__| 35. SELF EVALUATION
|__| 36. PEER EVALUATION
|__| 37. AUTOMATED EVALUATION
|__| 38. VERBAL/WRITTEN EVALUATI
|__| 39. IMMEDIATE ON RESPONSE
|x_| 40. IMMEDIATE ON ERROR
|__| 41. POST-SESSION EVALUATION
|__| 42. FAULT INSERTION
*ENVIRONMENTAL CONDITIONS
|x_| 43. PHYSICAL MOTION
|__| 44. NOISE
|__| 45. LIGHTING
|__| 46. VIBRATION
|__| 47. RESTRICTIVE CLOTHING
*LEARNING LEVELS
|__| 48. A. FAMILIARITY
|__| 49. B. PERFORM PROCEDURE
|x_| 50. C. PERFORM JOB
|__| 51. D. PERFORM MISSION
*SPECIAL REQUIREMENTS
|__| 52. CREW/TEAM INTERACTION
|__| 53. RANDOM ACCESS LOGIC
*COMMUNICATIONS
|__| 54. VERBAL/VOICE
|__| 55. NON-VERBAL/SIGNAL
|__| 56. SOUND/NOISE/SIGN
*PERFORMANCE CRITERIA
|__| 57. SOP'S
|__| 58. TIME
|x_| 59. ACCURACY
*SCENARIO DEVELOPMENT
|x_| 60. INTERACTIVE

SELECTION WORKSHEET FOR USE WITH THE FILE : seawolf

Objective Number: 6.0

Objective: Hydraulic Valve Actuator: Override and handpump "OPEN" RAM Eject Pump Door

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

*TYPE OF LEARNING
|__| 1. PSYCHOMOTOR
|__| 2. AFFECTIVE(ATTITUDINAL)
|__| 3. CONCEPTUAL
|x_| 4. PROCEDURAL
|__| 5. DECISION MAKING

*DISPLAY CHARACTERISTICS
|__| 6. VERBAL/TEXT
|__| 7. PHOTOGRAPHS
|__| 8. DRAWINGS
|__| 9. DIAGRAMS
|__| 10. GRAPHICS
|__| 11. ANIMATION
|__| 12. COLORS
|__| 13. VISUAL MOTION(CONSTANT)
|__| 14. VISUAL MOTION(VARIABLE)
|__| 15. AUDIO(VOICE)
|__| 16. FIELD OF VIEW
|__| 17. PHYSICAL SIMILARITY
|__| 18. FUNCTIONAL SIMILARITY
|__| 19. FIDELITY/REALISM
|x_| 20. INDICATORS/GAUGES
|__| 21. TACTILE CUES
|__| 22. KINESTHETIC CUES

*RESPONSE MODE
|__| 23. VERBAL/WRITTEN RESPONSE
|__| 24. VOICE RESPONSE
|__| 25. DECISION INDICATORS
|__| 26. FINE MOTOR RESPONSE
|__| 27. GROSS MOTOR RESPONSE
|__| 28. TRACKING RESPONSE
|__| 29. MANIPULATIVE RESPONSE
|__| 30. PHYSICAL SIMILARITY
|__| 31. FUNCTIONAL SIMILARITY
|x_| 32. FIDELITY/REALISM
|__| 33. CONTINUOUS RESPONSE

*EVALUATION MODE
|__| 34. INSTRUCTOR EVALUATION
|__| 35. SELF EVALUATION
|__| 36. PEER EVALUATION
|__| 37. AUTOMATED EVALUATION
|__| 38. VERBAL/WRITTEN EVALUATION
|__| 39. IMMEDIATE ON RESPONSE
|x_| 40. IMMEDIATE ON ERROR
|__| 41. POST-SESSION EVALUATION
|__| 42. FAULT INSERTION

*ENVIRONMENTAL CONDITIONS
|x_| 43. PHYSICAL MOTION
|__| 44. NOISE
|__| 45. LIGHTING
|__| 46. VIBRATION
|__| 47. RESTRICTIVE CLOTHING

*LEARNING LEVELS
|__| 48. A. FAMILIARITY
|__| 49. B. PERFORM PROCEDURE
|x_| 50. C. PERFORM JOB
|__| 51. D. PERFORM MISSION

*SPECIAL REQUIREMENTS
|__| 52. CREW/TEAM INTERACTION
|__| 53. RANDOM ACCESS LOGIC

*COMMUNICATIONS
|__| 54. VERBAL/VOICE
|__| 55. NON-VERBAL/SIGNAL
|__| 56. SOUND/NOISE/SIGN

*PERFORMANCE CRITERIA
|__| 57. SOP'S
|__| 58. TIME
|x_| 59. ACCURACY

*SCENARIO DEVELOPMENT
|x_| 60. INTERACTIVE

SELECTION WORKSHEET FOR USE WITH THE FILE : seawolf

Objective Number: 7.0

Objective: At Flood Valve, open valve until solid stream of water is vented

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

*TYPE OF LEARNING
|__| 1. PSYCHOMOTOR
|__| 2. AFFECTIVE(ATTITUDINAL)
|__| 3. CONCEPTUAL
|x_| 4. PROCEDURAL
|__| 5. DECISION MAKING

*DISPLAY CHARACTERISTICS
|__| 6. VERBAL/TEXT
|__| 7. PHOTOGRAPHS
|__| 8. DRAWINGS
|__| 9. DIAGRAMS
|__| 10. GRAPHICS
|__| 11. ANIMATION
|__| 12. COLORS
|__| 13. VISUAL MOTION(CONSTANT)
|__| 14. VISUAL MOTION(VARIABLE)
|__| 15. AUDIO(VOICE)
|__| 16. FIELD OF VIEW
|x_| 17. PHYSICAL SIMILARITY
|__| 18. FUNCTIONAL SIMILARITY
|x_| 19. FIDELITY/REALISM
|__| 20. INDICATORS/GAUGES
|__| 21. TACTILE CUES
|__| 22. KINESTHETIC CUES

*RESPONSE MODE
|__| 23. VERBAL/WRITTEN RESPONSE
|__| 24. VOICE RESPONSE
|__| 25. DECISION INDICATORS
|__| 26. FINE MOTOR RESPONSE
|__| 27. GROSS MOTOR RESPONSE
|__| 28. TRACKING RESPONSE
|__| 29. MANIPULATIVE RESPONSE
|x_| 30. PHYSICAL SIMILARITY
|x_| 31. FUNCTIONAL SIMILARITY
|x_| 32. FIDELITY/REALISM
|__| 33. CONTINUOUS RESPONSE

*EVALUATION MODE
|__| 34. INSTRUCTOR EVALUATION
|__| 35. SELF EVALUATION
|__| 36. PEER EVALUATION
|__| 37. AUTOMATED EVALUATION
|__| 38. VERBAL/WRITTEN EVALUATI
|__| 39. IMMEDIATE ON RESPONSE
|__| 40. IMMEDIATE ON ERROR
|x_| 41. POST-SESSION EVALUATION
|__| 42. FAULT INSERTION

*ENVIRONMENTAL CONDITIONS
|x_| 43. PHYSICAL MOTION
|__| 44. NOISE
|__| 45. LIGHTING
|__| 46. VIBRATION
|__| 47. RESTRICTIVE CLOTHING

*LEARNING LEVELS
|__| 48. A. FAMILIARITY
|__| 49. B. PERFORM PROCEDURE
|x_| 50. C. PERFORM JOB
|__| 51. D. PERFORM MISSION

*SPECIAL REQUIREMENTS
|__| 52. CREW/TEAM INTERACTION
|__| 53. RANDOM ACCESS LOGIC

*COMMUNICATIONS
|__| 54. VERBAL/VOICE
|__| 55. NON-VERBAL/SIGNAL
|__| 56. SOUND/NOISE/SIGN

*PERFORMANCE CRITERIA
|__| 57. SOP'S
|__| 58. TIME
|x_| 59. ACCURACY

*SCENARIO DEVELOPMENT
|x_| 60. INTERACTIVE

SELECTION WORKSHEET FOR USE WITH THE FILE : seawolf

Objective Number: 8.0

Objective: Override and handpump shut the IAL Flood Valve

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

*TYPE OF LEARNING
- |__| 1. PSYCHOMOTOR
- |__| 2. AFFECTIVE(ATTITUDINAL)
- |__| 3. CONCEPTUAL
- |x_| 4. PROCEDURAL
- |__| 5. DECISION MAKING

*DISPLAY CHARACTERISTICS
- |__| 6. VERBAL/TEXT
- |__| 7. PHOTOGRAPHS
- |__| 8. DRAWINGS
- |__| 9. DIAGRAMS
- |__| 10. GRAPHICS
- |__| 11. ANIMATION
- |__| 12. COLORS
- |__| 13. VISUAL MOTION(CONSTANT)
- |__| 14. VISUAL MOTION(VARIABLE)
- |__| 15. AUDIO(VOICE)
- |__| 16. FIELD OF VIEW
- |x_| 17. PHYSICAL SIMILARITY
- |__| 18. FUNCTIONAL SIMILARITY
- |x_| 19. FIDELITY/REALISM
- |__| 20. INDICATORS/GAUGES
- |__| 21. TACTILE CUES
- |__| 22. KINESTHETIC CUES

*RESPONSE MODE
- |__| 23. VERBAL/WRITTEN RESPONSE
- |__| 24. VOICE RESPONSE
- |__| 25. DECISION INDICATORS
- |__| 26. FINE MOTOR RESPONSE
- |__| 27. GROSS MOTOR RESPONSE
- |__| 28. TRACKING RESPONSE
- |__| 29. MANIPULATIVE RESPONSE
- |x_| 30. PHYSICAL SIMILARITY
- |x_| 31. FUNCTIONAL SIMILARITY
- |x_| 32. FIDELITY/REALISM
- |__| 33. CONTINUOUS RESPONSE

*EVALUATION MODE
- |__| 34. INSTRUCTOR EVALUATION
- |__| 35. SELF EVALUATION
- |__| 36. PEER EVALUATION
- |__| 37. AUTOMATED EVALUATION
- |__| 38. VERBAL/WRITTEN EVALUATION
- |__| 39. IMMEDIATE ON RESPONSE
- |__| 40. IMMEDIATE ON ERROR
- |x_| 41. POST-SESSION EVALUATION
- |__| 42. FAULT INSERTION

*ENVIRONMENTAL CONDITIONS
- |x_| 43. PHYSICAL MOTION
- |__| 44. NOISE
- |__| 45. LIGHTING
- |__| 46. VIBRATION
- |__| 47. RESTRICTIVE CLOTHING

*LEARNING LEVELS
- |__| 48. A. FAMILIARITY
- |__| 49. B. PERFORM PROCEDURE
- |x_| 50. C. PERFORM JOB
- |__| 51. D. PERFORM MISSION

*SPECIAL REQUIREMENTS
- |__| 52. CREW/TEAM INTERACTION
- |__| 53. RANDOM ACCESS LOGIC

*COMMUNICATIONS
- |__| 54. VERBAL/VOICE
- |__| 55. NON-VERBAL/SIGNAL
- |__| 56. SOUND/NOISE/SIGN

*PERFORMANCE CRITERIA
- |__| 57. SOP'S
- |__| 58. TIME
- |x_| 59. ACCURACY

*SCENARIO DEVELOPMENT
- |x_| 60. INTERACTIVE

SELECTION WORKSHEET FOR USE WITH THE FILE : seawolf

Objective Number: 9.0

Objective: Handpump "OPEN" the Equalization Valve and ensure Equalization Valve Light is "ON"

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

*TYPE OF LEARNING
|__| 1. PSYCHOMOTOR
|__| 2. AFFECTIVE(ATTITUDINAL)
|__| 3. CONCEPTUAL
|x_| 4. PROCEDURAL
|__| 5. DECISION MAKING

*DISPLAY CHARACTERISTICS
|__| 6. VERBAL/TEXT
|__| 7. PHOTOGRAPHS
|__| 8. DRAWINGS
|__| 9. DIAGRAMS
|__| 10. GRAPHICS
|__| 11. ANIMATION
|__| 12. COLORS
|__| 13. VISUAL MOTION(CONSTANT)
|__| 14. VISUAL MOTION(VARIABLE)
|__| 15. AUDIO(VOICE)
|__| 16. FIELD OF VIEW
|x_| 17. PHYSICAL SIMILARITY
|__| 18. FUNCTIONAL SIMILARITY
|x_| 19. FIDELITY/REALISM
|__| 20. INDICATORS/GAUGES
|__| 21. TACTILE CUES
|__| 22. KINESTHETIC CUES

*RESPONSE MODE
|__| 23. VERBAL/WRITTEN RESPONSE
|__| 24. VOICE RESPONSE
|__| 25. DECISION INDICATORS
|__| 26. FINE MOTOR RESPONSE
|__| 27. GROSS MOTOR RESPONSE
|__| 28. TRACKING RESPONSE
|__| 29. MANIPULATIVE RESPONSE
|x_| 30. PHYSICAL SIMILARITY
|x_| 31. FUNCTIONAL SIMILARITY
|x_| 32. FIDELITY/REALISM
|__| 33. CONTINUOUS RESPONSE

*EVALUATION MODE
|__| 34. INSTRUCTOR EVALUATION
|__| 35. SELF EVALUATION
|__| 36. PEER EVALUATION
|__| 37. AUTOMATED EVALUATION
|__| 38. VERBAL/WRITTEN EVALUATI
|__| 39. IMMEDIATE ON RESPONSE
|__| 40. IMMEDIATE ON ERROR
|x_| 41. POST-SESSION EVALUATION
|__| 42. FAULT INSERTION

*ENVIRONMENTAL CONDITIONS
|x_| 43. PHYSICAL MOTION
|__| 44. NOISE
|__| 45. LIGHTING
|__| 46. VIBRATION
|__| 47. RESTRICTIVE CLOTHING

*LEARNING LEVELS
|__| 48. A. FAMILIARITY
|__| 49. B. PERFORM PROCEDURE
|x_| 50. C. PERFORM JOB
|__| 51. D. PERFORM MISSION

*SPECIAL REQUIREMENTS
|__| 52. CREW/TEAM INTERACTION
|__| 53. RANDOM ACCESS LOGIC

*COMMUNICATIONS
|__| 54. VERBAL/VOICE
|__| 55. NON-VERBAL/SIGNAL
|__| 56. SOUND/NOISE/SIGN

*PERFORMANCE CRITERIA
|__| 57. SOP'S
|__| 58. TIME
|x_| 59. ACCURACY

*SCENARIO DEVELOPMENT
|x_| 60. INTERACTIVE

SELECTION WORKSHEET FOR USE WITH THE FILE : seawolf

Objective Number: 10.0

Objective: Check Equalization and Flood LIne Pressure Gauges to ensure same pressure

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

*TYPE OF LEARNING
|__| 1. PSYCHOMOTOR
|__| 2. AFFECTIVE(ATTITUDINAL)
|__| 3. CONCEPTUAL
|x_| 4. PROCEDURAL
|__| 5. DECISION MAKING

*DISPLAY CHARACTERISTICS
|__| 6. VERBAL/TEXT
|__| 7. PHOTOGRAPHS
|__| 8. DRAWINGS
|__| 9. DIAGRAMS
|__| 10. GRAPHICS
|__| 11. ANIMATION -
|__| 12. COLORS
|__| 13. VISUAL MOTION(CONSTANT)
|__| 14. VISUAL MOTION(VARIABLE)
|__| 15. AUDIO(VOICE)
|__| 16. FIELD OF VIEW
|x_| 17. PHYSICAL SIMILARITY
|__| 18. FUNCTIONAL SIMILARITY
|x_| 19. FIDELITY/REALISM
|__| 20. INDICATORS/GAUGES
|__| 21. TACTILE CUES
|__| 22. KINESTHETIC CUES

*RESPONSE MODE
|__| 23. VERBAL/WRITTEN RESPONSE
|__| 24. VOICE RESPONSE
|__| 25. DECISION INDICATORS
|__| 26. FINE MOTOR RESPONSE
|__| 27. GROSS MOTOR RESPONSE
|__| 28. TRACKING RESPONSE
|__| 29. MANIPULATIVE RESPONSE
|x_| 30. PHYSICAL SIMILARITY
|x_| 31. FUNCTIONAL SIMILARITY
|x_| 32. FIDELITY/REALISM
|__| 33. CONTINUOUS RESPONSE

*EVALUATION MODE
|__| 34. INSTRUCTOR EVALUATION
|__| 35. SELF EVALUATION
|__| 36. PEER EVALUATION
|__| 37. AUTOMATED EVALUATION
|__| 38. VERBAL/WRITTEN EVALUATION
|__| 39. IMMEDIATE ON RESPONSE
|__| 40. IMMEDIATE ON ERROR
|x_| 41. POST-SESSION EVALUATION
|__| 42. FAULT INSERTION

*ENVIRONMENTAL CONDITIONS
|x_| 43. PHYSICAL MOTION
|__| 44. NOISE
|__| 45. LIGHTING
|__| 46. VIBRATION
|__| 47. RESTRICTIVE CLOTHING

*LEARNING LEVELS
|__| 48. A. FAMILIARITY
|__| 49. B. PERFORM PROCEDURE
|x_| 50. C. PERFORM JOB
|__| 51. D. PERFORM MISSION

*SPECIAL REQUIREMENTS
|__| 52. CREW/TEAM INTERACTION
|__| 53. RANDOM ACCESS LOGIC

*COMMUNICATIONS
|__| 54. VERBAL/VOICE
|__| 55. NON-VERBAL/SIGNAL
|__| 56. SOUND/NOISE/SIGN

*PERFORMANCE CRITERIA
|__| 57. SOP'S
|__| 58. TIME
|x_| 59. ACCURACY

*SCENARIO DEVELOPMENT
|x_| 60. INTERACTIVE

SELECTION WORKSHEET FOR USE WITH THE FILE : seawolf

Objective Number: 11.0

Objective: Handpump "OPEN" the Muzzle Door

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

*TYPE OF LEARNING
|__| 1. PSYCHOMOTOR
|__| 2. AFFECTIVE(ATTITUDINAL)
|__| 3. CONCEPTUAL
|x_| 4. PROCEDURAL
|__| 5. DECISION MAKING
*DISPLAY CHARACTERISTICS
|__| 6. VERBAL/TEXT
|__| 7. PHOTOGRAPHS
|__| 8. DRAWINGS
|__| 9. DIAGRAMS
|__| 10. GRAPHICS
|__| 11. ANIMATION
|__| 12. COLORS
|__| 13. VISUAL MOTION(CONSTANT)
|__| 14. VISUAL MOTION(VARIABLE)
|__| 15. AUDIO(VOICE)
|__| 16. FIELD OF VIEW
|x_| 17. PHYSICAL SIMILARITY
|__| 18. FUNCTIONAL SIMILARITY
|x_| 19. FIDELITY/REALISM
|__| 20. INDICATORS/GAUGES
|__| 21. TACTILE CUES
|__| 22. KINESTHETIC CUES
*RESPONSE MODE
|__| 23. VERBAL/WRITTEN RESPONSE
|__| 24. VOICE RESPONSE
|__| 25. DECISION INDICATORS
|__| 26. FINE MOTOR RESPONSE
|__| 27. GROSS MOTOR RESPONSE
|__| 28. TRACKING RESPONSE
|__| 29. MANIPULATIVE RESPONSE
|x_| 30. PHYSICAL SIMILARITY
|x_| 31. FUNCTIONAL SIMILARITY
|x_| 32. FIDELITY/REALISM
|__| 33. CONTINUOUS RESPONSE
*EVALUATION MODE
|__| 34. INSTRUCTOR EVALUATION
|__| 35. SELF EVALUATION
|__| 36. PEER EVALUATION
|__| 37. AUTOMATED EVALUATION
|__| 38. VERBAL/WRITTEN EVALUATI
|__| 39. IMMEDIATE ON RESPONSE
|__| 40. IMMEDIATE ON ERROR
|x_| 41. POST-SESSION EVALUATION
|__| 42. FAULT INSERTION
*ENVIRONMENTAL CONDITIONS
|x_| 43. PHYSICAL MOTION
|__| 44. NOISE
|__| 45. LIGHTING
|__| 46. VIBRATION
|__| 47. RESTRICTIVE CLOTHING
*LEARNING LEVELS
|__| 48. A. FAMILIARITY
|__| 49. B. PERFORM PROCEDURE
|x_| 50. C. PERFORM JOB
|__| 51. D. PERFORM MISSION
*SPECIAL REQUIREMENTS
|__| 52. CREW/TEAM INTERACTION
|__| 53. RANDOM ACCESS LOGIC
*COMMUNICATIONS
|__| 54. VERBAL/VOICE
|__| 55. NON-VERBAL/SIGNAL
|__| 56. SOUND/NOISE/SIGN
*PERFORMANCE CRITERIA
|__| 57. SOP'S
|__| 58. TIME
|x_| 59. ACCURACY
*SCENARIO DEVELOPMENT
|x_| 60. INTERACTIVE

SELECTION WORKSHEET FOR USE WITH THE FILE : seawolf

Objective Number: 12.0

Objective: Ensure Impulse Isolation Door opens to appropriate launcher and light is "ON"

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

*TYPE OF LEARNING
- |__| 1. PSYCHOMOTOR
- |__| 2. AFFECTIVE(ATTITUDINAL)
- |__| 3. CONCEPTUAL
- |x_| 4. PROCEDURAL
- |__| 5. DECISION MAKING

*DISPLAY CHARACTERISTICS
- |__| 6. VERBAL/TEXT
- |__| 7. PHOTOGRAPHS
- |__| 8. DRAWINGS
- |__| 9. DIAGRAMS
- |__| 10. GRAPHICS
- |__| 11. ANIMATION
- |__| 12. COLORS
- |__| 13. VISUAL MOTION(CONSTANT)
- |__| 14. VISUAL MOTION(VARIABLE)
- |__| 15. AUDIO(VOICE)
- |__| 16. FIELD OF VIEW
- |x_| 17. PHYSICAL SIMILARITY
- |__| 18. FUNCTIONAL SIMILARITY
- |x_| 19. FIDELITY/REALISM
- |__| 20. INDICATORS/GAUGES
- |__| 21. TACTILE CUES
- |__| 22. KINESTHETIC CUES

*RESPONSE MODE
- |__| 23. VERBAL/WRITTEN RESPONSE
- |__| 24. VOICE RESPONSE
- |__| 25. DECISION INDICATORS
- |__| 26. FINE MOTOR RESPONSE
- |__| 27. GROSS MOTOR RESPONSE
- |__| 28. TRACKING RESPONSE
- |__| 29. MANIPULATIVE RESPONSE
- |x_| 30. PHYSICAL SIMILARITY
- |x_| 31. FUNCTIONAL SIMILARITY
- |x_| 32. FIDELITY/REALISM
- |__| 33. CONTINUOUS RESPONSE

*EVALUATION MODE
- |__| 34. INSTRUCTOR EVALUATION
- |__| 35. SELF EVALUATION
- |__| 36. PEER EVALUATION
- |__| 37. AUTOMATED EVALUATION
- |__| 38. VERBAL/WRITTEN EVALUATION
- |__| 39. IMMEDIATE ON RESPONSE
- |__| 40. IMMEDIATE ON ERROR
- |x_| 41. POST-SESSION EVALUATION
- |__| 42. FAULT INSERTION

*ENVIRONMENTAL CONDITIONS
- |x_| 43. PHYSICAL MOTION
- |__| 44. NOISE
- |__| 45. LIGHTING
- |__| 46. VIBRATION
- |__| 47. RESTRICTIVE CLOTHING

*LEARNING LEVELS
- |__| 48. A. FAMILIARITY
- |__| 49. B. PERFORM PROCEDURE
- |x_| 50. C. PERFORM JOB
- |__| 51. D. PERFORM MISSION

*SPECIAL REQUIREMENTS
- |__| 52. CREW/TEAM INTERACTION
- |__| 53. RANDOM ACCESS LOGIC

*COMMUNICATIONS
- |__| 54. VERBAL/VOICE
- |__| 55. NON-VERBAL/SIGNAL
- |__| 56. SOUND/NOISE/SIGN

*PERFORMANCE CRITERIA
- |__| 57. SOP'S
- |__| 58. TIME
- |x_| 59. ACCURACY

*SCENARIO DEVELOPMENT
- |x_| 60. INTERACTIVE

SELECTION WORKSHEET FOR USE WITH THE FILE : seawolf

Objective Number: 13.0

Objective: LCDP: Ensure RAM Position Light is on "BATTERY"

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

*TYPE OF LEARNING
|__| 1. PSYCHOMOTOR
|__| 2. AFFECTIVE(ATTITUDINAL)
|__| 3. CONCEPTUAL
|x_| 4. PROCEDURAL
|__| 5. DECISION MAKING
*DISPLAY CHARACTERISTICS
|__| 6. VERBAL/TEXT
|__| 7. PHOTOGRAPHS
|__| 8. DRAWINGS
|__| 9. DIAGRAMS
|__| 10. GRAPHICS
|__| 11. ANIMATION
|__| 12. COLORS
|__| 13. VISUAL MOTION(CONSTANT)
|__| 14. VISUAL MOTION(VARIABLE)
|__| 15. AUDIO(VOICE)
|__| 16. FIELD OF VIEW
|__| 17. PHYSICAL SIMILARITY
|__| 18. FUNCTIONAL SIMILARITY
|__| 19. FIDELITY/REALISM
|x_| 20. INDICATORS/GAUGES
|__| 21. TACTILE CUES
|__| 22. KINESTHETIC CUES
*RESPONSE MODE
|__| 23. VERBAL/WRITTEN RESPONSE
|__| 24. VOICE RESPONSE
|__| 25. DECISION INDICATORS
|__| 26. FINE MOTOR RESPONSE
|__| 27. GROSS MOTOR RESPONSE
|__| 28. TRACKING RESPONSE
|__| 29. MANIPULATIVE RESPONSE
|__| 30. PHYSICAL SIMILARITY
|__| 31. FUNCTIONAL SIMILARITY
|x_| 32. FIDELITY/REALISM
|__| 33. CONTINUOUS RESPONSE
*EVALUATION MODE
|__| 34. INSTRUCTOR EVALUATION
|__| 35. SELF EVALUATION
|__| 36. PEER EVALUATION
|__| 37. AUTOMATED EVALUATION
|__| 38. VERBAL/WRITTEN EVALUATI
|__| 39. IMMEDIATE ON RESPONSE
|x_| 40. IMMEDIATE ON ERROR
|__| 41. POST-SESSION EVALUATION
|__| 42. FAULT INSERTION
*ENVIRONMENTAL CONDITIONS
|x_| 43. PHYSICAL MOTION
|__| 44. NOISE
|__| 45. LIGHTING
|__| 46. VIBRATION
|__| 47. RESTRICTIVE CLOTHING
*LEARNING LEVELS
|__| 48. A. FAMILIARITY
|__| 49. B. PERFORM PROCEDURE
|x_| 50. C. PERFORM JOB
|__| 51. D. PERFORM MISSION
*SPECIAL REQUIREMENTS
|__| 52. CREW/TEAM INTERACTION
|__| 53. RANDOM ACCESS LOGIC
*COMMUNICATIONS
|__| 54. VERBAL/VOICE
|__| 55. NON-VERBAL/SIGNAL
|__| 56. SOUND/NOISE/SIGN
*PERFORMANCE CRITERIA
|__| 57. SOP'S
|__| 58. TIME
|x_| 59. ACCURACY
*SCENARIO DEVELOPMENT
|x_| 60. INTERACTIVE

SELECTION WORKSHEET FOR USE WITH THE FILE : seawolf

Objective Number: 14.0

Objective: Position Load/Loaded Switch to "LOADED" and ensure light is "ON"

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

*TYPE OF LEARNING
|__| 1. PSYCHOMOTOR
|__| 2. AFFECTIVE(ATTITUDINAL)
|__| 3. CONCEPTUAL
|x_| 4. PROCEDURAL
|__| 5. DECISION MAKING
*DISPLAY CHARACTERISTICS
|__| 6. VERBAL/TEXT
|__| 7. PHOTOGRAPHS
|__| 8. DRAWINGS
|__| 9. DIAGRAMS
|__| 10. GRAPHICS
|__| 11. ANIMATION
|__| 12. COLORS
|__| 13. VISUAL MOTION(CONSTANT)
|__| 14. VISUAL MOTION(VARIABLE)
|__| 15. AUDIO(VOICE)
|__| 16. FIELD OF VIEW
|x_| 17. PHYSICAL SIMILARITY
|__| 18. FUNCTIONAL SIMILARITY
|x_| 19. FIDELITY/REALISM
|__| 20. INDICATORS/GAUGES
|__| 21. TACTILE CUES
|__| 22. KINESTHETIC CUES
*RESPONSE MODE
|__| 23. VERBAL/WRITTEN RESPONSE
|__| 24. VOICE RESPONSE
|__| 25. DECISION INDICATORS
|__| 26. FINE MOTOR RESPONSE
|__| 27. GROSS MOTOR RESPONSE
|__| 28. TRACKING RESPONSE
|__| 29. MANIPULATIVE RESPONSE
|x_| 30. PHYSICAL SIMILARITY
|x_| 31. FUNCTIONAL SIMILARITY
|x_| 32. FIDELITY/REALISM
|__| 33. CONTINUOUS RESPONSE
*EVALUATION MODE
|__| 34. INSTRUCTOR EVALUATION
|__| 35. SELF EVALUATION
|__| 36. PEER EVALUATION
|__| 37. AUTOMATED EVALUATION
|__| 38. VERBAL/WRITTEN EVALUATION
|__| 39. IMMEDIATE ON RESPONSE
|__| 40. IMMEDIATE ON ERROR
|x_| 41. POST-SESSION EVALUATION
|__| 42. FAULT INSERTION
*ENVIRONMENTAL CONDITIONS
|x_| 43. PHYSICAL MOTION
|__| 44. NOISE
|__| 45. LIGHTING
|__| 46. VIBRATION
|__| 47. RESTRICTIVE CLOTHING
*LEARNING LEVELS
|__| 48. A. FAMILIARITY
|__| 49. B. PERFORM PROCEDURE
|x_| 50. C. PERFORM JOB
|__| 51. D. PERFORM MISSION
*SPECIAL REQUIREMENTS
|__| 52. CREW/TEAM INTERACTION
|__| 53. RANDOM ACCESS LOGIC
*COMMUNICATIONS
|__| 54. VERBAL/VOICE
|__| 55. NON-VERBAL/SIGNAL
|__| 56. SOUND/NOISE/SIGN
*PERFORMANCE CRITERIA
|__| 57. SOP'S
|__| 58. TIME
|x_| 59. ACCURACY
*SCENARIO DEVELOPMENT
|x_| 60. INTERACTIVE

SELECTION WORKSHEET FOR USE WITH THE FILE : seawolf

Objective Number: 15.0

Objective: Manually override Firing Valve Hydraulic Interlocks

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

*TYPE OF LEARNING
- |__| 1. PSYCHOMOTOR
- |__| 2. AFFECTIVE(ATTITUDINAL)
- |__| 3. CONCEPTUAL
- |x_| 4. PROCEDURAL
- |__| 5. DECISION MAKING

*DISPLAY CHARACTERISTICS
- |__| 6. VERBAL/TEXT
- |__| 7. PHOTOGRAPHS
- |__| 8. DRAWINGS
- |__| 9. DIAGRAMS
- |__| 10. GRAPHICS
- |__| 11. ANIMATION
- |__| 12. COLORS
- |__| 13. VISUAL MOTION(CONSTANT)
- |__| 14. VISUAL MOTION(VARIABLE)
- |__| 15. AUDIO(VOICE)
- |__| 16. FIELD OF VIEW
- |x_| 17. PHYSICAL SIMILARITY
- |__| 18. FUNCTIONAL SIMILARITY
- |x_| 19. FIDELITY/REALISM
- |__| 20. INDICATORS/GAUGES
- |__| 21. TACTILE CUES
- |__| 22. KINESTHETIC CUES

*RESPONSE MODE
- |__| 23. VERBAL/WRITTEN RESPONSE
- |__| 24. VOICE RESPONSE
- |__| 25. DECISION INDICATORS
- |__| 26. FINE MOTOR RESPONSE
- |__| 27. GROSS MOTOR RESPONSE
- |__| 28. TRACKING RESPONSE
- |__| 29. MANIPULATIVE RESPONSE
- |x_| 30. PHYSICAL SIMILARITY
- |x_| 31. FUNCTIONAL SIMILARITY
- |x_| 32. FIDELITY/REALISM
- |__| 33. CONTINUOUS RESPONSE

*EVALUATION MODE
- |__| 34. INSTRUCTOR EVALUATION
- |__| 35. SELF EVALUATION
- |__| 36. PEER EVALUATION
- |__| 37. AUTOMATED EVALUATION
- |__| 38. VERBAL/WRITTEN EVALUATI
- |__| 39. IMMEDIATE ON RESPONSE
- |__| 40. IMMEDIATE ON ERROR
- |x_| 41. POST-SESSION EVALUATION
- |__| 42. FAULT INSERTION

*ENVIRONMENTAL CONDITIONS
- |x_| 43. PHYSICAL MOTION
- |__| 44. NOISE
- |__| 45. LIGHTING
- |__| 46. VIBRATION
- |__| 47. RESTRICTIVE CLOTHING

*LEARNING LEVELS
- |__| 48. A. FAMILIARITY
- |__| 49. B. PERFORM PROCEDURE
- |x_| 50. C. PERFORM JOB
- |__| 51. D. PERFORM MISSION

*SPECIAL REQUIREMENTS
- |__| 52. CREW/TEAM INTERACTION
- |__| 53. RANDOM ACCESS LOGIC

*COMMUNICATIONS
- |__| 54. VERBAL/VOICE
- |__| 55. NON-VERBAL/SIGNAL
- |__| 56. SOUND/NOISE/SIGN

*PERFORMANCE CRITERIA
- |__| 57. SOP'S
- |__| 58. TIME
- |x_| 59. ACCURACY

*SCENARIO DEVELOPMENT
- |x_| 60. INTERACTIVE

SELECTION WORKSHEET FOR USE WITH THE FILE : seawolf

Objective Number: 16.0

Objective: Launch device using Launch Switch

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

*TYPE OF LEARNING
- |__| 1. PSYCHOMOTOR
- |__| 2. AFFECTIVE(ATTITUDINAL)
- |__| 3. CONCEPTUAL
- |x_| 4. PROCEDURAL
- |__| 5. DECISION MAKING

*DISPLAY CHARACTERISTICS
- |__| 6. VERBAL/TEXT
- |__| 7. PHOTOGRAPHS
- |__| 8. DRAWINGS
- |__| 9. DIAGRAMS
- |__| 10. GRAPHICS
- |__| 11. ANIMATION
- |__| 12. COLORS
- |__| 13. VISUAL MOTION(CONSTANT)
- |__| 14. VISUAL MOTION(VARIABLE)
- |__| 15. AUDIO(VOICE)
- |__| 16. FIELD OF VIEW
- |__| 17. PHYSICAL SIMILARITY
- |__| 18. FUNCTIONAL SIMILARITY
- |__| 19. FIDELITY/REALISM
- |x_| 20. INDICATORS/GAUGES
- |__| 21. TACTILE CUES
- |__| 22. KINESTHETIC CUES

*RESPONSE MODE
- |__| 23. VERBAL/WRITTEN RESPONSE
- |__| 24. VOICE RESPONSE
- |__| 25. DECISION INDICATORS
- |__| 26. FINE MOTOR RESPONSE
- |__| 27. GROSS MOTOR RESPONSE
- |__| 28. TRACKING RESPONSE
- |__| 29. MANIPULATIVE RESPONSE
- |__| 30. PHYSICAL SIMILARITY
- |__| 31. FUNCTIONAL SIMILARITY
- |x_| 32. FIDELITY/REALISM
- |__| 33. CONTINUOUS RESPONSE

*EVALUATION MODE
- |__| 34. INSTRUCTOR EVALUATION
- |__| 35. SELF EVALUATION
- |__| 36. PEER EVALUATION
- |__| 37. AUTOMATED EVALUATION
- |__| 38. VERBAL/WRITTEN EVALUATION
- |__| 39. IMMEDIATE ON RESPONSE
- |x_| 40. IMMEDIATE ON ERROR
- |__| 41. POST-SESSION EVALUATION
- |__| 42. FAULT INSERTION

*ENVIRONMENTAL CONDITIONS
- |x_| 43. PHYSICAL MOTION
- |__| 44. NOISE
- |__| 45. LIGHTING
- |__| 46. VIBRATION
- |__| 47. RESTRICTIVE CLOTHING

*LEARNING LEVELS
- |__| 48. A. FAMILIARITY
- |__| 49. B. PERFORM PROCEDURE
- |x_| 50. C. PERFORM JOB
- |__| 51. D. PERFORM MISSION

*SPECIAL REQUIREMENTS
- |__| 52. CREW/TEAM INTERACTION
- |__| 53. RANDOM ACCESS LOGIC

*COMMUNICATIONS
- |__| 54. VERBAL/VOICE
- |__| 55. NON-VERBAL/SIGNAL
- |__| 56. SOUND/NOISE/SIGN

*PERFORMANCE CRITERIA
- |__| 57. SOP'S
- |__| 58. TIME
- |x_| 59. ACCURACY

*SCENARIO DEVELOPMENT
- |x_| 60. INTERACTIVE

SELECTION WORKSHEET FOR USE WITH THE FILE : seawolf

Objective Number: 17.0

Objective: Monitor Indicators for "LAUNCHED" indicators

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

*TYPE OF LEARNING
- |__| 1. PSYCHOMOTOR
- |__| 2. AFFECTIVE(ATTITUDINAL)
- |__| 3. CONCEPTUAL
- |x_| 4. PROCEDURAL
- |__| 5. DECISION MAKING

*DISPLAY CHARACTERISTICS
- |__| 6. VERBAL/TEXT
- |__| 7. PHOTOGRAPHS
- |__| 8. DRAWINGS
- |__| 9. DIAGRAMS
- |__| 10. GRAPHICS
- |__| 11. ANIMATION
- |__| 12. COLORS
- |__| 13. VISUAL MOTION(CONSTANT)
- |__| 14. VISUAL MOTION(VARIABLE)
- |__| 15. AUDIO(VOICE)
- |__| 16. FIELD OF VIEW
- |__| 17. PHYSICAL SIMILARITY
- |__| 18. FUNCTIONAL SIMILARITY
- |__| 19. FIDELITY/REALISM
- |x_| 20. INDICATORS/GAUGES
- |__| 21. TACTILE CUES
- |__| 22. KINESTHETIC CUES

*RESPONSE MODE
- |__| 23. VERBAL/WRITTEN RESPONSE
- |__| 24. VOICE RESPONSE
- |__| 25. DECISION INDICATORS
- |__| 26. FINE MOTOR RESPONSE
- |__| 27. GROSS MOTOR RESPONSE
- |__| 28. TRACKING RESPONSE
- |__| 29. MANIPULATIVE RESPONSE
- |__| 30. PHYSICAL SIMILARITY
- |__| 31. FUNCTIONAL SIMILARITY
- |x_| 32. FIDELITY/REALISM
- |__| 33. CONTINUOUS RESPONSE

*EVALUATION MODE
- |__| 34. INSTRUCTOR EVALUATION
- |__| 35. SELF EVALUATION
- |__| 36. PEER EVALUATION
- |__| 37. AUTOMATED EVALUATION
- |__| 38. VERBAL/WRITTEN EVALUATI
- |__| 39. IMMEDIATE ON RESPONSE
- |x_| 40. IMMEDIATE ON ERROR
- |__| 41. POST-SESSION EVALUATION
- |__| 42. FAULT INSERTION

*ENVIRONMENTAL CONDITIONS
- |x_| 43. PHYSICAL MOTION
- |__| 44. NOISE
- |__| 45. LIGHTING
- |__| 46. VIBRATION
- |__| 47. RESTRICTIVE CLOTHING

*LEARNING LEVELS
- |__| 48. A. FAMILIARITY
- |__| 49. B. PERFORM PROCEDURE
- |x_| 50. C. PERFORM JOB
- |__| 51. D. PERFORM MISSION

*SPECIAL REQUIREMENTS
- |__| 52. CREW/TEAM INTERACTION
- |__| 53. RANDOM ACCESS LOGIC

*COMMUNICATIONS
- |__| 54. VERBAL/VOICE
- |__| 55. NON-VERBAL/SIGNAL
- |__| 56. SOUND/NOISE/SIGN

*PERFORMANCE CRITERIA
- |__| 57. SOP'S
- |__| 58. TIME
- |x_| 59. ACCURACY

*SCENARIO DEVELOPMENT
- |x_| 60. INTERACTIVE

SELECTION WORKSHEET FOR USE WITH THE FILE : seawolf

Objective Number: 18.0

Objective: Handpump Muzzle Door to "SHUT" and ensure Shut Door Light is "ON"

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

*TYPE OF LEARNING
- |__| 1. PSYCHOMOTOR
- |__| 2. AFFECTIVE(ATTITUDINAL)
- |__| 3. CONCEPTUAL
- |x_| 4. PROCEDURAL
- |__| 5. DECISION MAKING

*DISPLAY CHARACTERISTICS
- |__| 6. VERBAL/TEXT
- |__| 7. PHOTOGRAPHS
- |__| 8. DRAWINGS
- |__| 9. DIAGRAMS
- |__| 10. GRAPHICS
- |__| 11. ANIMATION
- |__| 12. COLORS
- |__| 13. VISUAL MOTION(CONSTANT)
- |__| 14. VISUAL MOTION(VARIABLE)
- |__| 15. AUDIO(VOICE)
- |__| 16. FIELD OF VIEW
- |x_| 17. PHYSICAL SIMILARITY
- |__| 18. FUNCTIONAL SIMILARITY
- |x_| 19. FIDELITY/REALISM
- |__| 20. INDICATORS/GAUGES
- |__| 21. TACTILE CUES
- |__| 22. KINESTHETIC CUES

*RESPONSE MODE
- |__| 23. VERBAL/WRITTEN RESPONSE
- |__| 24. VOICE RESPONSE
- |__| 25. DECISION INDICATORS
- |__| 26. FINE MOTOR RESPONSE
- |__| 27. GROSS MOTOR RESPONSE
- |__| 28. TRACKING RESPONSE
- |__| 29. MANIPULATIVE RESPONSE
- |x_| 30. PHYSICAL SIMILARITY
- |x_| 31. FUNCTIONAL SIMILARITY
- |x_| 32. FIDELITY/REALISM
- |__| 33. CONTINUOUS RESPONSE

*EVALUATION MODE
- |__| 34. INSTRUCTOR EVALUATION
- |__| 35. SELF EVALUATION
- |__| 36. PEER EVALUATION
- |__| 37. AUTOMATED EVALUATION
- |__| 38. VERBAL/WRITTEN EVALUATION
- |__| 39. IMMEDIATE ON RESPONSE
- |__| 40. IMMEDIATE ON ERROR
- |x_| 41. POST-SESSION EVALUATION
- |__| 42. FAULT INSERTION

*ENVIRONMENTAL CONDITIONS
- |x_| 43. PHYSICAL MOTION
- |__| 44. NOISE
- |__| 45. LIGHTING
- |__| 46. VIBRATION
- |__| 47. RESTRICTIVE CLOTHING

*LEARNING LEVELS
- |__| 48. A. FAMILIARITY
- |__| 49. B. PERFORM PROCEDURE
- |x_| 50. C. PERFORM JOB
- |__| 51. D. PERFORM MISSION

*SPECIAL REQUIREMENTS
- |__| 52. CREW/TEAM INTERACTION
- |__| 53. RANDOM ACCESS LOGIC

*COMMUNICATIONS
- |__| 54. VERBAL/VOICE
- |__| 55. NON-VERBAL/SIGNAL
- |__| 56. SOUND/NOISE/SIGN

*PERFORMANCE CRITERIA
- |__| 57. SOP'S
- |__| 58. TIME
- |x_| 59. ACCURACY

*SCENARIO DEVELOPMENT
- |x_| 60. INTERACTIVE

SELECTION WORKSHEET FOR USE WITH THE FILE : seawolf

Objective Number: 19.0

Objective: Handpump shut the Seawater Impulse Isolation Valve and ensure light is "ON"

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

*TYPE OF LEARNING
- [ ] 1. PSYCHOMOTOR
- [ ] 2. AFFECTIVE(ATTITUDINAL)
- [ ] 3. CONCEPTUAL
- [x] 4. PROCEDURAL
- [ ] 5. DECISION MAKING

*DISPLAY CHARACTERISTICS
- [ ] 6. VERBAL/TEXT
- [ ] 7. PHOTOGRAPHS
- [ ] 8. DRAWINGS
- [ ] 9. DIAGRAMS
- [ ] 10. GRAPHICS
- [ ] 11. ANIMATION
- [ ] 12. COLORS
- [ ] 13. VISUAL MOTION(CONSTANT)
- [ ] 14. VISUAL MOTION(VARIABLE)
- [ ] 15. AUDIO(VOICE)
- [ ] 16. FIELD OF VIEW
- [x] 17. PHYSICAL SIMILARITY
- [ ] 18. FUNCTIONAL SIMILARITY
- [x] 19. FIDELITY/REALISM
- [ ] 20. INDICATORS/GAUGES
- [ ] 21. TACTILE CUES
- [ ] 22. KINESTHETIC CUES

*RESPONSE MODE
- [ ] 23. VERBAL/WRITTEN RESPONSE
- [ ] 24. VOICE RESPONSE
- [ ] 25. DECISION INDICATORS
- [ ] 26. FINE MOTOR RESPONSE
- [ ] 27. GROSS MOTOR RESPONSE
- [ ] 28. TRACKING RESPONSE
- [ ] 29. MANIPULATIVE RESPONSE
- [x] 30. PHYSICAL SIMILARITY
- [x] 31. FUNCTIONAL SIMILARITY
- [x] 32. FIDELITY/REALISM
- [ ] 33. CONTINUOUS RESPONSE

*EVALUATION MODE
- [ ] 34. INSTRUCTOR EVALUATION
- [ ] 35. SELF EVALUATION
- [ ] 36. PEER EVALUATION
- [ ] 37. AUTOMATED EVALUATION
- [ ] 38. VERBAL/WRITTEN EVALUATI
- [ ] 39. IMMEDIATE ON RESPONSE
- [ ] 40. IMMEDIATE ON ERROR
- [x] 41. POST-SESSION EVALUATION
- [ ] 42. FAULT INSERTION

*ENVIRONMENTAL CONDITIONS
- [x] 43. PHYSICAL MOTION
- [ ] 44. NOISE
- [ ] 45. LIGHTING
- [ ] 46. VIBRATION
- [ ] 47. RESTRICTIVE CLOTHING

*LEARNING LEVELS
- [ ] 48. A. FAMILIARITY
- [ ] 49. B. PERFORM PROCEDURE
- [x] 50. C. PERFORM JOB
- [ ] 51. D. PERFORM MISSION

*SPECIAL REQUIREMENTS
- [ ] 52. CREW/TEAM INTERACTION
- [ ] 53. RANDOM ACCESS LOGIC

*COMMUNICATIONS
- [ ] 54. VERBAL/VOICE
- [ ] 55. NON-VERBAL/SIGNAL
- [ ] 56. SOUND/NOISE/SIGN

*PERFORMANCE CRITERIA
- [ ] 57. SOP'S
- [ ] 58. TIME
- [x] 59. ACCURACY

*SCENARIO DEVELOPMENT
- [x] 60. INTERACTIVE

SELECTION WORKSHEET FOR USE WITH THE FILE : seawolf

Objective Number: 20.0

Objective: Handpump Open Vent/Drain Valves and drain barrel to Gravity System

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

*TYPE OF LEARNING

|__| 1. PSYCHOMOTOR
|__| 2. AFFECTIVE(ATTITUDINAL)
|__| 3. CONCEPTUAL
|x_| 4. PROCEDURAL
|__| 5. DECISION MAKING

*DISPLAY CHARACTERISTICS

|__| 6. VERBAL/TEXT
|__| 7. PHOTOGRAPHS
|__| 8. DRAWINGS
|__| 9. DIAGRAMS
|__| 10. GRAPHICS
|__| 11. ANIMATION
|__| 12. COLORS
|__| 13. VISUAL MOTION(CONSTANT)
|__| 14. VISUAL MOTION(VARIABLE)
|__| 15. AUDIO(VOICE)
|__| 16. FIELD OF VIEW
|x_| 17. PHYSICAL SIMILARITY
|__| 18. FUNCTIONAL SIMILARITY
|x_| 19. FIDELITY/REALISM
|__| 20. INDICATORS/GAUGES
|__| 21. TACTILE CUES
|__| 22. KINESTHETIC CUES

*RESPONSE MODE

|__| 23. VERBAL/WRITTEN RESPONSE
|__| 24. VOICE RESPONSE
|__| 25. DECISION INDICATORS
|__| 26. FINE MOTOR RESPONSE
|__| 27. GROSS MOTOR RESPONSE
|__| 28. TRACKING RESPONSE
|__| 29. MANIPULATIVE RESPONSE
|x_| 30. PHYSICAL SIMILARITY
|x_| 31. FUNCTIONAL SIMILARITY
|x_| 32. FIDELITY/REALISM
|__| 33. CONTINUOUS RESPONSE

*EVALUATION MODE

|__| 34. INSTRUCTOR EVALUATION
|__| 35. SELF EVALUATION
|__| 36. PEER EVALUATION
|__| 37. AUTOMATED EVALUATION
|__| 38. VERBAL/WRITTEN EVALUATION
|__| 39. IMMEDIATE ON RESPONSE
|__| 40. IMMEDIATE ON ERROR
|x_| 41. POST-SESSION EVALUATION
|__| 42. FAULT INSERTION

*ENVIRONMENTAL CONDITIONS

|x_| 43. PHYSICAL MOTION
|__| 44. NOISE
|__| 45. LIGHTING
|__| 46. VIBRATION
|__| 47. RESTRICTIVE CLOTHING

*LEARNING LEVELS

|__| 48. A. FAMILIARITY
|__| 49. B. PERFORM PROCEDURE
|x_| 50. C. PERFORM JOB
|__| 51. D. PERFORM MISSION

*SPECIAL REQUIREMENTS

|__| 52. CREW/TEAM INTERACTION
|__| 53. RANDOM ACCESS LOGIC

*COMMUNICATIONS

|__| 54. VERBAL/VOICE
|__| 55. NON-VERBAL/SIGNAL
|__| 56. SOUND/NOISE/SIGN

*PERFORMANCE CRITERIA

|__| 57. SOP'S
|__| 58. TIME
|x_| 59. ACCURACY

*SCENARIO DEVELOPMENT

|x_| 60. INTERACTIVE

APPENDIX E

AIMS MEDIA SELECTION PRINTOUTS

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MEDIA SELECTIONS FOR OBJECTIVES 1.0 TO 20.0
20 TOTAL OBJECTIVES

	# OF OBJECTIVES	% OF OBJECTIVES	MEDIUM
1.	20	100.00	PART TASK TRAINER
2.	20	100.00	INTERACTIVE VIDEO DISK
3.	20	100.00	COMPUTER MANAGED INSTRUCTION
4.	20	100.00	COMPUTER AIDED INSTRUCTION
5.	20	100.00	MEDIATED INTERACTIVE LECTURE
6.	19	95.00	WHOLE TASK TRAINER
7.	13	65.00	OPERATIONAL EQUIPMENT
8.	13	65.00	MOCK-UP

MEDIA SELECTION FOR OBJECTIVE 1.0

	MEDIUM	SPECIFIC RATING	GENERAL RATING
1.	MEDIATED INTERACTIVE LECTU	4.933	4.91
2.	INTERACTIVE VIDEO DISK	3.600	3.15
3.	COMPUTER AIDED INSTRUCTION	3.400	2.81
4.	PART TASK TRAINER	3.333	3.35
5.	COMPUTER MANAGED INSTRUCTI	3.267	2.58

MEDIA SELECTION FOR OBJECTIVE 2.0

	MEDIUM	SPECIFIC RATING	GENERAL RATING
1.	MEDIATED INTERACTIVE LECTU	5.000	4.91
2.	WHOLE TASK TRAINER	4.500	3.86
3.	PART TASK TRAINER	3.600	3.35
4.	INTERACTIVE VIDEO DISK	3.400	3.15
5.	COMPUTER AIDED INSTRUCTION	3.300	2.81
6.	COMPUTER MANAGED INSTRUCTI	3.100	2.58

MEDIA SELECTION FOR OBJECTIVE 3.0

	MEDIUM	SPECIFIC RATING	GENERAL RATING
1.	MEDIATED INTERACTIVE LECTU	5.000	4.91
2.	OPERATIONAL EQUIPMENT	4.909	4.03
3.	WHOLE TASK TRAINER	4.273	3.86
4.	PART TASK TRAINER	3.364	3.35
5.	MOCK-UP	3.364	2.35
6.	INTERACTIVE VIDEO DISK	3.273	3.15
7.	COMPUTER AIDED INSTRUCTION	3.091	2.81
8.	COMPUTER MANAGED INSTRUCTI	3.000	2.58

MEDIA SELECTION FOR OBJECTIVE 4.0

	MEDIUM	SPECIFIC RATING	GENERAL RATING
1.	MEDIATED INTERACTIVE LECTU	5.000	4.91
2.	OPERATIONAL EQUIPMENT	4.909	4.03
3.	WHOLE TASK TRAINER	4.273	3.86
4.	PART TASK TRAINER	3.364	3.35
5.	MOCK-UP	3.364	2.35
6.	INTERACTIVE VIDEO DISK	3.273	3.15
7.	COMPUTER AIDED INSTRUCTION	3.091	2.81
8.	COMPUTER MANAGED INSTRUCTI	3.000	2.58

MEDIA SELECTION FOR OBJECTIVE 5.0

	MEDIUM	SPECIFIC RATING	GENERAL RATING
1.	MEDIATED INTERACTIVE LECTU	5.000	4.91
2.	WHOLE TASK TRAINER	4.125	3.86
3.	PART TASK TRAINER	3.625	3.35
4.	INTERACTIVE VIDEO DISK	3.250	3.15
5.	COMPUTER AIDED INSTRUCTION	3.125	2.81
6.	COMPUTER MANAGED INSTRUCTI	3.000	2.58

MEDIA SELECTION FOR OBJECTIVE 6.0

	MEDIUM	SPECIFIC RATING	GENERAL RATING
1.	MEDIATED INTERACTIVE LECTU	5.000	4.91
2.	WHOLE TASK TRAINER	4.125	3.86
3.	PART TASK TRAINER	3.625	3.35
4.	INTERACTIVE VIDEO DISK	3.250	3.15
5.	COMPUTER AIDED INSTRUCTION	3.125	2.81
6.	COMPUTER MANAGED INSTRUCTI	3.000	2.58

MEDIA SELECTION FOR OBJECTIVE 7.0

	MEDIUM	SPECIFIC RATING	GENERAL RATING
1.	MEDIATED INTERACTIVE LECTU	5.000	4.91
2.	OPERATIONAL EQUIPMENT	4.909	4.03
3.	WHOLE TASK TRAINER	4.273	3.86
4.	PART TASK TRAINER	3.364	3.35
5.	MOCK-UP	3.364	2.35
6.	INTERACTIVE VIDEO DISK	3.273	3.15
7.	COMPUTER AIDED INSTRUCTION	3.091	2.81
8.	COMPUTER MANAGED INSTRUCTI	3.000	2.58

MEDIA SELECTION FOR OBJECTIVE 8.0

	MEDIUM	SPECIFIC RATING	GENERAL RATING
1.	MEDIATED INTERACTIVE LECTU	5.000	4.91
2.	OPERATIONAL EQUIPMENT	4.909	4.03
3.	WHOLE TASK TRAINER	4.273	3.86
4.	PART TASK TRAINER	3.364	3.35
5.	MOCK-UP	3.364	2.35
6.	INTERACTIVE VIDEO DISK	3.273	3.15
7.	COMPUTER AIDED INSTRUCTION	3.091	2.81
8.	COMPUTER MANAGED INSTRUCTI	3.000	2.58

MEDIA SELECTION FOR OBJECTIVE 9.0

	MEDIUM	SPECIFIC RATING	GENERAL RATING
1.	MEDIATED INTERACTIVE LECTU	5.000	4.91
2.	OPERATIONAL EQUIPMENT	5.000	4.03
3.	WHOLE TASK TRAINER	4.273	3.86
4.	PART TASK TRAINER	3.364	3.35
5.	MOCK-UP	3.364	2.35
6.	INTERACTIVE VIDEO DISK	3.273	3.15
7.	COMPUTER AIDED INSTRUCTION	3.091	2.81
8.	COMPUTER MANAGED INSTRUCTI	3.000	2.58

MEDIA SELECTION FOR OBJECTIVE 10.0

	MEDIUM	SPECIFIC RATING	GENERAL RATING
1.	MEDIATED INTERACTIVE LECTU	5.000	4.91
2.	OPERATIONAL EQUIPMENT	5.000	4.03
3.	WHOLE TASK TRAINER	4.273	3.86
4.	PART TASK TRAINER	3.364	3.35
5.	MOCK-UP	3.362	2.35
6.	INTERACTIVE VIDEO DISK	3.273	3.15
7.	COMPUTER AIDED INSTRUCTION	3.091	2.81
8.	COMPUTER MANAGED INSTRUCTI	3.000	2.58

MEDIA SELECTION FOR OBJECTIVE 11.0

	MEDIUM	SPECIFIC RATING	GENERAL RATING
1.	MEDIATED INTERACTIVE LECTU	5.000	4.91
2.	OPERATIONAL EQUIPMENT	4.909	4.03
3.	WHOLE TASK TRAINER	4.273	3.86
4.	PART TASK TRAINER	3.364	3.35
5.	MOCK-UP	3.364	2.35
6.	INTERACTIVE VIDEO DISK	3.273	3.15
7.	COMPUTER AIDED INSTRUCTION	3.091	2.81
8.	COMPUTER MANAGED INSTRUCTI	3.000	2.58

MEDIA SELECTION FOR OBJECTIVE 12.0

	MEDIUM	SPECIFIC RATING	GENERAL RATING
1.	MEDIATED INTERACTIVE LECTU	5.000	4.91
2.	OPERATIONAL EQUIPMENT	4.909	4.03
3.	WHOLE TASK TRAINER	4.273	3.86
4.	PART TASK TRAINER	3.364	3.35
5.	MOCK-UP	3.364	2.35
6.	INTERACTIVE VIDEO DISK	3.273	3.15
7.	COMPUTER AIDED INSTRUCTION	3.091	2.81
8.	COMPUTER MANAGED INSTRUCTI	3.000	2.58

MEDIA SELECTION FOR OBJECTIVE 13.0

	MEDIUM	SPECIFIC RATING	GENERAL RATING
1.	MEDIATED INTERACTIVE LECTU	5.000	4.91
2.	WHOLE TASK TRAINER	4.125	3.86
3.	PART TASK TRAINER	3.625	3.35
4.	INTERACTIVE VIDEO DISK	3.250	3.15
5.	COMPUTER AIDED INSTRUCTION	3.125	2.81
6.	COMPUTER MANAGED INSTRUCTI	3.000	2.58

MEDIA SELECTION FOR OBJECTIVE 14.0

	MEDIUM	SPECIFIC RATING	GENERAL RATING
1.	OPERATIONAL EQUIPMENT	5.000	4.03
2.	MEDIATED INTERACTIVE LECTU	5.000	4.91
3.	WHOLE TASK TRAINER	4.400	3.86
4.	PART TASK TRAINER	3.400	3.35
5.	MOCK-UP	3.400	2.35
6.	INTERACTIVE VIDEO DISK	3.300	3.15
7.	COMPUTER AIDED INSTRUCTION	3.100	2.81
8.	COMPUTER MANAGED INSTRUCTI	3.000	2.58

MEDIA SELECTION FOR OBJECTIVE 15.0

	MEDIUM	SPECIFIC RATING	GENERAL RATING
1.	OPERATIONAL EQUIPMENT	5.000	4.03
2.	MEDIATED INTERACTIVE LECTU	5.000	4.91
3.	WHOLE TASK TRAINER	4.400	3.86
4.	PART TASK TRAINER	3.400	3.35
5.	MOCK-UP	3.400	2.35
6.	INTERACTIVE VIDEO DISK	3.300	3.15
7.	COMPUTER AIDED INSTRUCTION	3.100	2.81
8.	COMPUTER MANAGED INSTRUCTI	3.000	2.58

MEDIA SELECTION FOR OBJECTIVE 16.0

	MEDIUM	SPECIFIC RATING	GENERAL RATING
1.	MEDIATED INTERACTIVE LECTU	5.000	4.91
2.	WHOLE TASK TRAINER	4.286	3.86
3.	PART TASK TRAINER	3.714	3.35
4.	INTERACTIVE VIDEO DISK	3.286	3.15
5.	COMPUTER AIDED INSTRUCTION	3.143	2.81
6.	COMPUTER MANAGED INSTRUCTI	3.000	2.58

MEDIA SELECTION FOR OBJECTIVE 17.0

	MEDIUM	SPECIFIC RATING	GENERAL RATING
1.	MEDIATED INTERACTIVE LECTU	5.000	4.91
2.	WHOLE TASK TRAINER	4.125	3.86
3.	PART TASK TRAINER	3.625	3.35
4.	INTERACTIVE VIDEO DISK	3.250	3.15
5.	COMPUTER AIDED INSTRUCTION	3.125	2.81
6.	COMPUTER MANAGED INSTRUCTI	3.000	2.58

MEDIA SELECTION FOR OBJECTIVE 18.0

	MEDIUM	SPECIFIC RATING	GENERAL RATING
1.	OPERATIONAL EQUIPMENT	5.000	4.03
2.	MEDIATED INTERACTIVE LECTU	5.000	4.91
3.	WHOLE TASK TRAINER	4.400	3.86
4.	PART TASK TRAINER	3.400	3.35
5.	MOCK-UP	3.400	2.35
6.	INTERACTIVE VIDEO DISK	3.300	3.15
7.	COMPUTER AIDED INSTRUCTION	3.100	2.81
8.	COMPUTER MANAGED INSTRUCTI	3.000	2.58

MEDIA SELECTION FOR OBJECTIVE 19.0

	MEDIUM	SPECIFIC RATING	GENERAL RATING
1.	MEDIATED INTERACTIVE LECTU	5.000	4.91
2.	OPERATIONAL EQUIPMENT	4.909	4.03
3.	WHOLE TASK TRAINER	4.273	3.86
4.	PART TASK TRAINER	3.364	3.35
5.	MOCK-UP	3.364	2.35
6.	INTERACTIVE VIDEO DISK	3.273	3.15
7.	COMPUTER AIDED INSTRUCTION	3.091	2.81
8.	COMPUTER MANAGED INSTRUCTI	3.000	2.58

MEDIA SELECTION FOR OBJECTIVE 20.0

	MEDIUM	SPECIFIC RATING	GENERAL RATING
1.	MEDIATED INTERACTIVE LECTU	5.000	4.91
2.	OPERATIONAL EQUIPMENT	4.909	4.03
3.	WHOLE TASK TRAINER	4.273	3.86
4.	PART TASK TRAINER	3.364	3.35
5.	MOCK-UP	3.364	2.35
6.	INTERACTIVE VIDEO DISK	3.273	3.15
7.	COMPUTER AIDED INSTRUCTION	3.091	2.81
8.	COMPUTER MANAGED INSTRUCTI	3.000	2.58

APPENDIX F

USER ATTITUDES QUESTIONNAIRE

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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: Dennis Hribar, Phil Stuckmeyer, Peter Stokes

BRANCH/SERVICE
NAME OF COMPANY: Newport News Shipbuilding

WORK PHONE: (804) 688-2351

AUTOVON ______-_______X_______

NAME OF TRAINING
SYSTEM(S) ANALYZED: Internal Auxiliary Launcher for Seawolf

____

____

____

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):

<u>OVERALL UTILITY</u>

1 CONVENTIONAL METHOD

3 ASTAR

2 AIMS

<u>EASE OF USE</u>

1 CONVENTIONAL METHOD

3 ASTAR

2 AIMS

<u>RELEVANCE</u>

1 CONVENTIONAL METHOD

3 ASTAR

2 AIMS

<u>EFFECTIVENESS</u>

3 CONVENTIONAL METHOD

2 ASTAR

1 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 * 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 2 3 4 * 6 7

RIGID — FLEXIBLE
1 * 3 4 5 6 7

UNPRODUCTIVE — VERY PRODUCTIVE
* 2 3 4 5 6 7

SCREEN

ORGANIZATION OF THE MENUS IS:
ILLOGICAL — LOGICAL
1 2 3 4 * 6 7

LABELS FOR FUNCTIONS WITHIN THE MENUS ARE:
CONFUSING — VERY CLEAR
1 2 3 4 * 6 7

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

WRITTEN PROMPTS ARE:
NOT AT ALL HELPFUL — VERY HELPFUL
1 2 3 * 5 6 7

ASTAR

TERMINOLOGY

COMPUTER KEEPS YOU INFORMED ABOUT WHAT IT IS DOING:
NEVER ALWAYS
1 * 3 4 5 6 7

LANGUAGE USED IS:
CONFUSING EASILY UNDERSTOOD
1 * 3 4 5 6 7

USE OF TERMS THROUGHOUT PROGRAM IS:
INCONSISTENT VERY CONSISTENT
1 * 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
* 2 3 4 5 6 7

INSTRUCTIONAL MATERIALS PROVIDED ARE:
INCOMPLETE VERY THOROUGH
* 2 3 4 5 6 7

USING ASTAR

TASKS CAN BE PERFORMED IN A STRAIGHT-FORWARD MANNER:

NEVER — ALWAYS

1 2 3 4 * 6 7

AUDIO/VISUAL FEEDBACK IS:

NOT AT ALL HELPFUL — VERY HELPFUL

1 2 3 * 5 6 7

USER MEMORY REQUIREMENTS ARE:

TOO HIGH — VERY LOW

* 2 3 4 5 6 7

ERROR MESSAGES PROVIDED ARE:

NOT AT ALL HELPFUL — VERY HELPFUL

1 * 3 4 5 6 7

ASTAR OUTPUT

ANALYSIS RESULTS ARE:

NOT AT ALL USEFUL — VERY USEFUL

1 * 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 2 3 * 5 6 7

COMMENTS (RE: OUTPUT IN GENERAL):

____

____

____

____

ASTAR

ACCEPTANCE OF ASTAR

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

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

STRONGLY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	STRONGLY DISAGREE
( )	( )	(X)	( )

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

STRONGLY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	STRONGLY DISAGREE
(X)	( )	( )	( )

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

STRONGLY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	STRONGLY DISAGREE
( )	( )	( )	(X)

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

STRONGLY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	STRONGLY DISAGREE
( )	( )	(X)	( )

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
( )	( )	( )	(X)

6. I WOULD FEEL COMFORTABLE WORKING WITH ASTAR.

STRONGLY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	STRONGLY DISAGREE
( )	( )	( )	(X)

ASTAR

PLEASE ANSWER THE FOLLOWING AS FULLY AS POSSIBLE.

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

Thorough analysis of training aspects of training device

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

Tedious data entry, inflexible data model once it is entered, focused on one device, does not allow comparison of two systems within the program

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

Provide input output from database or spreadsheets. Allow revision of data base, allow input data to be duplicated, upgrade to mouse input, allow side by side comparison of two systems rather that all one system then the next. Graphic output as is possible from spreadsheets.

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

___ LESS THAN 1 HR ___ 1-2 HRS ___ 2-3 HRS _X_ 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?

_X__YES ____NO ____UNABLE TO ANSWER

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

____EXTREMELY DIFFERENT __X_VERY DIFFERENT

____MODERATELY DIFFERENT ____ONLY SLIGHTLY DIFFERENT

PLEASE EXPLAIN: Gives specific requirements for simulator trainer

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 3 4 * 6 7

DIFFICULT — EASY
1 2 * 4 5 6 7

FRUSTRATING — SATISFYING
1 2 3 * 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 * 6 7

SCREEN

ORGANIZATION OF THE MENUS IS:
ILLOGICAL — LOGICAL
1 2 3 4 * 6 7

LABELS FOR FUNCTIONS WITHIN THE MENUS ARE:
CONFUSING — VERY CLEAR
1 2 3 4 * 6 7

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

WRITTEN PROMPTS ARE:
NOT AT ALL HELPFUL — VERY HELPFUL
1 2 3 * 5 6 7

AIMS

TERMINOLOGY

COMPUTER KEEPS YOU INFORMED ABOUT WHAT IT IS DOING:
NEVER ALWAYS
1 2 3 4 * 6 7

LANGUAGE USED IS:
CONFUSING EASILY UNDERSTOOD
1 2 3 * 5 6 7

USE OF TERMS THROUGHOUT PROGRAM IS:
INCONSISTENT VERY CONSISTENT
1 2 3 4 * 6 7

LEARNING AIMS

LEARNING TO OPERATE THE SYSTEM IS:
DIFFICULT EASY
1 2 3 4 * 6 7

EXPLORING NEW FEATURES BY TRIAL AND ERROR IS:
DIFFICULT EASY
1 2 3 * 5 6 7

INSTRUCTIONAL MATERIALS PROVIDED ARE:
NOT AT ALL HELPFUL VERY HELPFUL
1 2 3 4 5 * 7

INSTRUCTIONAL MATERIALS PROVIDED ARE:
INCOMPLETE VERY THOROUGH
1 2 3 4 5 * 7

AIMS

USING AIMS

TASKS CAN BE PERFORMED IN A STRAIGHT-FORWARD MANNER:
NEVER ALWAYS
1 2 3 4 5 * 7

AUDIO/VISUAL FEEDBACK IS:
NOT AT ALL HELPFUL VERY HELPFUL
1 2 * 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
1 * 3 4 5 6 7

AIMS OUTPUT

ANALYSIS RESULTS ARE:
NOT AT ALL USEFUL VERY USEFUL
1 2 * 4 5 6 7

ANALYSIS RESULTS ARE:
DIFFICULT TO UNDERSTAND EASY TO UNDERSTAND
1 2 * 4 5 6 7

FORMAT OF THE RESULTS IS:
CONFUSING VERY CLEAR
1 2 * 4 5 6 7

COMMENTS (RE: SPECIFIC RESULTS SCREENS):

AIMS

ACCEPTANCE OF AIMS

PLEASE PLACE AN X IN TE 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
( )	(X)	( )	( )

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

STRONGLY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	STRONGLY DISAGREE
(X)	( )	( )	( )

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

STRONGLY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	STRONGLY DISAGREE
( )	( )	( )	(X)

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

STRONGLY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	STRONGLY DISAGREE
( )	(X)	( )	( )

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
( )	( )	(X)	( )

6. I WOULD FEEL COMFORTABLE WORKING WITH AIMS.

STRONGLY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	STRONGLY DISAGREE
( )	(X)	( )	( )

AIMS

PLEASE ANSWER THE FOLLOWING AS FULLY AS POSSIBLE.

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

Model is flexible for adaptation

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

Need more flexible control-ESC rather than jump to basic. Interface could be fast if done directly on spreadsheet. Text for media, attributes and objectives not on screen. Tedious decisions on rating for attributes.

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

Replace subjective rating with decision support of appropriate used media. It relies on user to know the best application of media. Make output to spreadsheet and graphics. Provide input from word processor and database of objectives.

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

___ LESS THAN 1 HR _X_ 1-2HRS ___ 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 _X__UNABLE TO ANSWER

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

____EXTREMELY DIFFERENT ____VERY DIFFERENT

____MODERATELY DIFFERENT ____ONLY SLIGHTLY DIFFERENT

PLEASE EXPLAIN: ____

____

____

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
( )	( )	( )	(X)

2. I LIKE TO WORK WITH COMPUTERS.

STRONGLY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	STRONGLY DISAGREE
(X)	( )	( )	( )

3. I USE COMPUTERS MANY WAYS IN MY WORK.

STRONGLY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	STRONGLY DISAGREE
(X)	( )	( )	( )

4. WORKING WITH A COMPUTER MAKES ME VERY NERVOUS.

STRONGLY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	STRONGLY DISAGREE
( )	( )	( )	(X)

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

STRONGLY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	STRONGLY DISAGREE
( )	( )	( )	(X)

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

STRONGLY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	STRONGLY DISAGREE
(X)	( )	( )	( )

APPENDIX G

USER LOG SYNOPSIS/TRANSCRIPT

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Mr. Phil Stuckemeyer initially attempted to build his own database. He had difficulty in doing so while running ASTAR from a floppy diskette. The program prompted for a non-evident batch file. Both the data disk and work copy disk were entered in an attempt to satisfy the search for the batch file; neither diskette resulted in a complete database.

Mr. Stuckemeyer again attempted to build a data base using ASTAR from a floppy. He ignored the "Insert disk with batch file" prompt, and left the data disk in the drive. The prompt appeared again. Mr. Stuckemeyer inserted the system disk; the prompt indicated that a task and subtask was being built. Before entering, Mr. Stuckemeyer reinserted the data disk. The prompt indicated that the build was complete, and then asked that the disk with the batch file be inserted. When Mr. Stuckemeyer inserted the disk, the screen returned to an A:\> prompt. Mr. Stuckemeyer quickly looked at the new directory that had been built, named 4D. His review revealed that the 4D directory was on the system disk, and that there was nothing in either the 4D directory, or on the data diskette.

Next, Mr. Stuckemeyer endeavored to build database 4D from the hard drive. After Mr. Stuckemeyer followed the prompts, the screen indicated "Database build completed". Mr. Stuckemeyer returned to the C:\ASTAR> prompt, and looked for the 4D file. It was not on the C drive, and not on the floppy diskette. Mr. Stuckemeyer concluded that a database cannot be successfully completed in accordance with the procedures as listed in the user's manual.

Mr. Pete Stokes subsequently attempted to manipulate the databases that were provided by IST. First, Mr. Stokes created a directory named "4D". Then he copied the six files developed by IST into directory 4D.

Mr. Stokes chose to work with the Database Maintenance option. When Mr. Stokes was entering tasks and subtasks (option one), he found that the screen displayed did not resemble the screen that the workbook said would appear. A title should have been requested. Instead, the screen asked for a training device task with a subtask number. Mr. Stokes exited the program to try again.

Mr. Stokes' next attempt again found a request for a training device task with a subtask number. Mr. Stokes entered "1.0". The screen prompted for a title, and then again for a training device task with a subtask number. Mr. Stokes entered a total of five tasks/subtasks, and repeated the process for operational equipment.

Some confusion ensued when Mr. Stokes attempted to correct an input error, and also upon his entering of controls and displays. Mr. Stokes realized that editing is possible, and that controls and displays must be added for each task. Five controls/displays were entered for the first task, and the same amount entered for the first task under operational equipment.

Mr. Stokes did not appreciate ASTAR's commonality analysis, and questioned the value of this option. He did not have problems following the procedures, but believed that the program did not do anything. He asked why the computer could not compare the task statements, match key words for phrases, and then simply request verification.

Mr. Stokes had technical problems with similarity matching. After Mr. Stokes entered the first control number as prompted, the screen indicated a run-time error, and the computer exited to the C:\> prompt. ASTAR was run again; unfortunately, however, none of the previously input data was available.

Next, Mr. Dennis Hribar loaded both ASTAR and AIMS. He observed that files and information were missing that would allow smooth movement from loading to running. He recommended that more on-line direction be added.

While running AIMS, Mr. Hribar found that when he used the master copy, the program installed on the hard drive was deleted. The write-protect function precluded the program from being erased on the floppy diskette. Mr. Hribar recommended that an on-screen spreadsheet with a window offering more information be added to the program. He also believes that the program should run on its own without printing and make automatic file backups.

IST-TR-90-03

OPERATIONAL STUDY #3

Foreign Language Reading Comprehension

Technical Interim Report
CDRL AOO8

January 29, 1990
(Revised February 14, 1990)
Prepared under Contract Number 61339-89-C-0029
for
Naval Training Systems Center

Institute for Simulation and Training
12424 Research Parkway, Suite 300
Orlando FL 32826

University of Central Florida
Division of Sponsored Research

IST-TR-90-03

OPERATIONAL STUDY #3:

FOREIGN LANGUAGE READING COMPREHENSION

Technical Interim Report

CDRL A008

Brenda A. Bradley

Michael A. Companion

January 29, 1990

(Revised February 14, 1990)

Prepared under Contract Number 61339-89-C-0029

for the Naval Training Systems Center

by

University of Central Florida

Institute for Simulation and Training

12424 Research Parkway, Suite 300

Orlando, Florida 32826

APPROVED BY:

Michael Companion, Ph.D.
Principal Investigator

APPROVED BY:

Daniel Mullally
Program Manager

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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 training analysts from the Defense Language Institute Foreign Language Center (DLIFLC), located on the Presidio of Monterey, California. The analysts were asked to use and evaluate ASTAR and AIMS and compare them to the existing methodologies used by DLIFLC for the development of language training courses. The "operational system" for this study was defined to be an intelligence analyst. The training environment and tasks for the study involved teaching reading comprehension for Spanish, level 2. A combination of questionnaires and actual results derived from the use of the evaluation techniques were used to gather data on ASTAR and AIMS. The findings indicated that while both programs were fundamentally beneficial to their application, both need modifications before widespread implementation is possible. A special area of needed change is modification of terminology in ASTAR questions to meet their application environment. Of the two programs, AIMS was considered much more acceptable and friendly. Both programs were developed several years ago and do not reflect current software and interface designs. In both cases, most of the negative aspects cited could be corrected by updating the programs to make use of current guidelines in software design and human interface design. A number of specific suggestions for changes to the programs which would improve user acceptance were elicited during the study.

1.0 INTRODUCTION

An operational study evaluating the utility of ASTAR (the Automated Simulator Test and Assessment Routine) and AIMS (the Automated Instructional Media Selection) System was conducted with the assistance of training analysts from the Defense Language Institute Foreign Language Center (DLIFLC) located at the Presidio of Monterey, California. These analysts were asked to evaluate ASTAR and AIMS in terms of their utility in the Instructional System Design (ISD) process. The DLIFLC is the primary center for instruction in foreign languages for the DoD and other government agencies. The DLIFLC training environment and mission is quite different from those examined in other ASTAR and AIMS studies, however, both ASTAR and AIMS should be applicable to any training environment. Inclusion of DLIFLC in this operational study, was intended to provide better insight about the requirements to implement decision aids, such as ASTAR and AIMS, across the entire DoD training community.

In support of a major initiative to improve the quality of instruction and upgrade their curriculum, DLIFLC is in the process of surveying and ultimately acquiring the "state-of-the-art" instructional media for training personnel in the acquisition and evaluation of foreign language skills. The major thrust of this activity is scheduled to begin in mid-1990. ASTAR and AIMS are intended to assist in this type of selection process. Hence, DLIFLC researchers were interested in participating in the study to determine whether either or both techniques could be beneficial in accomplishing this task. If the analysts perceived ASTAR and/or AIMS as beneficial decision aids, then they could have a major impact on DLIFLC's technology improvement effort. The analysts were asked to compare ASTAR and AIMS to the existing methodologies used by DLIFLC. A combination of questionnaires and the actual scores on ASTAR and AIMS were used to gather the necessary data.

The main purpose of this study was to evaluate ASTAR and AIMS in the actual operational environment by those individuals (training analysts and/or subject matter experts) who would use such programs once distributed. The objectives of the project were to demonstrate the operational utility of ASTAR, develop a transition plan to implement ASTAR as an operational technique, and compare and contrast ASTAR to AIMS and traditional design methodologies.

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 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 by assigning the training device under evaluation a subjective rating with a value of between zero and one hundred. This value represents the analysts' perceptions 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 building a data base with tasks and subtasks as Levels Two and Three require. The decision of which level to use depends upon the amount of information that the analyst has 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) System 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 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 Intelligence Analyst

Many of the graduates from DLIFLC transition into classified positions, hence, DLIFLC often does not know the specific tasks performed on the operational job. Instead, they know the general type of position filled by graduates and structure their curriculum to teach basic language skills associated with these positions. A common type of position toward which their foreign language training is oriented is that of an intelligence analyst. A person in this position is required to speak, read, write and interpret printed and audio information sources. DLIFLC curricula are designed to teach reading and verbal comprehension to a level sufficient to perform the job in a particular language.

For this study, the "Operational System" was defined as the position of an intelligence analyst in a Spanish speaking country. The training environment select for the study was training level 2 reading comprehension in Spanish. The specification of a specific language environment was required because DLIFLC personnel indicated that ASTAR ratings would be highly language dependent. Although the reading comprehension tasks were chosen as the focus of this study, Intelligence Officers are normally required to speak, write, interpret as well as read the foreign language(s) trained. However, separate analyses would be required for each of these language training functions. The specific task list used to describe the reading comprehension is presented in Section 2.3, Study Materials.

Two training systems for reading comprehension were chosen to be evaluated and compared during the ASTAR analysis. The two training systems were computer-managed instruction (CMI) and Programmed Text. CMI was defined as a computer-based training system using the Electronic Information Delivery System (EIDS) as a reference. EIDS is currently available within the DLIFLC training device inventory. EIDS is an interactive audio-visual training workstation that can integrate the delivery of existing audio-visual media such as print, film, videotape, slides, etc. Programmed Text was defined as a paper-based text which is self-paced and consists of short training materials followed questions that must be correctly answered before continuing.

2.0 APPROACH

2.1 Subjects

Two subjects from the Defense Language Institute Foreign Language Center participated in the study, one specializing in instructional technologies and the other in curriculum development. The section of the User Attitudes Questionnaire addressing comfort with computers indicated that both subjects were confident, comfortable, and experienced in using computers on the job.

2.2 Procedure

Two half and one full day sessions were required to complete the activities necessary to conduct the study. The first half day consisted of brief introductions as to the purpose and plan of the overall study, discussions aimed at familiarizing the subjects to the programs, how the programs could be utilized in the subjects' work environments, and finally to gather the initial data needed to construct the databases within each system to be used in the analyses. The initial data included the definition of the operational environment, the training function, the task list, the AIMS media list and the AIMS attribute list. These data were used by the experimenters to construct basic ASTAR and AIMS data bases for use in the study.

The remaining day and one half were used for training and conduct of the study. The morning of the first day was used to conduct the AIMS analysis. The analysts were trained on the basic operations of AIMS including the hands-on development of a portion of the data base. When the training on the basic functions of AIMS were complete, the basic DLIFLC AIMS data base was loaded on the program. The analysts completed data base by rating the added media/attribute relations. Next, the AIMS worksheets for the DLIFLC training tasks/objectives were filled out and entered into the instructional media selection routine. At the end of the session the two analysts completed the AIMS portion of the user attitude questionnaire.

In the afternoon, the ASTAR task lists were redefined and the subjects were given hands-on training with ASTAR. This training included creation of a subset of the actual ASTAR database. Once the subjects had a sufficient amount of time to understand the procedures of ASTAR, they conducted an ASTAR Level 1 evaluation. The ASTAR Level 2 analysis was conducted on the morning of the final day. After finishing both ASTAR evaluations, the subjects completed the ASTAR portion of the user attitude questionnaire. The subjects were debriefed and provided disk copies of the two programs and copies of all pertinent users manuals.

2.3 Study Materials

The materials developed for this study include the task/training objectives list and the AIMS media list, attribute list, rating matrix and worksheets.

The investigators' general knowledge of the task, along with discussions with the training analysts were used to derive the task/training objective list presented in Table 1. This list encompasses the area of foreign language (Spanish) reading comprehension. NOTE: Since only ASTAR Levels 1 and 2 were performed, displays and controls were not included within the task list. The granularity in the task list was constrained by the ASTAR analyses. The sheer number of responses required by the second and third levels of ASTAR drives this tailoring of the task list. Although an ASTAR Level 3 evaluation was not actually performed, a brief discussion of the questions unique to that level and the additional data necessary to performed this level of evaluation took place. This discussion was primarily to familiarize the subjects further about the operations within ASTAR, so that a more accurate assessment of ASTAR could be accomplished.

In preparation of the AIMS evaluation, a new AIMS database was created. The default database was used as a starting point to create the DLIFLC specific AIMS database. The DLIFLC media list, Table 2, contains 17 media. DLIFLC would normally break out CMI into all of its possible variations, because past experience has shown variable utility for their application. However, for this study it was decided to combine them into a single category. A revised list of 46 attributes covering eleven topic areas was developed. DLIFLC included several new

TABLE 1

DLIFLC READING COMPREHENSION TASK LIST

1.0 Assess impact of grammar on comprehension

2.0 Basic reading skills
  2.1 Attend to reading task

3.0 Reading strategies
  3.1 Use of skimming strategies
  3.2 Use of prediction strategies
  3.3 Use of scanning strategies
  3.4 Use of decoding strategies
  3.5 Use of verification

4.0 Integrate data from multiple sources

TABLE 2

AIMS MEDIA LIST FOR READING COMPREHENSION

1 lecture with chalkboard
2 lecture with poster
3 lecture with wall chart
4 lecture with handout
5 lecture with transparency
6 lecture with slides
7 lecture with random slides
8 programmed text
9 workbook
10 checklist
11 text
12 audio tape
13 film
14 video tape
15 slide/tape
16 CMI
17 model

attributes including cost, portability and acceptance. Based on this list, AIMS was used to print out worksheets for the identification of the critical attributes for each training objective. Table 3 presents a sample worksheet which depicts the categorized attribute list used for the AIMS study. The completed set of AIMS worksheets for the DLIFLC study is provided in Appendix B. Since both the media and attribute pools were revised from the AIMS default database, a new Media/Attribute Rating Matrix was also developed. It is included as Appendix A.

3.0 RESULTS

3.1 ASTAR Evaluation

Two training systems, CMI and Programmed Text, as previously defined, were used for the ASTAR evaluations. The analysts performed an ASTAR Level 1 evaluation, as well as two ASTAR Level 2 analyses (Task and Subtask) comparing each of the two training media to the operational system of foreign language reading comprehension of an intelligence analyst. The subjects input consensus ratings for each of the appropriate ASTAR questions for level 1 and level 2. Evaluation summaries were produced for each training device alternative. Figure 1 shows the ASTAR Level 1 analysis summary. Figures 2 and 3 provide the ASTAR Level 2 analysis summaries (the task and subtask levels, respectively).

All three ASTAR evaluations indicate that CMI was predicted to be more effective at training Spanish reading comprehension than Programmed Text. The ASTAR Level 1 scores were 77.81 for CMI and 160.18 for Programmed Text. For the ASTAR Level 2 analyses the task scores were 81.95 for CMI and 102.03 for Programmed Text, and the subtasks scores were 78.40 for CMI and 89.39 for Programmed Text. The differences in the summary scores between CMI and Programmed Text become smaller as the ASTAR Level of evaluation increases. This appears to be a function of the greater specificity of the analyses as you progress through the ASTAR analyses. This reflects the concern of the DLIFLC analysts that the granularity of the task lists associated with language training will significantly affect any analysis. This application appears to be much more sensitive to the task granularity than other applications.

The training problem is identical within each of the evaluations. This makes sense in that the performance deficit of the trainees and the learning difficulty of this deficit are dependent upon the trainees and the task to be learned, not a function of the device used to do the training. This score is relatively high in each case because the trainees are expected to enter the training environment with a large performance deficit (unable to speak the foreign language), and are predicted to have great difficulty in learning the new task. The DLIFLC analysts indicated that the ratings on these criteria are highly dependent upon the language to be taught.

TABLE 3

AIMS WORKSHEET/ATTRIBUTE LIST FOR DLIFLC

SELECTION WORKSHEET FOR USE WITH THE FILE : DLIFLC

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.

*TYPE OF LEARNING
|__| 1. AFFECTIVE(ATTITUDINAL)
|__| 2. CONCEPTUAL
|__| 3. PROCEDURAL
|__| 4. DECISION MAKING

*DISPLAY CHARACTERISTICS
|__| 5. TEXT
|__| 6. PHOTOGRAPHS
|__| 7. DRAWINGS
|__| 8. DIAGRAMS
|__| 9. GRAPHICS
|__| 10. ANIMATION
|__| 11. COLORS
|__| 12. VISUAL MOTION(CONSTANT)
|__| 13. VISUAL MOTION(VARIABLE)
|__| 14. AUDIO(VOICE)
|__| 15. PHYSICAL SIMILARITY
|__| 16. FUNCTIONAL SIMILARITY

*RESPONSE MODE
|__| 17. WRITTEN RESPONSE
|__| 18. VOICE RESPONSE
|__| 19. DECISION INDICATORS
|__| 20. PHYSICAL SIMILARITY
|__| 21. FUNCTIONAL SIMILARITY
|__| 22. FIDELITY/REALISM

*EVALUATION MODE
|__| 23. INSTRUCTOR
|__| 24. SELF
|__| 25. PEER
|__| 26. AUTOMATED
|__| 27. WRITTEN
|__| 28. IMMEDIATE ON RESPONSE
|__| 29. IMMEDIATE ON ERROR
|__| 30. POST-SESSION
|__| 31. FAULT INSERTION

*ENVIRONMENTAL CONDITIONS
|__| 32. LIGHTING

*LEARNING LEVELS
|__| 33. a. FAMILIARITY
|__| 34. b. PERFORM PROCEDURE
|__| 35. c. PERFORM JOB
|__| 36. d. PERFORM MISSION

*SPECIAL REQUIREMENTS
|__| 37. TEAM INTERACTION

*COMMUNICATIONS
|__| 38. VOICE

*PERFORMANCE CRITERIA
|__| 39. SOP'S
|__| 40. TIME
|__| 41. ACCURACY

*SCENARIO DEVELOPMENT
|__| 42. INTERACTIVE

*MISCELLANEOUS
|__| 43. COST
|__| 44. PORTABILITY
|__| 45. ACCEPTANCE-INSTRUCTOR
|__| 46. ACCEPTANCE-STUDENT

ASTAR 1 EVALUATIONS

CMI

Performance Deficit	90		
Learning Difficulty	70		
Training Problem		63.00	
Quality of Training-Acquisition	100		
Acquisition-Efficiency		1.00	
Acquisition			63.00
Residual Deficit	20		
Residual Learning Difficulty	60		
Physical Similarity	30		
Functional Similarity	80		
Transfer Problem		12.00	
Quality of Training-Transfer	67		
Transfer Efficiency		.81	
Transfer			14.81
sum			77.81

Programmed Text

Performance Deficit	90		
Learning Difficulty	70		
Training Problem		63.00	
Quality of Training-Acquisition	50		
Acquisition-Efficiency		.70	
Acquisition			90.00
Residual Deficit	50		
Residual Learning Difficulty	60		
Physical Similarity	70		
Functional Similarity	60		
Transfer Problem		40.00	
Quality of Training-Transfer	33		
Transfer Efficiency		.57	
Transfer			70.18
sum			160.18

Figure 1. Evaluation summary for the ASTAR 1 analysis.

ASTAR 2 EVALUATIONS - TASK

CMI		
Training Problem	64.75	
Acquisition-Efficiency	1.00	
Acquisition		64.75
Transfer Problem	16.17	
Transfer Efficiency	.94	
Transfer		17.20
sum		81.95
Programmed Text		
Training Problem	64.75	
Acquisition-Efficiency	.85	
Acquisition		76.18
Transfer Problem	20.42	
Transfer Efficiency	.79	
Transfer		25.85
sum		102.03

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

ASTAR 2 EVALUATIONS - SUBTASK

CMI		
Training Problem	64.36	
Acquisition-Efficiency	1.00	
Acquisition		64.36
Transfer Problem	13.20	
Transfer Efficiency	.94	
Transfer		14.04
sum		78.40
Programmed Text		
Training Problem	64.36	
Acquisition-Efficiency	.85	
Acquisition		75.72
Transfer Problem	10.80	
Transfer Efficiency	.79	
Transfer		13.67
sum		89.39

Figure 3. Evaluation summary for the ASTAR 2 (subtask level).

The acquisition efficiency and transfer efficiency scores of the CMI method are both higher than that of the Programmed Text method for all three ASTAR analyses. [CMI: acquisition efficiency = 1.0, transfer efficiency = .94; Programmed Text: acquisition efficiency = .85, transfer efficiency = .79). Within the two ASTAR Level 2 analyses there is no change in these scores for the two devices.

The transfer problem appears to be the major cause for the disadvantage of Programmed Text. This score is as high as 40.00 at ASTAR Level 1, which is over three times higher than the transfer problem predicted for CMI. The predicted transfer problem is lowered when more specificity is introduced with ASTAR Level 2. An anomaly occurs in the data of the ASTAR Level 2 subtask level in that the transfer problem was rated as lower for Programmed Text. Overall, Programmed Text was consistently predicted less effective than CMI for training reading comprehension on breakdowns of the data.

3.2 AIMS Evaluation

The AIMS analysis was conducted with a pool of 17 media and 46 attributes presented in Tables 2 and 3 of Section 2.3, Study Materials, the media/attribute rating matrix in Appendix A and the critical attributes worksheets in Appendix B. The analysts completed a critical attributes worksheet for each of the objectives.

The worksheet data were entered into the AIMS media selection routine. Table 4 presents the summary output from the AIMS analysis. Of the potential pool of 17 media, a subset of 14 were selected as acceptable media for the reading comprehension training objectives. Of the 14, 7 were selected as possible media for all 10 of the learning objectives, while three were selected for 5 of the 10 objectives, two were selected for 3 of the objectives, and one was selected for 2, and 1 was selected for 1 of the 10 learning objectives. Three media were not selected as acceptable media: checklist, audiotape, and model.

Table 5 presents several instructional media selections for individual objectives. The total set of instructional media selections by objective is included in Appendix C. For each objective the media which met all of the critical attributes were selected as candidate media. The AIMS program computes two ratings; a specific rating which is the average rating on the critical attributes for that objective and a general rating which is the average rating on all forty-six attributes. The ratings vary between 0.0 and 5.0. The AIMS program sorts and prints the selected media in descending order based on the specific rating. Between seven and fourteen media were selected for each objective.

The instructional media selections presented in Table 5 are representative of the outcomes across all ten objectives. They show that the selected set of media, order of selected media, and specific ratings vary across objectives based on the

TABLE 4

SUMMARY TABLE OF AIMS SELECTED MEDIA

MEDIA SELECTIONS FOR OBJECTIVES 1.0 TO 4.0
10 TOTAL OBJECTIVES

	# OF OBJECTIVES	% OF OBJECTIVES	MEDIUM
1.	10	100.00	CMI
2.	10	100.00	lect w/random slides
3.	10	100.00	lect w/slide
4.	10	100.00	lect w/transparency
5.	10	100.00	lect w/handout
6.	10	100.00	lect w/wall chart
7.	10	100.00	lect w/poster
8.	5	50.00	text
9.	5	50.00	workbook
10.	5	50.00	programmed text
11.	3	30.00	videotape
12.	3	30.00	film
13.	2	20.00	lect w/chalkboard
14.	1	10.00	slide/tape

critical attributes for that objective. CMI was selected with the highest rating for every objective. Also, the majority of the lecture plus medium were chosen for each of the objectives. The last seven media shown in Table 4 were scattered throughout the objectives, with text and workbook rating as high as second after CMI.

Corresponding with the ASTAR analysis, CMI was chosen as more appropriate than Programmed Text for training the tasks associated with Spanish reading comprehension. CMI was selected as appropriate for all ten objectives, while Programmed Text was selected for only five of the objectives. In the AIMS analysis, the highest rating achieved for Programmed Text was on objective 3.5 (use of verification) where it had a specific rating of 3.091. Comparing the general rating for CMI and Programmed Text show an overall rating of 3.54 for CMI and only 2.36 for Programmed Text based on the attribute pool developed for this study.

3.3 <u>User Attitudes Questionnaire</u>

A user attitudes questionnaire was developed to assess the analysts reactions to the device effectiveness technologies (DET) for both ASTAR and AIMS. The questions addressed the analysts' acceptance of and attitudes about the user friendliness and overall usefulness of the DET, as well as, the analysts general feelings regarding computers. A copy of the questionnaire with the composite ratings and comments for this Operational Study can be found in Appendix D.

TABLE 5

SAMPLE MEDIA SELECTIONS
FOR
READING COMPREHENSION TRAINING OBJECTIVES

MEDIA SELECTION FOR OBJECTIVE 1.0
[ASSESS IMPACT OF GRAMMAR OF COMPREHENSION]

	MEDIUM	SPECIFIC RATING	GENERAL RATING
1.	CMI	3.450	3.54
2.	lect w/handout	3.300	2.5
3.	lect w/poster	3.000	2.43
4.	lect w/wall chart	2.950	2.41
5.	lect w/chalkboard	2.900	2.28
6.	lect w/transparency	2.850	2.32
7.	lect w/slides	2.800	2.36
8.	lect w/random slides	2.700	2.43

MEDIA SELECTION FOR OBJECTIVE 3.0
[USE OF READING STRATEGIES]

	MEDIUM	SPECIFIC RATING	GENERAL RATING
1.	CMI	3.727	3.54
2.	lect w/handout	3.091	2.5
3.	lect w/poster	3.091	2.43
4.	lect w/wall chart	3.045	2.41
5.	lect w/slides	3.000	2.36
6.	lect w/random slides	2.955	2.43
7.	lect w/transparency	2.864	2.32

MEDIA SELECTION FOR OBJECTIVE 3.5
[USE OF VERIFICATION]

	MEDIUM	SPECIFIC RATING	GENERAL RATING
1.	CMI	3.909	3.54
2.	text	3.273	2.5
3.	workbook	3.182	2.26
4.	programmed text	3.091	2.36
5.	lect w/random slides	2.909	2.43
6.	lect w/handout	2.909	2.5
7.	lect w/slides	2.818	2.36
8.	lect w/transparency	2.818	2.32
9.	lect w/chalkboard	2.727	2.28
10.	lect w/wall chart	2.636	2.41
11.	lect w/poster	2.636	2.43
12.	video tape	2.455	1.93
13.	slide/tape	2.273	1.65
14.	film	2.273	1.86

3.3.1 **OVERALL ATTITUDES**. The two systems were evaluated against each other and also against the analysts' conventional methods of evaluating training effectiveness and selecting media. Overall attitudes were assessed in four categories: "overall utility", "ease of use", "relevance", and "effectiveness". The analysts were asked to rank-order ASTAR, AIMS, and the conventional method by assigning either a one, a two, or a three to each method, with one equal to the highest rating, and three equal to the lowest.

The users' attitudes were identical in each of the four categories. Both analysts rated AIMS to be better than both the conventional method and ASTAR. The conventional method was rated as the analysts second choice. ASTAR was rated lowest for each of the four categories.

3.3.2 **REACTIONS TO ASTAR**. The following sections summarize the analysts' reactions to ASTAR in seven areas. In each section a synopsis of the ratings is provided followed by actual rating scales for that area. The analysts' composite rating is indicated by an asterisk "*" on the rating scale.

3.3.2.1 Overall Reactions. The analysts' overall reactions to ASTAR were that ASTAR is somewhat difficult, frustrating, and rigid. The inability to modify rating scales, especially in Level 3, was the cause for the analysts' feelings that ASTAR was rigid. The analysis results were also found to be slightly difficult to understand becuase of the inability to interpret the numbers. However, the analysts commented that the overall language of the program was considered consistent and understandable. Both subjects did agree that with an updating of the data entry procedures, ASTAR could be useful and more user friendly.

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

DIFFICULT — EASY
1 2 3 * 4 5 6 7

FRUSTRATING — SATISFYING
1 2 3 * 4 5 6 7

INADEQUATE POWER — ADEQUATE POWER
1 2 3 4 * 6 7

RIGID — FLEXIBLE
1 2 * 4 5 6 7

UNPRODUCTIVE — VERY PRODUCTIVE
1 2 * 4 5 6 7

3.3.2.2 Screen. The analysts also evaluated ASTAR's screens. They gave average ratings to the menu organization, the clarity of the questions, and clarity of the function labels. The analysts indicated overall that the presentation of the questions, and the labels for functions within the menus were both clear.

ORGANIZATION OF THE MENUS IS:
ILLOGICAL LOGICAL

1 2 3 * 5 6 7

LABELS FOR FUNCTIONS WITHIN THE MENUS ARE:
CONFUSING VERY CLEAR
1 2 3 4 * 6 7

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

WRITTEN PROMPTS ARE:
NOT AT ALL HELPFUL VERY HELPFUL

1 2 3 * 5 6 7

3.3.2.3 Terminology. As stated above, the subjects did feel ASTAR's terminology was reasonably good. They found the language, and use of terms to be easily understood and above average in consistency. The recent rewording of the rating questions probably played a role in this result. Once the psychological vocabulary was removed, and replaced with what might be considered lay persons vocabulary, clarity is bound to improve.

COMPUTER KEEPS YOU INFORMED ABOUT WHAT IT IS DOING:
NEVER ALWAYS
1 2 3 * 5 6 7

LANGUAGE USED IS:
CONFUSING EASILY UNDERSTOOD
1 2 3 4 * 5 6 7

USE OF TERMS THROUGHOUT PROGRAM IS:
INCONSISTENT VERY CONSISTENT
1 2 3 4 5 * 6 7

3.3.2.4 Learning ASTAR. The instructional materials were considered to be thorough and quite helpful. Because of the complexity of ASTAR and need for updated programming, the analysts found that exploring new features by trial and error to be rather difficult. But the analysts did feel that overall

ASTAR is a about average or slightly above in ease of learning.

LEARNING TO OPERATE THE SYSTEM IS:
DIFFICULT EASY
1 2 3 4 * 5 6 7

EXPLORING NEW FEATURES BY TRIAL AND ERROR IS:
DIFFICULT EASY
1 2 * 4 5 6 7

INSTRUCTIONAL MATERIALS PROVIDED ARE:
NOT AT ALL HELPFUL VERY HELPFUL
1 2 3 4 * 5 6 7

INSTRUCTIONAL MATERIALS PROVIDED ARE:
INCOMPLETE VERY THOROUGH
1 2 3 4 5 * 6 7

3.3.2.5 Using ASTAR. Unfortunately, the subjects seemed to consider ASTAR's audio/visual feedback and error messages to be not very helpful. Nor did they find the overall tasks to be performed on ASTAR to be very straightforward, but they subjects did not believe the user memory requirements to be too high.

TASKS CAN BE PERFORMED IN A STRAIGHTFORWARD MANNER:
NEVER ALWAYS
1 2 * 3 4 5 6 7

AUDIO/VISUAL FEEDBACK IS:
NOT AT ALL HELPFUL VERY HELPFUL
1 2 * 4 5 6 7

USER MEMORY REQUIREMENTS ARE:
TOO HIGH VERY LOW
1 2 3 4 5 * 7

ERROR MESSAGES PROVIDED ARE:
NOT AT ALL HELPFUL VERY HELPFUL
1 * 3 4 5 6 7

3.3.2.6 ASTAR OUTPUT. The results generated by ASTAR were all rated below average. The format of the results was considered very confusing. Again, recommended revisions to ASTAR already stated could improve ASTAR in this area as well.

ANALYSIS RESULTS ARE:
NOT AT ALL USEFUL VERY USEFUL
1 2 * 4 5 6 7

ANALYSIS RESULTS ARE:

DIFFICULT TO UNDERSTAND   EASY TO UNDERSTAND

1 2 * 4 5 6 7

FORMAT OF THE RESULTS IS:

CONFUSING   VERY CLEAR

1 * 3 4 5 6 7

3.3.2.7 Acceptance of ASTAR. The analysts were asked to discuss their acceptance of ASTAR. The analysts both felt that they could do work with ASTAR, but not very comfortably, and that they expected not to have much use for ASTAR in their daily work of curriculum development. They also did not feel ASTAR could help with their job effectiveness. Finally, the analysts disagreed with each other when it came to whether they felt anything that ASTAR could be used for, they could do just as well some other way. The analysts seemed to be more comfortable with AIMS than ASTAR mainly because AIMS was designed to assist in exactly what they do, instructional media selection for curriculum development. Although ASTAR was initially designed for predicting effectiveness of training simulators, it is applicable to this setting as well.

3.3.2.8 General Comments on ASTAR. The "broad brush of decisions" generated from Levels 1 and 2 were considered quite useful by the analysts, but Level 3 was considered to be too rigid because of the restrictive rating scales. They felt that at least 2 hours were needed to become comfortable in using ASTAR. Some of the subjects' specific recommendations were:

1. Some type of window/spreadsheet program be included for both the input and output functions for the ASTAR data base;
2. Some cost factors be included in ASTAR or costing recommendations made that could be used with the existing ASTAR results;
3. Simpler revision of the database, and;
4. Allowing for simultaneous evaluation of two or more training systems.

3.3.3 **REACTIONS TO AIMS**. The following sections summarize the analysts' reactions to the seven areas of AIMS. In each section, a synopsis of the ratings is provided followed by the actual rating scales for that area. The analysts' composite rating is indicated by an asterisk "*" on the rating scale.

3.3.3.1 Overall Reactions. Overall, the analysts seemed very pleased with AIMS. In each of the six ratings listed below, the analysts gave above average ratings to AIMS. They found it useful, easy, satisfying, with adequate power, flexible, and quite productive.

NOT AT ALL USEFUL   VERY USEFUL

1 2 3 4 5 * 6 7

```
               DIFFICULT                EASY
                    1  2  3  4  5 * 6  7

             FRUSTRATING                SATISFYING
                    1  2  3  4  5 * 6  7

        INADEQUATE POWER                ADEQUATE POWER
                    1  2  3  4  5  *  7

                   RIGID                FLEXIBLE
                    1  2  3  4  5  *  7

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

3.3.3.2 Screen. The analysts gave positive responses to all aspects of AIMS's screens. They seemed to believe the written prompts were very helpful, the presentation of the questions quite clear, the labeling of the functions clear, and the organization of the menus logical.

```
ORGANIZATION OF THE MENUS IS:
               ILLOGICAL                LOGICAL
                    1  2  3  4  5 * 6  7

LABELS FOR FUNCTIONS WITHIN THE MENUS ARE:
               CONFUSING                VERY CLEAR
                    1  2  3  4  5 * 6  7

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

WRITTEN PROMPTS ARE:
      NOT AT ALL HELPFUL                VERY HELPFUL
                    1  2  3  4  5 * 6  7
```

3.3.3.3 Terminology. The analysts were overall very pleased with the terminology used in AIMS. They considered the use of terms throughout AIMS to be consistent, its language to be easily understood, and AIMS kept them informed of its operations.

```
COMPUTER KEEPS YOU INFORMED ABOUT WHAT IT IS DOING:
                   NEVER                ALWAYS
                    1  2  3  4  5  *  7

LANGUAGE USED IS:
               CONFUSING                EASILY UNDERSTOOD
                    1  2  3  4  5  6 * 7
```

USE OF TERMS THROUGHOUT PROGRAM IS:
INCONSISTENT VERY CONSISTENT
1 2 3 4 5 6 * 7

3.3.3.4 Learning AIMS. It seemed the analysts felt learning to use AIMS a positive experience overall. They stated that the instructional materials were both helpful and thorough, and the use of trial and error within AIMS was relatively easy.

LEARNING TO OPERATE THE SYSTEM IS:
DIFFICULT EASY
1 2 3 4 5 6 *

EXPLORING NEW FEATURES BY TRIAL AND ERROR IS:
DIFFICULT EASY
1 2 3 4 * 6 7

INSTRUCTIONAL MATERIALS PROVIDED ARE:
NOT AT ALL HELPFUL VERY HELPFUL
1 2 3 4 5 * 7

INSTRUCTIONAL MATERIALS PROVIDED ARE:
INCOMPLETE VERY THOROUGH
1 2 3 4 5 * 7

3.3.3.5 Using AIMS. Other than the error messages not being very helpful, the analysts again made it clear their positive feelings about AIMS. They felt the demands on user memory were not too high, that tasks could be performed in a straightforward manner, and that the audio/visual feedback was quite helpful. The evaluation on error messages was slightly below average, though AIMS does not currently utilize many error messages.

TASKS CAN BE PERFORMED IN A STRAIGHTFORWARD MANNER:
NEVER ALWAYS
1 2 3 4 5 6 * 7

AUDIO/VISUAL FEEDBACK IS:
NOT AT ALL HELPFUL VERY HELPFUL
1 2 3 4 5 6 * 7

DEMANDS ON USER MEMORY ARE:
TOO HIGH VERY LOW
1 2 3 4 * 6 7

ERROR MESSAGES PROVIDED ARE:
NOT AT ALL HELPFUL VERY HELPFUL
1 2 3 * 4 5 6 7

3.3.3.6 AIMS Output. The analysts' also rated the AIMS output above average on each scale. They stated that the results of the AIMS analyses were very useful and understandable, and that the format of those results was also very clear.

ANALYSIS RESULTS ARE:

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

ANALYSIS RESULTS ARE:

DIFFICULT TO UNDERSTAND								EASY TO UNDERSTAND
	1	2	3	4	5	*	6	7

FORMAT OF THE RESULTS IS:

CONFUSING								VERY CLEAR
	1	2	3	4	5	*	6	7

3.3.3.7 Acceptance of AIMS. The analysts stated that they could work comfortably with AIMS, and they believed that it would increase their job effectiveness as well. One of the analysts, however, stated that he did not expect to have much use for AIMS in his daily work, and that whatever could be done with AIMS, he could do some other way. This indicates that acceptance of a decision aid does not guarantee its use.

3.3.3.8 General Comments on AIMS The only negative comments stated by the analysts about AIMS was that the error messages within AIMS were not as helpful as they could be. They seemed to believe that AIMS's flexibility in terms of being able to modify the database its strongest plus. They also felt it to be quite easy to understand overall, and that AIMS was quite user friendly. The analysts did have one recommendation for the implementation of AIMS. They felt that if some type of cost factors could be included within AIMS, other than as an attribute, that it definitely should be. During the study they also indicated that it would be desirable to assign different weights to categories of attributes because of variations between languages. This application has a large number of additional variables that are considered during instructional media selection including recurring and non-recurring cost, resource availability (both people and hardware), and acceptance issues.

4.0 **CONCLUSIONS**

The operational study of ASTAR and AIMS with the assistance of personnel at the Defense Language Institute Foreign Language Center provided an appropriate test environment. The test case, foreign language reading comprehension, provided a unique application of the two techniques and permitted the analysts the opportunity to determine whether the two DET have sufficient merit to be used on other areas of the curriculum development processes. This different training environment provides additional insight about the requirements to implement ASTAR and/or AIMS as DoD standard techniques. It also illustrates that the two DET techniques have applicability to a wide variety of training applications.

The overall acceptance of ASTAR was rather low. AIMS was thought of quite highly in terms of the analysts' work needs. The user interface seems to be the major factor in determining user acceptance. Both ASTAR and AIMS are relatively old programs. They were developed before much of the recent advancements in software design/technology and human computer interface design. AIMS is generally acceptable, but certain features need to be updated before widespread adoption. Primarily, the data base structure, data entry, and data editing need revision within AIMS. There was also a stated need to more effectively incorporate cost factors in the AIMS analysis. ASTAR requires more extensive enhancements, though they involve the same basic areas as AIMS. ASTAR's biggest problem is the rigid and unfriendly data base development and editing procedures currently used. Simultaneous evaluation of devices is also a major concern for the users because of the time involved. Finally, ASTAR needs better data output options to make it easier for the analyst to visualize the data.

The findings of this study indicate that both DET require modifications before being implemented as standard evaluation techniques. Without the modifications, user acceptance would be poor for ASTAR and not as high as possible for AIMS. Comments seem to indicate that user acceptance is proportional to the perceived friendliness of the DET. What is encouraging is the fact that most of the problems can be alleviated by modifying the programs to incorporate current software practices, data base techniques, and user interface standards. The analysts who participated made a number of suggestions for improvements of the two DET and their interfaces. Given the nature of the modifications required, an acceptable version of the programs should be achievable with moderate resources.

One additional problem associated with ASTAR was finally identified during this study. It had been observed over the three operational studies that occasionally problems would be experienced in attempting to complete an ASTAR Level 2 or 3 analysis. Access to the database during the use of ASTAR would occasionally cause the program to "hang up" or not accept data. Based on the computers used in this study, it became apparent that the compiler used for ASTAR is outdated. Looking across the run problems in the three studies is was observed that ASTAR always ran correctly on an 8088 or 8086 based computer, however, when run on a 80286, AT class of computer, database problems were always encountered. It appears that the compiler used for ASTAR does not generate code that is totally 80286 compatible. This is unacceptable for any implementation plan and requires ASTAR to be recoded to avoid this problem in the future.

5.0 **APPENDICES**

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APPENDIX A

AIMS MEDIA/ATTRIBUTE RATING MATRIX

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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. lect w/chalkboard	2	3	2	1	1	0	3	3	4	0	2	0	0	5
2. lect w/poster	2	3	3	1	3	4	4	4	4	0	4	0	0	5
3. lect w/wall chart	2	3	3	1	3	4	4	4	4	0	4	0	0	5
4. lect w/handout	3	3	3	1	2	2	4	4	3	0	2	0	0	5
5. lect w/transparency	2	3	3	1	2	3	3	4	4	0	3	0	0	5
6. lect w/slides	3	4	3	1	4	4	4	4	4	1	5	0	0	5
7. lect w/random slide	3	4	3	2	4	4	4	4	4	2	5	0	0	5
8. programmed text	3	4	4	3	3	4	3	3	4	0	2	0	0	0
9. workbook	3	4	4	3	3	4	4	4	4	0	2	0	0	0
10. checklist	1	2	5	1	2	2	1	1	2	0	2	0	0	0
11. text	3	3	3	3	3	4	5	5	4	0	5	0	0	0
12. audio tape	1	2	2	2	0	0	0	0	0	0	0	0	0	5
13. film	1	4	2	2	2	4	3	2	3	5	5	5	5	5
14. video tape	2	4	2	2	2	3	3	3	4	5	5	5	5	5
15. slide/tape	2	4	3	2	2	4	4	2	4	1	5	0	0	5
16. CMI	4	4	5	4	4	5	5	4	4	5	4	4	4	3
17. model	2	2	1	1	0	1	1	0	0	0	4	0	0	0

MEDIA X ATTRIBUTES TABLE ** CONTINUED **

ATTRIBUTE NUMBER ----> MEDIA	15	16	17	18	19	20	21	22	23	24	25	26	27	28
1. lect w/chalkboard	1	3	2	3	0	0	0	0	5	2	2	0	1	5
2. lect w/poster	4	4	2	3	0	0	0	0	5	2	2	0	1	5
3. lect w/wall chart	3	4	2	3	0	0	0	0	5	2	2	0	1	5
4. lect w/handout	4	5	2	3	0	0	0	0	5	2	2	0	1	5
5. lect w/transparency	1	3	2	3	0	0	0	0	5	2	2	0	1	5
6. lect w/slides	1	2	2	3	0	0	0	0	5	2	2	0	1	5
7. lect w/random slide	1	1	2	3	0	0	0	0	5	2	2	0	1	5
8. programmed text	2	3	3	0	2	3	1	2	1	5	0	0	4	3
9. workbook	2	3	2	0	2	3	1	2	2	4	0	0	3	1
10. checklist	2	2	1	0	2	0	0	1	1	4	0	0	2	1
11. text	5	5	0	0	0	2	5	4	4	5	0	0	2	0
12. audio tape	0	0	0	0	0	0	0	0	0	2	0	0	0	0
13. film	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14. video tape	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15. slide/tape	0	1	0	0	0	0	0	0	0	0	0	0	0	0
16. CMI	3	4	4	0	3	2	2	3	3	3	0	5	2	5
17. model	1	2	0	0	0	0	2	0	0	2	0	0	0	0

MEDIA X ATTRIBUTES TABLE ** CONTINUED **

ATTRIBUTE NUMBER ----> MEDIA	29	30	31	32	33	34	35	36	37	38	39	40	41	42
1. lect w/chalkboard	5	0	4	4	3	2	1	1	1	5	3	1	3	3
2. lect w/poster	5	0	1	4	3	2	1	1	1	5	3	1	3	1
3. lect w/wall chart	5	0	1	4	3	2	1	1	1	5	3	1	3	1
4. lect w/handout	5	0	3	4	3	2	1	1	1	5	3	1	3	2
5. lect w/transparency	5	0	2	4	3	2	1	1	1	5	3	1	3	2
6. lect w/slides	5	0	0	3	3	2	1	1	1	5	3	2	3	2
7. lect w/random slide	5	0	4	3	3	2	1	1	1	5	2	2	3	2
8. programmed text	1	4	2	4	4	3	3	3	2	0	4	1	5	1
9. workbook	0	3	2	4	4	2	2	2	2	0	3	1	4	1
10. checklist	0	0	0	4	2	4	0	0	1	0	3	1	4	1
11. text	0	0	2	4	3	3	4	4	0	0	3	1	2	1
12. audio tape	0	0	0	0	3	1	0	0	0	5	0	1	1	2
13. film	0	0	0	3	4	2	1	1	1	5	2	1	1	1
14. video tape	0	0	0	3	4	2	1	1	1	5	2	1	1	2
15. slide/tape	0	0	2	3	3	2	1	1	0	5	3	1	1	1
16. CMI	5	4	5	3	4	4	3	5	2	2	4	3	5	4
17. model	0	0	0	3	3	2	0	0	1	0	0	1	2	1

MEDIA X ATTRIBUTES TABLE ** CONTINUED **

ATTRIBUTE NUMBER ----> MEDIA	43	44	45	46
1. lect w/chalkboard	5	4	5	5
2. lect w/poster	4	4	4	4
3. lect w/wall chart	4	4	4	4
4. lect w/handout	5	5	5	5
5. lect w/transparency	4	3	5	5
6. lect w/slides	3	3	3	4
7. lect w/random slide	2	3	3	4
8. programmed text	1	5	1	3
9. workbook	2	5	3	4
10. checklist	3	5	1	1
11. text	3	5	5	5
12. audio tape	4	4	5	5
13. film	5	3	4	4
14. video tape	5	3	4	4
15. slide/tape	5	3	3	3
16. CMI	2	3	2	5
17. model	2	1	3	1

APPENDIX B

AIMS MEDIA SELECTION WORKSHEETS

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SELECTION WORKSHEET FOR USE WITH THE FILE : DLIFLC

Objective Number: 1.0

Objective: ASSESS IMPACT OF GRAMMAR ON COMPREHENSION

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

*TYPE OF LEARNING
- |x_| 1. AFFECTIVE(ATTITUDINAL)
- |x_| 2. CONCEPTUAL
- |x_| 3. PROCEDURAL
- |x_| 4. DECISION MAKING

*DISPLAY CHARACTERISTICS
- |x_| 5. TEXT
- |__| 6. PHOTOGRAPHS
- |__| 7. DRAWINGS
- |__| 8. DIAGRAMS
- |__| 9. GRAPHICS
- |__| 10. ANIMATION
- |__| 11. COLORS
- |__| 12. VISUAL MOTION(CONSTANT)
- |__| 13. VISUAL MOTION(VARIABLE)
- |x_| 14. AUDIO(VOICE)
- |x_| 15. PHYSICAL SIMILARITY
- |x_| 16. FUNCTIONAL SIMILARITY

*RESPONSE MODE
- |__| 17. WRITTEN RESPONSE
- |__| 18. VOICE RESPONSE
- |__| 19. DECISION INDICATORS
- |__| 20. PHYSICAL SIMILARITY
- |__| 21. FUNCTIONAL SIMILARITY
- |__| 22. FIDELITY/REALISM

*EVALUATION MODE
- |__| 23. INSTRUCTOR
- |__| 24. SELF
- |__| 25. PEER
- |__| 26. AUTOMATED
- |__| 27. WRITTEN
- |__| 28. IMMEDIATE ON RESPONSE
- |__| 29. IMMEDIATE ON ERROR
- |__| 30. POST-SESSION
- |__| 31. FAULT INSERTION

*ENVIRONMENTAL CONDITIONS
- |x_| 32. LIGHTING

*LEARNING LEVELS
- |__| 33. a. FAMILIARITY
- |__| 34. b. PERFORM PROCEDURE
- |x_| 35. c. PERFORM JOB
- |__| 36. d. PERFORM MISSION

*SPECIAL REQUIREMENTS
- |x_| 37. TEAM INTERACTION

*COMMUNICATIONS
- |x_| 38. VOICE

*PERFORMANCE CRITERIA
- |x_| 39. SOP'S
- |x_| 40. TIME
- |x_| 41. ACCURACY

*SCENARIO DEVELOPMENT
- |x_| 42. INTERACTIVE

*MISCELLANEOUS
- |x_| 43. COST
- |x_| 44. PORTABILITY
- |x_| 45. ACCEPTANCE-INSTRUCTOR
- |x_| 46. ACCEPTANCE-STUDENT

SELECTION WORKSHEET FOR USE WITH THE FILE : DLIFLC

Objective Number: 2.0

Objective: BASIC READING SKILLS

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

*TYPE OF LEARNING

|x_| 1. AFFECTIVE(ATTITUDINAL)
|__| 2. CONCEPTUAL
|__| 3. PROCEDURAL
|__| 4. DECISION MAKING

*DISPLAY CHARACTERISTICS

|x_| 5. TEXT
|x_| 6. PHOTOGRAPHS
|x_| 7. DRAWINGS
|x_| 8. DIAGRAMS
|x_| 9. GRAPHICS
|__| 10. ANIMATION
|x_| 11. COLORS
|__| 12. VISUAL MOTION(CONSTANT)
|__| 13. VISUAL MOTION(VARIABLE)
|x_| 14. AUDIO(VOICE)
|__| 15. PHYSICAL SIMILARITY
|__| 16. FUNCTIONAL SIMILARITY

*RESPONSE MODE

|__| 17. WRITTEN RESPONSE
|__| 18. VOICE RESPONSE
|__| 19. DECISION INDICATORS
|__| 20. PHYSICAL SIMILARITY
|__| 21. FUNCTIONAL SIMILARITY
|__| 22. FIDELITY/REALISM

*EVALUATION MODE

|__| 23. INSTRUCTOR
|__| 24. SELF
|__| 25. PEER
|__| 26. AUTOMATED
|__| 27. WRITTEN
|__| 28. IMMEDIATE ON RESPONSE
|__| 29. IMMEDIATE ON ERROR
|__| 30. POST-SESSION
|__| 31. FAULT INSERTION

*ENVIRONMENTAL CONDITIONS

|x_| 32. LIGHTING

*LEARNING LEVELS

|__| 33. a. FAMILIARITY
|__| 34. b. PERFORM PROCEDURE
|x_| 35. c. PERFORM JOB
|__| 36. d. PERFORM MISSION

*SPECIAL REQUIREMENTS

|x_| 37. TEAM INTERACTION

*COMMUNICATIONS

|__| 38. VOICE

*PERFORMANCE CRITERIA

|__| 39. SOP'S
|x_| 40. TIME
|__| 41. ACCURACY

*SCENARIO DEVELOPMENT

|x_| 42. INTERACTIVE

*MISCELLANEOUS

|__| 43. COST
|__| 44. PORTABILITY
|__| 45. ACCEPTANCE-INSTRUCTOR
|x_| 46. ACCEPTANCE-STUDENT

SELECTION WORKSHEET FOR USE WITH THE FILE : DLIFLC

Objective Number: 2.1

Objective: ATTEND TO READING TASK

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

*TYPE OF LEARNING
- |x_| 1. AFFECTIVE(ATTITUDINAL)
- |__| 2. CONCEPTUAL
- |__| 3. PROCEDURAL
- |__| 4. DECISION MAKING

*DISPLAY CHARACTERISTICS
- |x_| 5. TEXT
- |x_| 6. PHOTOGRAPHS
- |x_| 7. DRAWINGS
- |x_| 8. DIAGRAMS
- |x_| 9. GRAPHICS
- |__| 10. ANIMATION
- |x_| 11. COLORS
- |__| 12. VISUAL MOTION(CONSTANT)
- |__| 13. VISUAL MOTION(VARIABLE)
- |x_| 14. AUDIO(VOICE)
- |__| 15. PHYSICAL SIMILARITY
- |__| 16. FUNCTIONAL SIMILARITY

*RESPONSE MODE
- |__| 17. WRITTEN RESPONSE
- |__| 18. VOICE RESPONSE
- |__| 19. DECISION INDICATORS
- |__| 20. PHYSICAL SIMILARITY
- |__| 21. FUNCTIONAL SIMILARITY
- |__| 22. FIDELITY/REALISM

*EVALUATION MODE
- |__| 23. INSTRUCTOR
- |__| 24. SELF
- |__| 25. PEER
- |__| 26. AUTOMATED
- |__| 27. WRITTEN
- |__| 28. IMMEDIATE ON RESPONSE
- |__| 29. IMMEDIATE ON ERROR
- |__| 30. POST-SESSION
- |__| 31. FAULT INSERTION

*ENVIRONMENTAL CONDITIONS
- |x_| 32. LIGHTING

*LEARNING LEVELS
- |__| 33. a. FAMILIARITY
- |__| 34. b. PERFORM PROCEDURE
- |x_| 35. c. PERFORM JOB
- |__| 36. d. PERFORM MISSION

*SPECIAL REQUIREMENTS
- |x_| 37. TEAM INTERACTION

*COMMUNICATIONS
- |__| 38. VOICE

*PERFORMANCE CRITERIA
- |__| 39. SOP'S
- |x_| 40. TIME
- |__| 41. ACCURACY

*SCENARIO DEVELOPMENT
- |x_| 42. INTERACTIVE

*MISCELLANEOUS
- |__| 43. COST
- |__| 44. PORTABILITY
- |__| 45. ACCEPTANCE-INSTRUCTOR
- |x_| 46. ACCEPTANCE-STUDENT

SELECTION WORKSHEET FOR USE WITH THE FILE : DLIFLC

Objective Number: 3.0

Objective: READING STRATEGIES

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

*TYPE OF LEARNING
- |x_| 1. AFFECTIVE(ATTITUDINAL)
- |x_| 2. CONCEPTUAL
- |x_| 3. PROCEDURAL
- |x_| 4. DECISION MAKING

*DISPLAY CHARACTERISTICS
- |x_| 5. TEXT
- |x_| 6. PHOTOGRAPHS
- |x_| 7. DRAWINGS
- |x_| 8. DIAGRAMS
- |x_| 9. GRAPHICS
- |__| 10. ANIMATION
- |x_| 11. COLORS
- |__| 12. VISUAL MOTION(CONSTANT)
- |__| 13. VISUAL MOTION(VARIABLE)
- |x_| 14. AUDIO(VOICE)
- |x_| 15. PHYSICAL SIMILARITY
- |x_| 16. FUNCTIONAL SIMILARITY

*RESPONSE MODE
- |__| 17. WRITTEN RESPONSE
- |__| 18. VOICE RESPONSE
- |__| 19. DECISION INDICATORS
- |__| 20. PHYSICAL SIMILARITY
- |__| 21. FUNCTIONAL SIMILARITY
- |__| 22. FIDELITY/REALISM

*EVALUATION MODE
- |__| 23. INSTRUCTOR
- |__| 24. SELF
- |__| 25. PEER
- |__| 26. AUTOMATED
- |__| 27. WRITTEN
- |__| 28. IMMEDIATE ON RESPONSE
- |__| 29. IMMEDIATE ON ERROR
- |__| 30. POST-SESSION
- |__| 31. FAULT INSERTION

*ENVIRONMENTAL CONDITIONS
- |x_| 32. LIGHTING

*LEARNING LEVELS
- |__| 33. a. FAMILIARITY
- |__| 34. b. PERFORM PROCEDURE
- |x_| 35. c. PERFORM JOB
- |__| 36. d. PERFORM MISSION

*SPECIAL REQUIREMENTS
- |x_| 37. TEAM INTERACTION

*COMMUNICATIONS
- |__| 38. VOICE

*PERFORMANCE CRITERIA
- |__| 39. SOP'S
- |x_| 40. TIME
- |x_| 41. ACCURACY

*SCENARIO DEVELOPMENT
- |x_| 42. INTERACTIVE

*MISCELLANEOUS
- |x_| 43. COST
- |__| 44. PORTABILITY
- |x_| 45. ACCEPTANCE-INSTRUCTOR
- |x_| 46. ACCEPTANCE-STUDENT

SELECTION WORKSHEET FOR USE WITH THE FILE : DLIFLC

Objective Number: 3.1

Objective: USE OF SKIMMING STRATEGIES

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

*TYPE OF LEARNING
- |x_| 1. AFFECTIVE(ATTITUDINAL)
- |__| 2. CONCEPTUAL
- |x_| 3. PROCEDURAL
- |__| 4. DECISION MAKING

*DISPLAY CHARACTERISTICS
- |x_| 5. TEXT
- |x_| 6. PHOTOGRAPHS
- |x_| 7. DRAWINGS
- |x_| 8. DIAGRAMS
- |x_| 9. GRAPHICS
- |__| 10. ANIMATION
- |x_| 11. COLORS
- |__| 12. VISUAL MOTION(CONSTANT)
- |__| 13. VISUAL MOTION(VARIABLE)
- |x_| 14. AUDIO(VOICE)
- |x_| 15. PHYSICAL SIMILARITY
- |__| 16. FUNCTIONAL SIMILARITY

*RESPONSE MODE
- |__| 17. WRITTEN RESPONSE
- |__| 18. VOICE RESPONSE
- |__| 19. DECISION INDICATORS
- |__| 20. PHYSICAL SIMILARITY
- |__| 21. FUNCTIONAL SIMILARITY
- |__| 22. FIDELITY/REALISM

*EVALUATION MODE
- |__| 23. INSTRUCTOR
- |__| 24. SELF
- |__| 25. PEER
- |__| 26. AUTOMATED
- |__| 27. WRITTEN
- |__| 28. IMMEDIATE ON RESPONSE
- |__| 29. IMMEDIATE ON ERROR
- |__| 30. POST-SESSION
- |__| 31. FAULT INSERTION

*ENVIRONMENTAL CONDITIONS
- |x_| 32. LIGHTING

*LEARNING LEVELS
- |__| 33. a. FAMILIARITY
- |__| 34. b. PERFORM PROCEDURE
- |x_| 35. c. PERFORM JOB
- |__| 36. d. PERFORM MISSION

*SPECIAL REQUIREMENTS
- |x_| 37. TEAM INTERACTION

*COMMUNICATIONS
- |__| 38. VOICE

*PERFORMANCE CRITERIA
- |__| 39. SOP'S
- |x_| 40. TIME
- |__| 41. ACCURACY

*SCENARIO DEVELOPMENT
- |x_| 42. INTERACTIVE

*MISCELLANEOUS
- |__| 43. COST
- |__| 44. PORTABILITY
- |__| 45. ACCEPTANCE-INSTRUCTOR
- |__| 46. ACCEPTANCE-STUDENT

SELECTION WORKSHEET FOR USE WITH THE FILE : DLIFLC

Objective Number: 3.2

Objective: USE OF PREDICTION STRATEGIES

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

*TYPE OF LEARNING
- |x_| 1. AFFECTIVE(ATTITUDINAL)
- |x_| 2. CONCEPTUAL
- |x_| 3. PROCEDURAL
- |x_| 4. DECISION MAKING

*DISPLAY CHARACTERISTICS
- |x_| 5. TEXT
- |x_| 6. PHOTOGRAPHS
- |x_| 7. DRAWINGS
- |x_| 8. DIAGRAMS
- |x_| 9. GRAPHICS
- |__| 10. ANIMATION
- |x_| 11. COLORS
- |__| 12. VISUAL MOTION(CONSTANT)
- |__| 13. VISUAL MOTION(VARIABLE)
- |__| 14. AUDIO(VOICE)
- |x_| 15. PHYSICAL SIMILARITY
- |__| 16. FUNCTIONAL SIMILARITY

*RESPONSE MODE
- |__| 17. WRITTEN RESPONSE
- |__| 18. VOICE RESPONSE
- |__| 19. DECISION INDICATORS
- |__| 20. PHYSICAL SIMILARITY
- |__| 21. FUNCTIONAL SIMILARITY
- |__| 22. FIDELITY/REALISM

*EVALUATION MODE
- |__| 23. INSTRUCTOR
- |__| 24. SELF
- |__| 25. PEER
- |__| 26. AUTOMATED
- |__| 27. WRITTEN
- |__| 28. IMMEDIATE ON RESPONSE
- |__| 29. IMMEDIATE ON ERROR
- |__| 30. POST-SESSION
- |__| 31. FAULT INSERTION

*ENVIRONMENTAL CONDITIONS
- |x_| 32. LIGHTING

*LEARNING LEVELS
- |__| 33. a. FAMILIARITY
- |__| 34. b. PERFORM PROCEDURE
- |x_| 35. c. PERFORM JOB
- |__| 36. d. PERFORM MISSION

*SPECIAL REQUIREMENTS
- |__| 37. TEAM INTERACTION

*COMMUNICATIONS
- |__| 38. VOICE

*PERFORMANCE CRITERIA
- |__| 39. SOP'S
- |x_| 40. TIME
- |__| 41. ACCURACY

*SCENARIO DEVELOPMENT
- |x_| 42. INTERACTIVE

*MISCELLANEOUS
- |__| 43. COST
- |__| 44. PORTABILITY
- |__| 45. ACCEPTANCE-INSTRUCTOR
- |x_| 46. ACCEPTANCE-STUDENT

SELECTION WORKSHEET FOR USE WITH THE FILE : DLIFLC

Objective Number: 3.3

Objective: USE OF SCANNING STRATEGIES

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

*TYPE OF LEARNING
- |x_| 1. AFFECTIVE(ATTITUDINAL)
- |x_| 2. CONCEPTUAL
- |x_| 3. PROCEDURAL
- |x_| 4. DECISION MAKING

*DISPLAY CHARACTERISTICS
- |x_| 5. TEXT
- |x_| 6. PHOTOGRAPHS
- |x_| 7. DRAWINGS
- |x_| 8. DIAGRAMS
- |x_| 9. GRAPHICS
- |__| 10. ANIMATION
- |x_| 11. COLORS
- |__| 12. VISUAL MOTION(CONSTANT)
- |__| 13. VISUAL MOTION(VARIABLE)
- |__| 14. AUDIO(VOICE)
- |x_| 15. PHYSICAL SIMILARITY
- |__| 16. FUNCTIONAL SIMILARITY

*RESPONSE MODE
- |__| 17. WRITTEN RESPONSE
- |__| 18. VOICE RESPONSE
- |__| 19. DECISION INDICATORS
- |__| 20. PHYSICAL SIMILARITY
- |__| 21. FUNCTIONAL SIMILARITY
- |__| 22. FIDELITY/REALISM

*EVALUATION MODE
- |__| 23. INSTRUCTOR
- |__| 24. SELF
- |__| 25. PEER
- |__| 26. AUTOMATED
- |__| 27. WRITTEN
- |__| 28. IMMEDIATE ON RESPONSE
- |__| 29. IMMEDIATE ON ERROR
- |__| 30. POST-SESSION
- |__| 31. FAULT INSERTION

*ENVIRONMENTAL CONDITIONS
- |x_| 32. LIGHTING

*LEARNING LEVELS
- |__| 33. a. FAMILIARITY
- |__| 34. b. PERFORM PROCEDURE
- |x_| 35. c. PERFORM JOB
- |__| 36. d. PERFORM MISSION

*SPECIAL REQUIREMENTS
- |__| 37. TEAM INTERACTION

*COMMUNICATIONS
- |__| 38. VOICE

*PERFORMANCE CRITERIA
- |__| 39. SOP'S
- |x_| 40. TIME
- |__| 41. ACCURACY

*SCENARIO DEVELOPMENT
- |x_| 42. INTERACTIVE

*MISCELLANEOUS
- |__| 43. COST
- |__| 44. PORTABILITY
- |__| 45. ACCEPTANCE-INSTRUCTOR
- |x_| 46. ACCEPTANCE-STUDENT

SELECTION WORKSHEET FOR USE WITH THE FILE : DLIFLC

Objective Number: 3.4

Objective: USE OF DECODING STRATEGIES

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

*TYPE OF LEARNING
- |x_| 1. AFFECTIVE(ATTITUDINAL)
- |x_| 2. CONCEPTUAL
- |x_| 3. PROCEDURAL
- |x_| 4. DECISION MAKING

*DISPLAY CHARACTERISTICS
- |x_| 5. TEXT
- |x_| 6. PHOTOGRAPHS
- |x_| 7. DRAWINGS
- |x_| 8. DIAGRAMS
- |x_| 9. GRAPHICS
- |__| 10. ANIMATION
- |x_| 11. COLORS
- |__| 12. VISUAL MOTION(CONSTANT)
- |__| 13. VISUAL MOTION(VARIABLE)
- |__| 14. AUDIO(VOICE)
- |x_| 15. PHYSICAL SIMILARITY
- |x_| 16. FUNCTIONAL SIMILARITY

*RESPONSE MODE
- |__| 17. WRITTEN RESPONSE
- |__| 18. VOICE RESPONSE
- |__| 19. DECISION INDICATORS
- |__| 20. PHYSICAL SIMILARITY
- |__| 21. FUNCTIONAL SIMILARITY
- |__| 22. FIDELITY/REALISM

*EVALUATION MODE
- |__| 23. INSTRUCTOR
- |__| 24. SELF
- |__| 25. PEER
- |__| 26. AUTOMATED
- |__| 27. WRITTEN
- |__| 28. IMMEDIATE ON RESPONSE
- |__| 29. IMMEDIATE ON ERROR
- |__| 30. POST-SESSION
- |__| 31. FAULT INSERTION

*ENVIRONMENTAL CONDITIONS
- |x_| 32. LIGHTING

*LEARNING LEVELS
- |__| 33. a. FAMILIARITY
- |__| 34. b. PERFORM PROCEDURE
- |x_| 35. c. PERFORM JOB
- |__| 36. d. PERFORM MISSION

*SPECIAL REQUIREMENTS
- |__| 37. TEAM INTERACTION

*COMMUNICATIONS
- |__| 38. VOICE

*PERFORMANCE CRITERIA
- |__| 39. SOP'S
- |__| 40. TIME
- |x_| 41. ACCURACY

*SCENARIO DEVELOPMENT
- |x_| 42. INTERACTIVE

*MISCELLANEOUS
- |x_| 43. COST
- |__| 44. PORTABILITY
- |__| 45. ACCEPTANCE-INSTRUCTOR
- |x_| 46. ACCEPTANCE-STUDENT

SELECTION WORKSHEET FOR USE WITH THE FILE : DLIFLC

Objective Number: 3.5

Objective: USE OF VERIFICATION

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

*TYPE OF LEARNING
- |x_| 1. AFFECTIVE(ATTITUDINAL)
- |x_| 2. CONCEPTUAL
- |x_| 3. PROCEDURAL
- |x_| 4. DECISION MAKING

*DISPLAY CHARACTERISTICS
- |x_| 5. TEXT
- |__| 6. PHOTOGRAPHS
- |__| 7. DRAWINGS
- |__| 8. DIAGRAMS
- |__| 9. GRAPHICS
- |__| 10. ANIMATION
- |__| 11. COLORS
- |__| 12. VISUAL MOTION(CONSTANT)
- |__| 13. VISUAL MOTION(VARIABLE)
- |__| 14. AUDIO(VOICE)
- |__| 15. PHYSICAL SIMILARITY
- |__| 16. FUNCTIONAL SIMILARITY

*RESPONSE MODE
- |__| 17. WRITTEN RESPONSE
- |__| 18. VOICE RESPONSE
- |__| 19. DECISION INDICATORS
- |__| 20. PHYSICAL SIMILARITY
- |__| 21. FUNCTIONAL SIMILARITY
- |__| 22. FIDELITY/REALISM

*EVALUATION MODE
- |__| 23. INSTRUCTOR
- |__| 24. SELF
- |__| 25. PEER
- |__| 26. AUTOMATED
- |__| 27. WRITTEN
- |__| 28. IMMEDIATE ON RESPONSE
- |__| 29. IMMEDIATE ON ERROR
- |__| 30. POST-SESSION
- |__| 31. FAULT INSERTION

*ENVIRONMENTAL CONDITIONS
- |x_| 32. LIGHTING

*LEARNING LEVELS
- |__| 33. a. FAMILIARITY
- |__| 34. b. PERFORM PROCEDURE
- |x_| 35. c. PERFORM JOB
- |__| 36. d. PERFORM MISSION

*SPECIAL REQUIREMENTS
- |__| 37. TEAM INTERACTION

*COMMUNICATIONS
- |__| 38. VOICE

*PERFORMANCE CRITERIA
- |__| 39. SOP'S
- |__| 40. TIME
- |x_| 41. ACCURACY

*SCENARIO DEVELOPMENT
- |x_| 42. INTERACTIVE

*MISCELLANEOUS
- |__| 43. COST
- |__| 44. PORTABILITY
- |x_| 45. ACCEPTANCE-INSTRUCTOR
- |x_| 46. ACCEPTANCE-STUDENT

SELECTION WORKSHEET FOR USE WITH THE FILE : DLIFLC

Objective Number: 4.0

Objective: INTEGRATE DATA FORM MULTIPLE SOURCES

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

*TYPE OF LEARNING
- [ ] 1. AFFECTIVE(ATTITUDINAL)
- [x] 2. CONCEPTUAL
- [x] 3. PROCEDURAL
- [x] 4. DECISION MAKING

*DISPLAY CHARACTERISTICS
- [x] 5. TEXT
- [x] 6. PHOTOGRAPHS
- [x] 7. DRAWINGS
- [x] 8. DIAGRAMS
- [x] 9. GRAPHICS
- [ ] 10. ANIMATION
- [x] 11. COLORS
- [ ] 12. VISUAL MOTION(CONSTANT)
- [ ] 13. VISUAL MOTION(VARIABLE)
- [ ] 14. AUDIO(VOICE)
- [x] 15. PHYSICAL SIMILARITY
- [x] 16. FUNCTIONAL SIMILARITY

*RESPONSE MODE
- [ ] 17. WRITTEN RESPONSE
- [ ] 18. VOICE RESPONSE
- [ ] 19. DECISION INDICATORS
- [ ] 20. PHYSICAL SIMILARITY
- [ ] 21. FUNCTIONAL SIMILARITY
- [ ] 22. FIDELITY/REALISM

*EVALUATION MODE
- [ ] 23. INSTRUCTOR
- [ ] 24. SELF
- [ ] 25. PEER
- [ ] 26. AUTOMATED
- [ ] 27. WRITTEN
- [ ] 28. IMMEDIATE ON RESPONSE
- [ ] 29. IMMEDIATE ON ERROR
- [ ] 30. POST-SESSION
- [ ] 31. FAULT INSERTION

*ENVIRONMENTAL CONDITIONS
- [x] 32. LIGHTING

*LEARNING LEVELS
- [ ] 33. a. FAMILIARITY
- [ ] 34. b. PERFORM PROCEDURE
- [x] 35. c. PERFORM JOB
- [ ] 36. d. PERFORM MISSION

*SPECIAL REQUIREMENTS
- [ ] 37. TEAM INTERACTION

*COMMUNICATIONS
- [ ] 38. VOICE

*PERFORMANCE CRITERIA
- [ ] 39. SOP'S
- [x] 40. TIME
- [x] 41. ACCURACY

*SCENARIO DEVELOPMENT
- [x] 42. INTERACTIVE

*MISCELLANEOUS
- [ ] 43. COST
- [ ] 44. PORTABILITY
- [x] 45. ACCEPTANCE-INSTRUCTOR
- [x] 46. ACCEPTANCE-STUDENT

APPENDIX C

AIMS MEDIA SELECTION PRINTOUTS

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MEDIA SELECTIONS FOR OBJECTIVES 1.0 TO 4.0
10 TOTAL OBJECTIVES

	# OF OBJECTIVES	% OF OBJECTIVES	MEDIUM
1.	10	100.00	CMI
2.	10	100.00	lect w/random slides
3.	10	100.00	lect w/slides
4.	10	100.00	lect w/transparency
5.	10	100.00	lect w/handout
6.	10	100.00	lect w/wall chart
7.	10	100.00	lect w/poster
8.	5	50.00	text
9.	5	50.00	workbook
10.	5	50.00	programmed text
11.	3	30.00	video tape
12.	3	30.00	film
13.	2	20.00	lect w/chalkboard
14.	1	10.00	slide/tape

MEDIA SELECTION FOR OBJECTIVE 1.0

	MEDIUM	SPECIFIC RATING	GENERAL RATING
1.	CMI	3.450	3.54
2.	lect w/handout	3.300	2.5
3.	lect w/poster	3.000	2.43
4.	lect w/wall chart	2.950	2.41
5.	lect w/chalkboard	2.900	2.28
6.	lect w/transparency	2.850	2.32
7.	lect w/slides	2.800	2.36
8.	lect w/random slides	2.700	2.43

MEDIA SELECTION FOR OBJECTIVE 2.0

	MEDIUM	SPECIFIC RATING	GENERAL RATING
1.	CMI	3.786	3.54
2.	lect w/random slides	3.286	2.43
3.	lect w/slides	3.286	2.36
4.	lect w/wall chart	3.000	2.41
5.	lect w/poster	3.000	2.43
6.	lect w/transparency	2.857	2.32
7.	video tape	2.786	1.93
8.	lect w/handout	2.786	2.5
9.	film	2.571	1.86

MEDIA SELECTION FOR OBJECTIVE 2.1

	MEDIUM	SPECIFIC RATING	GENERAL RATING
1.	CMI	3.786	3.54
2.	lect w/random slides	3.286	2.43
3.	lect w/slides	3.286	2.36
4.	lect w/wall chart	3.000	2.41
5.	lect w/poster	3.000	2.43
6.	lect w/transparency	2.857	2.32
7.	video tape	2.786	1.93
8.	lect w/handout	2.786	2.5
9.	film	2.571	1.86

MEDIA SELECTION FOR OBJECTIVE 3.0

	MEDIUM	SPECIFIC RATING	GENERAL RATING
1.	CMI	3.727	3.54
2.	lect w/handout	3.091	2.5
3.	lect w/poster	3.091	2.43
4.	lect w/wall chart	3.045	2.41
5.	lect w/slides	3.000	2.36
6.	lect w/random slides	2.955	2.43
7.	lect w/transparency	2.864	2.32

MEDIA SELECTION FOR OBJECTIVE 3.1

	MEDIUM	SPECIFIC RATING	GENERAL RATING
1.	CMI	3.733	3.54
2.	lect w/random slides	3.067	2.43
3.	lect w/slides	3.067	2.36
4.	lect w/poster	3.000	2.43
5.	lect w/wall chart	2.933	2.41
6.	lect w/handout	2.733	2.5
7.	lect w/transparency	2.600	2.32

MEDIA SELECTION FOR OBJECTIVE 3.2

	MEDIUM	SPECIFIC RATING	GENERAL RATING
1.	CMI	4.000	3.54
2.	text	3.625	2.5
3.	lect w/random slides	3.125	2.43
4.	workbook	3.063	2.26
5.	lect w/slides	3.063	2.36
6.	programmed text	2.938	2.36
7.	lect w/poster	2.938	2.43
8.	lect w/wall chart	2.875	2.41
9.	lect w/handout	2.750	2.5
10.	lect w/transparency	2.625	2.32

MEDIA SELECTION FOR OBJECTIVE 3.3

	MEDIUM	SPECIFIC RATING	GENERAL RATING
1.	CMI	4.000	3.54
2.	text	3.625	2.5
3.	lect w/random slides	3.125	2.43
4.	workbook	3.063	2.26
5.	lect w/slides	3.063	2.36
6.	programmed text	2.938	2.36
7.	lect w/poster	2.938	2.43
8.	lect w/wall chart	2.875	2.41
9.	lect w/handout	2.750	2.5
10.	lect w/transparency	2.625	2.32

MEDIA SELECTION FOR OBJECTIVE 3.4

	MEDIUM	SPECIFIC RATING	GENERAL RATING
1.	CMI	4.000	3.54
2.	text	3.722	2.5
3.	workbook	3.167	2.26
4.	lect w/poster	3.167	2.43
5.	lect w/handout	3.111	2.5
6.	lect w/wall chart	3.111	2.41
7.	programmed text	3.056	2.36
8.	lect w/slides	3.056	2.36
9.	lect w/random slides	3.000	2.43
10.	lect w/transparency	2.833	2.32

MEDIA SELECTION FOR OBJECTIVE 3.5

	MEDIUM	SPECIFIC RATING	GENERAL RATING
1.	CMI	3.909	3.54
2.	text	3.273	2.5
3.	workbook	3.182	2.26
4.	programmed text	3.091	2.36
5.	lect w/random slides	2.909	2.43
6.	lect w/handout	2.909	2.5
7.	lect w/slides	2.818	2.36
8.	lect w/transparency	2.818	2.32
9.	lect w/chalkboard	2.727	2.28
10.	lect w/wall chart	2.636	2.41
11.	lect w/poster	2.636	2.43
12.	video tape	2.455	1.93
13.	slide/tape	2.273	1.65
14.	film	2.273	1.86

MEDIA SELECTION FOR OBJECTIVE 4.0

	MEDIUM	SPECIFIC RATING	GENERAL RATING
1.	CMI	3.944	3.54
2.	text	3.722	2.5
3.	workbook	3.111	2.26
4.	lect w/poster	3.111	2.43
5.	lect w/wall chart	3.056	2.41
6.	lect w/random slides	3.000	2.43
7.	lect w/slides	3.000	2.36
8.	lect w/handout	3.000	2.5
9.	programmed text	2.944	2.36
10.	lect w/transparency	2.833	2.32

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APPENDIX D

USER ATTITUDES QUESTIONNAIRE

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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: Sabine Atwell, Al Scott

BRANCH/SERVICE
NAME OF COMPANY: Defense Language Institute Foreign Language Center

WORK PHONE: (408) 647-5513

AUTOVON _______-________X_________

NAME OF TRAINING
SYSTEM(S) ANALYZED: Foreign Language Reading Comprehension

____

____

____

POINTS OF CONTACT:

NAVAL TRAINING SYSTEM CENTER

RHONWYN CARSON PHONE 380-4829

INSTITUTE FOR SIMULATION AND TRAINING:

DR. MICHAEL COMPANION PHONE 658-5024

TABLE OF CONTENTS

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

2 CONVENTIONAL METHOD

3 ASTAR

1 AIMS

EASE OF USE

2 CONVENTIONAL METHOD

3 ASTAR

1 AIMS

RELEVANCE

2 CONVENTIONAL METHOD

3 ASTAR

1 AIMS

EFFECTIVENESS

3 CONVENTIONAL METHOD

2 ASTAR

1 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
1 2 3 * 4 5 6 7

FRUSTRATING — SATISFYING
1 2 3 * 4 5 6 7

INADEQUATE POWER — ADEQUATE POWER
1 2 3 4 * 6 7

RIGID — FLEXIBLE
1 2 * 4 5 6 7

UNPRODUCTIVE — VERY PRODUCTIVE
1 2 * 4 5 6 7

SCREEN

ORGANIZATION OF THE MENUS IS:
ILLOGICAL — LOGICAL
1 2 3 * 5 6 7

LABELS FOR FUNCTIONS WITHIN THE MENUS ARE:
CONFUSING — VERY CLEAR
1 2 3 4 * 6 7

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

WRITTEN PROMPTS ARE:
NOT AT ALL HELPFUL — VERY HELPFUL
1 2 3 * 5 6 7

ASTAR

TERMINOLOGY

COMPUTER KEEPS YOU INFORMED ABOUT WHAT IT IS DOING:

NEVER 1 2 3 * 5 6 7 ALWAYS

LANGUAGE USED IS:

CONFUSING 1 2 3 4 * 5 6 7 EASILY UNDERSTOOD

USE OF TERMS THROUGHOUT PROGRAM IS:

INCONSISTENT 1 2 3 4 5 * 6 7 VERY CONSISTENT

LEARNING ASTAR

LEARNING TO OPERATE THE SYSTEM IS:

DIFFICULT 1 2 3 4 * 5 6 7 EASY

EXPLORING NEW FEATURES BY TRIAL AND ERROR IS:

DIFFICULT 1 2 * 4 5 6 7 EASY

INSTRUCTIONAL MATERIALS PROVIDED ARE:

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

INSTRUCTIONAL MATERIALS PROVIDED ARE:

INCOMPLETE 1 2 3 4 5 * 6 7 VERY THOROUGH

ASTAR

USING ASTAR

TASKS CAN BE PERFORMED IN A STRAIGHTFORWARD MANNER:
NEVER ALWAYS
1 2 * 3 4 5 6 7

AUDIO/VISUAL FEEDBACK IS:
NOT AT ALL HELPFUL VERY HELPFUL
1 2 * 4 5 6 7

USER MEMORY REQUIREMENTS ARE:
TOO HIGH VERY LOW
1 2 3 4 5 * 7

ERROR MESSAGES PROVIDED ARE:
NOT AT ALL HELPFUL VERY HELPFUL
1 * 3 4 5 6 7

ASTAR OUTPUT

ANALYSIS RESULTS ARE:
NOT AT ALL USEFUL VERY USEFUL
1 2 * 4 5 6 7

ANALYSIS RESULTS ARE:
DIFFICULT TO UNDERSTAND EASY TO UNDERSTAND
1 2 * 4 5 6 7

FORMAT OF THE RESULTS IS:
CONFUSING VERY CLEAR
1 * 3 4 5 6 7

COMMENTS (RE: OUTPUT IN GENERAL):

A spreadsheet type format would be helpful or at least windows through which one could compare various ratings as one could compare various ratings as one goes along. ASTAR 3 not really useful in its present form. Should be menu driven.

Introduction to each question need not be read-title is clear enough. Need to see data previously entered for comparison. Level 3 too rigid - need to be able to modify questions, rating scales, etc.

ACCEPTANCE OF ASTAR
[Sabine Atwell]

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

STRONGLY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	STRONGLY DISAGREE
( )	(X)	( )	( )

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

STRONGLY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	STRONGLY DISAGREE
( )	(X)	( )	( )

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

STRONGLY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	STRONGLY DISAGREE
( )	( )	( )	(X)

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

STRONGLY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	STRONGLY DISAGREE
( )	( )	(X)	( )

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
( )	( )	(X)	( )

6. I WOULD FEEL COMFORTABLE WORKING WITH ASTAR.

STRONGLY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	STRONGLY DISAGREE
( )	( )	(X)	( )

ACCEPTANCE OF ASTAR
[Al Scott]

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

STRONGLY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	STRONGLY DISAGREE
( )	(X)	( )	( )

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

STRONGLY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	STRONGLY DISAGREE
(X)	( )	( )	( )

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

STRONGLY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	STRONGLY DISAGREE
( )	( )	( )	(X)

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

STRONGLY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	STRONGLY DISAGREE
( )	( )	( )	(X)

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
( )	(X)	( )	( )

6. I WOULD FEEL COMFORTABLE WORKING WITH ASTAR.

STRONGLY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	STRONGLY DISAGREE
( )	( )	( )	(X)

ASTAR

PLEASE ANSWER THE FOLLOWING AS FULLY AS POSSIBLE.

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

Level 2. You get relative ratings of various aspects at Levels 1 and 2 to get broad brush types of decisions.

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

Level 3 -rigid. Not user friendly. Cost is not factored in. Too much data entry. L3 format may not be flexible enough for DLIFLC's specific purposes. Tasks and subtasks are not easily identified.

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

Convert to spreadsheet format. Make it user friendly, menu driven. Eliminate mix of print media and machine when one needs to refer back to info previously entered!

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

__ LESS THAN 1 HR ___ 1-2 HRS _X_ 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 _X_UNABLE TO ANSWER

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

____EXTREMELY DIFFERENT ___VERY DIFFERENT

____MODERATELY DIFFERENT ____ONLY SLIGHTLY DIFFERENT

PLEASE EXPLAIN:

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 3 4 5 * 6 7

DIFFICULT — EASY
1 2 3 4 5 * 6 7

FRUSTRATING — SATISFYING
1 2 3 4 5 * 6 7

INADEQUATE POWER — ADEQUATE POWER
1 2 3 4 5 * 7

RIGID — FLEXIBLE
1 2 3 4 5 * 7

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

SCREEN

ORGANIZATION OF THE MENUS IS:
ILLOGICAL — LOGICAL
1 2 3 4 5 * 6 7

LABELS FOR FUNCTIONS WITHIN THE MENUS ARE:
CONFUSING — VERY CLEAR
1 2 3 4 5 * 6 7

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

WRITTEN PROMPTS ARE:
NOT AT ALL HELPFUL — VERY HELPFUL
1 2 3 4 5 * 6 7

AIMS

TERMINOLOGY

COMPUTER KEEPS YOU INFORMED ABOUT WHAT IT IS DOING:
NEVER ... ALWAYS
1 2 3 4 5 * 7

LANGUAGE USED IS:
CONFUSING ... EASILY UNDERSTOOD
1 2 3 4 5 6 * 7

USE OF TERMS THROUGHOUT PROGRAM IS:
INCONSISTENT ... VERY CONSISTENT
1 2 3 4 5 6 * 7

LEARNING AIMS

LEARNING TO OPERATE THE SYSTEM IS:
DIFFICULT ... EASY
1 2 3 4 5 6 *

EXPLORING NEW FEATURES BY TRIAL AND ERROR IS:
DIFFICULT ... EASY
1 2 3 4 * 6 7

INSTRUCTIONAL MATERIALS PROVIDED ARE:
NOT AT ALL HELPFUL ... VERY HELPFUL
1 2 3 4 5 * 7

INSTRUCTIONAL MATERIALS PROVIDED ARE:
INCOMPLETE ... VERY THOROUGH
1 2 3 4 5 * 7

AIMS

USING AIMS

TASKS CAN BE PERFORMED IN A STRAIGHTFORWARD MANNER:
NEVER — ALWAYS
1 2 3 4 5 6 * 7

AUDIO/VISUAL FEEDBACK IS:
NOT AT ALL HELPFUL — VERY HELPFUL
1 2 3 4 5 6 * 7

DEMANDS ON USER MEMORY ARE:
TOO HIGH — VERY LOW
1 2 3 4 * 6 7

ERROR MESSAGES PROVIDED ARE:
NOT AT ALL HELPFUL — VERY HELPFUL
1 2 3 * 4 5 6 7

AIMS OUTPUT

ANALYSIS RESULTS ARE:
NOT AT ALL USEFUL — VERY USEFUL
1 2 3 4 5 * 7

ANALYSIS RESULTS ARE:
DIFFICULT TO UNDERSTAND — EASY TO UNDERSTAND
1 2 3 4 5 * 6 7

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

COMMENTS (RE: SPECIFIC RESULTS SCREENS):

____

____

____

AIMS

ACCEPTANCE OF AIMS
[Sabine Atwell]

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

STRONGLY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	STRONGLY DISAGREE
(X)	( )	( )	( )

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

STRONGLY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	STRONGLY DISAGREE
( )	( )	( )	(X)

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

STRONGLY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	STRONGLY DISAGREE
( )	( )	(X)	( )

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

STRONGLY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	STRONGLY DISAGREE
(X)	( )	( )	( )

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
( )	( )	( )	(X)

6. I WOULD FEEL COMFORTABLE WORKING WITH AIMS.

STRONGLY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	STRONGLY DISAGREE
(X)	( )	( )	( )

ACCEPTANCE OF AIMS
[Al Scott]

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

STRONGLY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	STRONGLY DISAGREE
(X)	( )	( )	( )

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

STRONGLY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	STRONGLY DISAGREE
( )	(X)	( )	( )

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

STRONGLY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	STRONGLY DISAGREE
( )	( )	(X)	( )

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

STRONGLY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	STRONGLY DISAGREE
( )	(X)	( )	( )

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STRONGLY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	STRONGLY DISAGREE
( )	(X)	( )	( )

6. I WOULD FEEL COMFORTABLE WORKING WITH AIMS.

STRONGLY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	STRONGLY DISAGREE
(X)	( )	( )	( )

AIMS

PLEASE ANSWER THE FOLLOWING AS FULLY AS POSSIBLE.

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

Flexibility. Adaptability to DLIFLC's specific concerns.

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

Need specific cost figures. Non-specific in some aspects to DLIFLC.

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

Factor in other areas such as cost, MOS, Officers vs. Enlisted, age, etc. Type decision making tools . Create a data base with DLIFLC folks from all the schools, ED Tech and faculty and staff and curriculum.

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

___ LESS THAN 1 HR ___ 1-2HRS _X_ 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 _X__UNABLE TO ANSWER

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

____EXTREMELY DIFFERENT ____VERY DIFFERENT

____MODERATELY DIFFERENT ____ONLY SLIGHTLY DIFFERENT

PLEASE EXPLAIN: ____________________

____

____

COMFORT WITH COMPUTERS

[Sabine Atwell]

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

STRONGLY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	STRONGLY DISAGREE
( )	( )	( )	(X)

2. I LIKE TO WORK WITH COMPUTERS.

STRONGLY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	STRONGLY DISAGREE
(X)	( )	( )	( )

3. I USE COMPUTERS MANY WAYS IN MY WORK.

STRONGLY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	STRONGLY DISAGREE
(X)	( )	( )	( )

4. WORKING WITH A COMPUTER MAKES ME VERY NERVOUS.

STRONGLY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	STRONGLY DISAGREE
( )	( )	( )	(X)

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

STRONGLY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	STRONGLY DISAGREE
(X)	( )	( )	( )

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

STRONGLY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	STRONGLY DISAGREE
(X)	( )	( )	( )

<u>COMFORT WITH COMPUTERS</u>

[Al Scott]

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

STRONGLY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	STRONGLY DISAGREE
( )	( )	( )	(X)

2. I LIKE TO WORK WITH COMPUTERS.

STRONGLY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	STRONGLY DISAGREE
(X)	( )	( )	( )

3. I USE COMPUTERS MANY WAYS IN MY WORK.

STRONGLY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	STRONGLY DISAGREE
(X)	( )	( )	( )

4. WORKING WITH A COMPUTER MAKES ME VERY NERVOUS.

STRONGLY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	STRONGLY DISAGREE
( )	( )	(X)	( )

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

STRONGLY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	STRONGLY DISAGREE
(X)	( )	( )	( )

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

STRONGLY AGREE	SLIGHTLY AGREE	SLIGHTLY DISAGREE	STRONGLY DISAGREE
( )	(X)	( )	( )

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ANALYTIC STUDY

April 13, 1990
Prepared under Contract Number 61339-89-C-0029
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Naval Training Systems Center

Institute for Simulation and Training
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University of Central Florida
Division of Sponsored Research

IST-TR-90-09

ANALYTIC STUDY: A COMPARISON OF ASTAR AND OTHER DEVICE EFFECTIVENESS TECHNIQUES (DET)

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April 3, 1990

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FOREWORD

This analytic report was prepared by the Institute for Simulation and Training under contract number N61339-89-C-0029 for the Naval Training Systems Center

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ABSTRACT

An analytic study was conducted to evaluate current automated cost and training effectiveness tools for assisting the training device design process. The analytic survey report was designed to illustrate various automated decision aids which assist training device designers in making tradeoff decisions between design alternatives. The purpose of this study was first, to assess the ability of each surveyed Device Effectiveness Technique (DET) to be used in conjunction with the Automated Simulator Test and Assessment Routine (ASTAR), and secondly to assess the optimal role and appropriate phases for application of the ASTAR technique within the Interservice Procedure for Instructional System Development (IPISD) model for training device procurement. It was determined that ASTAR could successfully work with the seven DETs surveyed. ASTAR was able to utilize information collected by other DETs in its analysis; used in a serial nature. ASTAR was also able to work in parallel as a method of cross checking outputs, and having its outputs checked, by the other DETs. Additionally, it was determined that the use of ASTAR can complement the current IPISD methodology; making the greatest contribution within the third phase (Development) of the IPISD process.

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1.0 INTRODUCTION

An analytic study was conducted to evaluate current automated cost and training effectiveness tools in development or limited use by the uniformed services and the DoD. The main purpose of this study was two-fold. First, to assess the ability of each surveyed Device Effectiveness Technique (DET) to be used in conjunction with the Automated Simulator Test and Assessment Routine (ASTAR). Second, to assess the optimal role and appropriate phases for application of ASTAR technique within the Interservice Procedures for Instructional System Development (IPISD) model for training device procurement. The IPISD model was selected for this effort because ASTAR was drafted under interservice funding. This augments a previous effort, conducted by Martin, Rose, and Wheaton (1988), which outlined each service's (Army, Air Force, and Navy) training device acquisition process in order to suggest points where ASTAR could be used to facilitate acquisition.

The analytic survey report was designed to illustrate various automated decision aids which assist training device designers in making tradeoff decisions between design alternatives. Background information is provided on each DET surveyed. The information describes the individual automated design aids in terms of their present state of development, capabilities, data base and resource requirements, and their ease of use.

1.1 Training Device Design

The training device design and simulation community has achieved the technological power to simulate operational equipment environments with impressive fidelity. Fidelity is the amount of physical and functional similarity exhibited by the training device in the replication of the actual equipment. Yet, any increase in fidelity may exponentially increase the cost of procuring the new training device. The design of new training systems, with high degrees of fidelity, can easily exceed the cost of the operational equipment they simulate.

The level of fidelity selected must be tempered by the amount of training effectiveness supported by the training device design. Transfer of training from the training device to the actual equipment is the standard measure of the effectiveness of the training device. Extensive research has been conducted, yet no design method has been established that guarantee good transfer of training. The assumption that only a training device which recreates all aspects of a system will result in good transfer is not necessarily true. A degradation in the training systems fidelity may have a small effect on transfer, yet significantly decrease cost (Hays & Singer, 1988).

Training device designers are faced with a large array of hardware options available to satisfy training requirements. The designers task is to make tradeoff decisions between technology and instructional features to improve training effectiveness at the lowest cost. Many tradeoff decisions are based primarily on the past experience of the designer. At times, identical design requirements can lead to vastly differing training devices. This discrepancy results from a general lack of knowledge as to which design features lead to the greatest amount of transfer of training.

1.2 The Need for Design Aids

Empirical transfer of training studies are recognized as the traditional method for assessing the effectiveness of training devices. Empirical approaches carefully observe the actual training device design and then directly determine the training effectiveness of the device, based on empirical experimentation. This usually involves a search for any measure or combination of measures that will predict the training effectiveness (Kantowitz & Roediger, 1984).

Unfortunately, empirical evaluation requires that the device under evaluation be sufficiently progressed in its development to permit operational testing. This typically means that an operational prototype must be fielded. Thus, empirical investigations to evaluate alternate device configurations occur too late in the acquisition cycle to be beneficial in assisting in the selection of design tradeoffs.

Present empirical methods do not satisfy the need for timely information when making accurate tradeoff decisions. As weapon systems become more sophisticated, the cost of training for system operation and maintenance will continue to increase. As a result, the MANPRINT initiative requires that manpower, personnel and training requirements of alternative weapon system design concepts be accurately estimated. The determination of a device's potential training effectiveness and associated costs need to be made early in the acquisition process to optimize the design of the total training system (Martin, Rose, & Wheaton, 1988).

1.3 Analytic Design Aids

Analytical approaches attempt to predict training effectiveness on the basis of a theoretical understanding or a model of the causes of training effectiveness. Researchers pursue the analytical approach because it offers understanding and flexibility in addition to predictive power (Kantowitz & Roediger, 1984). This approach assumes constants that can predict the effectiveness of a training device based on its inherent properties prior to the full-scale development of the device. Potential effectiveness can be predicted during early stages of device development and acquisition. Thus, analytical methods can satisfy the need for timely information when making accurate tradeoff decisions. Analytic methods for assessing device effectiveness are needed to guide training device effectiveness acquisition decisions.

2.0 APPROACH

Based on the need for analytic techniques, various automated decision aids have been developed in order to make the design and evaluation of training systems more systematic and effective. In the following sections seven DET, in current development or limited use by the services and the DoD, are summarized. The seven DETs were selected based on the following criteria: those in current DoD circulation; those employing computer based methods; those most recently developed; those which estimate device cost or training effectiveness; and finally those which had sufficient documentation to allow summary information to be obtained.

2.1 Procedure

A survey was conducted to identify existing Device Effectiveness Techniques (DETs). Based on the evaluation criteria, seven DETs were selected for further evaluation: ASTAR, Optimization of Simulation-Based Training Systems (OSBATS), Automated Instructional Media Selection (AIMS), Instructional System Development/Logistics Support Analysis Record Decision Support System (ISD/LSAR DSS), Training Resource Allocation Decision Support (TRADS), Computer Aided System for Developing Aircrew Training (CASDAT), and Automated Instructional Design System (AIDS). Background information was collected describing the individual automated design aids in terms of their present state of development, capabilities, data base and resource requirements, and their ease of use. This collected information was analyzed to assess the ability of each DET to be used in conjunction with ASTAR.

Next, the potential role and appropriate phases for application of the ASTAR technique within the IPISD model for training device procurement was evaluated. This was done through matching ASTAR capabilities with each Phase and Block of the IPISD methodology. A previous effort, conducted by Martin, Rose, and Wheaton (1988), outlined each service's (Army, Air Force, and Navy) training device acquisition process in order to suggest points where ASTAR could be used to facilitate acquisition. This survey effort continues that work by investigating points in the IPISD where ASTAR could be used to enhance the effectiveness of the training device design.

2.2 Study Materials

The detailed summaries for each DET surveyed in this study are presented below.

2.2.1 **ASTAR**. The Automated Simulator Test and Assessment Routine (ASTAR) was developed to address the need for a systematic, analytical evaluation procedure for application during the training device design and development process. ASTAR is a direct extension of an earlier procedure known as the Device Effectiveness Forecasting Technique (DEFT). It is based on a multidimensional view of training system effectiveness that looks at the global training effort. It considers the stated training and performance objectives and the capabilities and limitations of the trainee population. It then determines how well the entire training system will promote the acquisition of the skills and knowledge required for proficiency on both the training device and the operational hardware.

This perspective is in contrast to other training effectiveness models that focus exclusively on transfer of training as the sole criterion of effectiveness. ASTAR examines not only what is trained, but also how well the device-based system is designed to promote effective and efficient training and transfer. ASTAR converts subjective measures obtained from the analysts and uses generally accepted training principles to evaluate the effectiveness of any training method that involves practice on job tasks. ASTAR also helps the analyst evaluate a training approach by asking questions about the learning difficulty or 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.

Capabilities: ASTAR has been designed to forecast the training effectiveness of device-based training systems. It has the ability to evaluate alternative design concepts for a training device in the early stages of acquisition or to investigate which of several utilization patterns is most effective for an existing device. It can compare the effectiveness of two training devices that are designed to train the same tasks or evaluate the effectiveness of differing device configurations. New device-based training system designs can be compared with training on the actual equipment or against existing training systems.

Data and Resources Required: The program has three levels of evaluation. The amount of information required is dependent upon the level of analysis that will be conducted. Conversely, the amount of information available may determine the level of analysis possible. The selection of analysis level depends upon information available about the training device/method, the operational equipment/performance, the tasks to be trained, and the trainees themselves.

To conduct an ASTAR Level 1 analysis only general descriptions of the following are required:

Operational and training equipment (i.e., their physical and functional similarity, including displays and controls for each configuration.)

<u>Operational and training task objectives</u> (i.e., the tasks & subtasks, and performance criterion for each.)

<u>Trainee characteristics</u> (i.e., their skills & knowledge, educational background, job experience, any other previous training.)

<u>Trainer utilization</u> (i.e., the conditions & extent of practice, the role of the instructor, device's role in training system.)

To conduct an ASTAR Level 2 analysis more detailed descriptions of the above areas is required. Additionally, a list of the training and operational tasks must be entered into the data base structure. The types of skills and level of knowledge required to perform each task and a plan for device utilization must be established.

To conduct an ASTAR Level 3 analysis, all data required from the first two levels of analysis are needed in greater detail. Specific descriptions of the displays and controls in the training and parent equipment, where the displays and controls are located, and what their functions are must also be provided.

ASTAR was written to run on an IBM (or compatible) Personal Computer with either dual disk drives or a hard disk and one floppy drive. Resources required to provide information to the ASTAR data base is minimal. Data base information can be derived from existing task analyses and/or existing device specifications. The building of the data base can be accomplished by data entry personnel familiar with the entry procedures, leaving the analysis portion to highly trained Subject Matter Experts (SMEs).

<u>Ease of use and Operational Readiness</u>: A series of validation studies using ASTAR was conducted in the late 1980s (Pfieffer & Guynn, 1986; Pfieffer & Rankin, 1986; Pfieffer & Scott, 1985; Martin & Rose 1988; Rose & Martin, 1988). A series of operational studies were conducted during 1990 (Companion, et al, 1990). Based on the validation studies the intent was to finalize the implementation of ASTAR as a standard testing method in the DoD Instructional System Development (ISD) process. However, based on the operational studies it has been determined that ASTAR is not ready for implementation.

While showing promise in evaluating devices, the overall user acceptance of ASTAR is rather low. It is evident that ASTAR is considered quite worthwhile in concept but somewhat flawed in terms of user friendliness. Users feel that the concept of automated decision aids, to assist instructional developers in the evaluation and comparison of training device effectiveness, could become a valuable tool for the design of training systems. The ability to conduct ASTAR evaluations at three different levels of device development was felt to be of particular benefit. Proper application of ASTAR could result in considerable savings in time, cost and man hours during the analysis phases of training development. However, users would prefer not to use the program as it presently exists because of its unfriendly nature.

ASTAR is a relatively old program. It was developed before many of the recent advancements in the design and technology of both software and human/computer interfaces were implemented. ASTAR will require extensive enhancement 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 (e.g., graphics) and an on-line help feature for the summary data to make it easier for the analyst to interpret study results.

2.2.2 **AIMS**. The Automated Instructional Media Selection (AIMS) is a computer-based program developed to help training analysts select and design instructional media and training systems. The AIMS system provides a systematic media decision tool for the training device designer. It provides a source for the documenting of procedures and results. Furthermore, AIMS is a technique for modeling the training program because questions can be posed about the best method to train the identified learning objectives. AIMS requires definitions and assumptions to be formulated in a committee mode, facilitating dialogue among design experts. Assumptions and definitions can be changed in the model to ask new questions based on different design parameters.

Capabilities: Other media selection techniques have tended toward "canned" definitions of media and methods. That is, a preset and predefined list of media is used in the model. The media pools from which the "canned" models make their selections are rigid and confined. They are designed to be adaptable to meet the needs of a variety of training programs and cannot be updated to reflect new training tasks, equipment, or changing media technologies. AIMS was designed to overcome such weaknesses. The user of the system can develop a unique media model specifically tailored to the training program. The new model is input into the computer without the assistance of computer specialists or programming personnel (AIMS users manual).

Preliminary reports indicate that AIMS is useful and can save up to seventy five percent of the time required for media selection (Blaiwes, in press).

Data and Resources Required: The user must provide four basic data items prior to analysis: a list of media (media pool), a list of attributes required by the training program, relative weights for each media for how well it teaches each attribute, and a series of training objectives. The training analysts themselves select the media items, which might satisfy the training needs, for data input. No additional data items are specifically required, except an intimate understanding of the present training problem. Thus, the data base utilized is dependent upon the unique training requirements of the program, level of user confidence, and knowledge of the proposed training program's needs and constraints.

AIMS was written to run on an IBM (or compatible) Personal Computer with either dual disk drives, or a hard disk and one floppy drive. The data and resources required for the model's operation are minimal. AIMS is configured as a single user system; multiple analysts combine ratings for consensus of training objectives. Operation time, from creation of the data base to receipt of model recommendations, is less than one full working day.

Ease of Use and Operational Readiness: The operation of AIMS is controlled by a simple menu structure. A system of built-in questions and instructions appear on most screens displays throughout the selection process. The AIMS system allows the user to develop project-specific media models that can be edited or revised without the need for a programmer. The user can update media models and collect selection data with minimum effort. In addition, AIMS allows the user to input the critical attributes required by a learning objective into a specific media model. In return, the user will receive an output consisting of the rank order of media and methods which match the requirements. According to Blaiwes, 1989:

> "The clarity of the AIMS approach expanded new boundaries for media selection, especially for the design of simulation-based trainers. The potential for improved training system design should grow as the AIMS technology continues."

The AIMS model is considered to be operationally sound and is presently in distribution to interested parties. There exist two different distribution versions, one for NTSC and the second from Instructional Science and Development, Inc. The ISD version contained bugs which made it unacceptable for use in this study. The NTSC version, obtained for the conduct of the study, also contained bugs and required substantial reworking to make it usable. These corrections have been made to the revised NTSC distribution model presently in circulation.

2.2.3 **OSBATS**. The Optimization of Simulation-Based Training Systems (OSBATS), presently in prototype development, is designed to facilitate the investigation of tradeoffs involved in developing cost effective training device concepts. The model is based on benefit and cost approximations that are used to analyze tradeoffs between various training device features when developing a device configuration. It conducts similar tradeoffs between different configurations of the same training device.

The model evaluates different training strategies (part-task training, full-mission simulator, or use of the actual equipment for training) of alternative training-device designs. Five modules are sequentially used within OSBATS to make recommendations regarding the definition of task clusters, the design of training devices, and the allocation of training resources among selected training devices. The modules are used in a top-down sequence until an optimal solution is reached. The modules address the following activities:

a. clusters tasks for developing device configurations
b. identifies optimal instructional features for task clusters
c. specifies optimal fidelity levels for task clusters
d. selects the minimum training device family that meets training requirements
e. allocates training resources

The final output of the OSBATS model is a functional description of a new training device and the optimal set of efficient training devices for a training program given the tasks, training criteria, and cost constraints.

Capabilities: OSBATS determines the training device and training system configurations that meet training requirements at minimum cost. Training requirements are related to the specific level of student performance expected after training. OSBATS examines only those tasks that can be trained by a training device or simulator. OSBATS is designed to perform three tasks:

1. identify tasks that are good candidates for training on a training device
2. design training devices with a level of sophistication and cost tailored to the training requirements
3. allocate training resources among training devices and actual equipment to minimize cost

The outputs of the system include cost and benefit values for the levels of fidelity and instructional features selected. It is capable of designing the entire training program, informing the user of which training device to acquire, and how many are needed given the training approach determined.

Data and Resources Required: OSBATS is a data intensive approach for training device standardization. It requires specific information on domain parameters (resident data), and assumes that design trade-off decisions are different between training domains. The model derives cost estimates based on the design's fidelity configuration and historical cost data. The model structures design trade-off decisions based on situation specific task (non-resident) data.

No method has been developed to help a user collect data in a new domain area. Thus, methods and procedures have to be developed iteratively. Before application of OSBATS in a new domain, relevant data has to be collected on the following data items: task data, student data, device data, instructional feature data, main device data, fidelity dimension data, device instructional feature link data, and device fidelity dimension link data.

OSBATS requires an IBM PC/AT, Zenith 248 or compatible, with 640K of memory, and a ten megabyte hard disk. In addition an Enhanced Graphics Adapter (EGA) and monitor, a 80287 numeric co-processor, and a Microsoft mouse with mouse driver installed are required. The data required by OSBATS is available only through extensive investment of resources and time. Research must first be conducted which specifies relationships between tasks taught on the training device and the fidelity required to train these tasks effectively. Presently, data must be obtained through interviews with Subject Matter Experts (SMEs), historical contract information, and direct observation.

Ease of use and Operational Readiness: OSBATS is a complex model which requires users to be highly competent in their domain area and in interactions with computers. The effective use of the model relies on users' creative synthesis of the presented information. However, the support documentation provided does not outline the number of choices available within each module and where final decision points are located (Ragusa, Barron, & Gibbons, 1989). This lack of available support documentation makes learning to use OSBATS a very difficult procedure.

Additionally, system conventions adopted within the program changed periodically, causing user confidence to suffer. Important content information is often hidden in crowded screen formats. OSBATS conclusions and outputs have been found difficult to interpret (Ragusa, et al. 1989).

OSBATS is still in prototype development and has not been fully validated. Presently, the model is used to handle only training device designs in the rotary wing domain. The validation of the internal concepts and dependencies assumed by the model have not been completed. It is presently one of the most complex computer-based methods available to assist training device designers in their trade-off decisions.

2.2.4 **ISD/LSAR DSS**. The intent of the Joint Service Instructional System Development/Logistics Support Analysis Record (ISD/LSAR) Decision Support System (DSS) is to provide an automated Joint Service ISD process and an automated LSAR-to-ISD data interface. It was designed to eliminate labor-intensive data handling tasks to allow effective focus on the analysis of training systems requirements. Furthermore, the Joint Service ISD/LSAR DSS's design will overcome inefficiencies by automating many of the analysis and data handling steps and automating the interface between ISD and LSAR data.

The Logistics Support Analysis Record (LSAR) data base is governed by Military Standard 1388-2A and is required for all weapon system acquisition programs. Logistic Support Analysis (LSA) is an iterative process that regularly updates the system's design and supportability information through all acquisition phases. Neither the LSA process nor the LSAR data base is tailored to provide information directly to the ISD process. The ISD/LSAR DSS is intended to fill this gap.

Capabilities: The LSAR interface should improve the quality of information exchanges between ISD analysts and the weapon system design engineers and result in a wider range of training issues being addressed in a more complete fashion. In addition, it should provide decision support to the training system designer. Specifically, it should permit more efficient analyses of alternative training approaches.

The ISD/LSAR DSS is expected to demonstrate sizeable quantitative and qualitative improvements over current procedures for conducting, managing, and effectively using the products of ISD analyses.

Data and Resources Required: The Joint Service ISD/LSAR DDS will consist of LSAR data inputs, ISD analysis, and training, analysis and design procedures (ISD phases I & II and portions of III). The ISD/LSAR DSS should be modifiable to reflect and accommodate service-specific procedures. Merging LSAR and ISD baseline procedures with current Joint Service requirements has been accomplished by reviewing service ISD guidelines and instructions. Close coordination with both training development authorities and ISD procedure users within each service will be essential to finalize the Joint Service ISD/LSAR DSS design.

The prototype of the ISD/LSAR DSS will function in a PC-based environment. Constraints are based on whether the system is used as a single stand alone unit or used as part of a PC network. As a stand alone system it requires an IBM PC, XT, AT, Convertible, PS/2, and 100% compatibles with 640K bytes of RAM and a minimum fixed disk memory availability of 65 megabytes. An IBM graphics set printer with 80 to 256 columns is required. A color monitor is recommended. If the system is to be used in a PC network the CPU requirements increase to an IBM PC-AT (80286 or 80386 microprocessor), convertible, PS/2, or 100% compatible. The remainder of the requirements and recommendations do not change.

Ease of Use and Operational Readiness: A working prototype of the ISD/LSAR DSS is presently in development. The hardware, software, and the exact method of LSAR data element extraction to be used for ISD analysis activities have not yet been determined.

The proposed Joint Service ISD/LSAR DSS automated analysis and data manipulation steps will be organized and sequenced according to approved ISD guidance documents and supported by state-of-the-art data base management techniques. The ISD analyst will be supported through an effective user interface. The user interface will include: decision support logic, training analysis models, and meaningful presentations of LSAR and other analysis-related data. It will also be structured to facilitate modifying the system as ISD or LSAR procedures change, or as new or improved training analysis models become available. A comprehensive audit trail will record ISD analysis decisions for subsequent review and modification.

2.2.5 **TRADS**. The Training Resource Allocation Decision Support (TRADS) system is a model for estimating cost. TRADS is one component of the training planning process undertaken on an ongoing basis for the introduction of new training programs at NTSC. The intent of TRADS is to facilitate the creation and analysis of alternative training scenarios. It considers the resources associated with training alternatives. The cost of using an instructional delivery system is equal to the total value of all resources consumed in the training program and supported by the instructional delivery system. The resources include: the costs of equipment; the curriculum materials; the personnel; the supplies consumed; the facilities supporting the use of the system; and the wages and other costs of the student who learns from the system.

The system will permit users to create alternatives utilizing resource mixes in a matter of days (or hours), instead of weeks as is currently the case. It will also permit a more encompassing analysis of various resource alternatives, allowing the user to select those alternatives which are most cost effective. This will provide the best utilization of resources given the desired student throughput.

Capabilities: TRADS calculates the utilization of selected resources and highlights inefficiencies. Through a data base interface it displays cost estimates of alternatives in appropriate budget submission formats. TRADS assists the user in scheduling multiple starts of the same course by highlighting resource conflicts during overlapping periods. TRADS can accommodate inputs of either coarse or fine grain estimates of resource requirements. It can serve various levels of the training community. Moreover, it can calculate full cost, incremental cost, and economic cost of selected resource mixes. TRADS stores alternative analysis results for subsequent retrieval and modification. It also models new course alternatives based upon previous alternative analyses and is capable of supporting turn-key training system analysis.

Although TRADS exhibits great capabilities it also has limitations. It is not an "expert system" solution, it requires a training system specialist as the system user. TRADS does not enter the training system design cycle until the media selection stage and does not contain information on the availability of resources. It cannot accommodate simultaneous scheduling of courses with different resource requirements. Additionally, it requires data base updates at established intervals.

Data and Resources Required: Within TRADS there are two main data base components: the Resource Data base (RDB) and the Course Alternative Data base (CAD). The RDB contains raw data and parameters that permit generation of costs as required. The information contained in the RDB is used to facilitate alternative input and cost computations. The CAD contains specific information about individual course alternatives under development or analysis. This is the data base created by the system as a result of user inputs; it is the basis for alternative analysis

The TRADS system basic hardware configuration for NAVTRASYSCEN is a network with one server and one or more work stations. The server is required to be a 25 MHz 80386 CPU with a 327 MByte hard disk and 4 MByte of Memory. The hardware requirements for each work station are also detailed and extensive: 20 MHz 80386 CPU, 40 MByte hard disk, and 2 MByte of memory.

Ease of Use and Operational Readiness: The TRADS system is being developed by Synetics Corporation, Wakefield, MA, under contract number N61339-88-C-0072 awarded by the Naval Training System Center (NTSC), Orlando, FL. Full delivery of the TRADS system is scheduled for August, 1990. An evaluation report should be available before early 1991.

The advantages to be gained from TRADS will include greater speed, improved accuracy, improved economic validity, and the capacity for process audits. In addition, it will have an alternative storage and archive capability with a range of recall, modification, and reporting options. There will be a set of analyses tools and help facilities which, when combined with the resource-to-cost conversion data base resident within the TRADS system, should allow a degree of analyses flexibility not currently possible with commercial spreadsheet and data base software. Most of the system functionality has been checked for consistency with generally accepted economic analysis and financial management (Morris, 1990).

2.2.6 **CASDAT**. The Computer Aided System for Developing Aircrew Training (CASDAT) evolved from an effort by NAVTRAEQUIPCEN to reduce the costs of ISD. CASDAT was designed to aid in the design of new training systems, as well as to improve the training system modification process. It manages the ISD process by providing cues, instruction, menus, etc., which lead analysts through the ISD procedures. CASDAT provides a generic data base structure for the ISD process. This data base contains a standardized form of aircrew task and objective data which was derived from previous ISD efforts on fourteen military aircraft. The generic data base structure in CASDAT applies across all types of aircraft, mission and flight crew positions. It provides a substantial portion of the information needed in the development of task lists or objective hierarchies.

Capabilities: CASDAT was developed as a prototype to demonstrate the feasibility of enhancing the cost-effectiveness of ISD by automating portions of the process. Later plans were to further develop the system into an operational tool for developing aircrew training. Its current configuration provides automated support for completing five ISD steps: task list development; objectives hierarchy; media selection; syllabus design; and lesson specification development. It can be used to design training for seven aircrew mission phases (pre-mission planning, pre-flight, take-off/departure, navigation, approach/landing, post-mission debrief, and special procedures) and three crew positions (pilot, copilot and radar intercept officer). (Marcue, Blaiwes, & Bird, 1982).

Data and Resources Required: CASDAT generates a data base by asking questions of a user. The data base is modified by CASDAT and the user during each stage of the ISD process until the final syllabus and lesson specifications are produced. CASDAT generates lists which delineate the tasks to be trained and the objectives for the training. It selects training media and develops a prototype syllabus for training. It is capable of summarizing information needed by the developer to write training lessons. The aircraft-specific task list is generated through interaction of the following:

a. The generic task list model represented by generic task statements.
b. A menu of aircraft characteristics, such as aircraft mission, weapons loading and avionics.
c. A set of questions which allows the user to select from the menu of aircraft characteristics.
d. A data base creation and management structure used to create the aircraft-specific data base. This allows data from above to interact and create the task list.

Once the aircraft-specific task list is generated, a printout is produced for the user. The user can revise the task list in any of the following ways: assign tasks to aircrew members; add new tasks; replace existing tasks; or delete tasks. Once the user finishes validating and modifying the task list, a final printout is produced for the user. In addition, CASDAT produces a draft objectives hierarchy printout.

The CASDAT program is designed to run on the NAVTRAEQUIPCEN N-712 PDP 11/34 system under RSx11-M V3.2. The programming language is FORTRAN. The increased speed of ISD operations via

CASDAT leads directly to a decrease in man-hour requirements and consequently to dollar savings. Increased speed will enable ISD procedures to be applied to more training problems. Its speed and simplicity could allow many ISD tasks to be performed by relatively low-skilled personnel.

Ease of Use and Operational Readiness: Cursory evaluation of the CASDAT system showed that it has face, content, and construct validity. SMEs were able to create task listings and objective hierarchies for the aircraft in significantly less time than typical ISD methods (Marcue, Blaiwes, & Bird, 1982).

One of the major concerns in developing the prototype CASDAT was to facilitate user interaction with the system, particularly SMEs with little or no ISD experience. Thus, tutorial information is provided at critical points. A one key stoke method of accessing on-line help is available. Complementing documentation provides a step-by-step walk through of each feature within CASDAT. These provide hard copies of what each ISD output would look like once printed. The capability of performing key word search was also included to help simplify the users task.

In 1982 a recommendation for a full-scale field trial of CASDAT was stated (Marcue, Blaiwes, & Bird, 1982). This trial was to be accomplished by using CASDAT to design an aircrew training program for a military aircraft. Future research and development on CASDAT were planed to address the utility of the system to the operational community. As of today the CASDAT program has had no further progress; it still is in an unvalidated prototype stage of development, with no further development planned.

2.2.7 **AIDS**. The Automated Instructional Design System (AIDS) was developed in the late 1970s and early 1980s (Kribs, 1989; Simpson & Kribs, 1980). This system, implemented on a microcomputer, provides for rapid filing, sorting, editing, numbering, categorizing, hierarchy, and printing of task statements and learning objectives. AIDS is presently being updated into the C programming environment to take advantage of modern tools. The resulting DET will be relabeled ISD Tools.

AIDS has three format options. The first provides spaces for indicating the task criticality level, difficulty level, and frequency of performance as well as who performs each task. The second format is just for maintenance tasks. It allows a task statement to be referenced to six basic maintenance functions: inspection, troubleshooting, repair, remove and replace, servicing, and adjustment. Each of these functions is assessed with respect to criticality, difficulty, frequency, and who performs the function. The third format is for use with answer sheets. It provides seven columns in which respondents can place coded answers with alphanumeric characters.

Included in the AIDS model is the AIMS DET. AIDS utilizes the AIMS media selection capabilities by inserting AIMS results into the AIDS analysis process.

Capabilities: ISD Tools basic capabilities described below are based on the 1984 AIDS manual (Instructional Science and Development, 1984). The system supports seven activities:

a. Development of task statements
b. Development and processing of survey questionnaires
c. Development of learning objectives
d. Development of a training syllabus
e. Developing lessons materials
f. Producing evaluation forms
g. Media Selection, provided by AIMS

AIDS is a computerized system designed to reduce the labor-intensive costs of the job analysis and training system development process. It increases the analyst's efficiency and effectiveness. It reduces lead time to project completion. It improves the common understanding of both task statements and learning objectives. The system is designed to be adaptable to a variety of job (training) applications. AIDS brings computer technology to support personnel and training functions. The AIDS programs focus on the procedures for performing job task analysis and training system design. Job task analysis serves as the basis for building the complete training system. It also provides the basis for personnel planning, selection, and evaluation (Instructional Science and Development, 1984).

Data and Resources Required: Job task analysis with AIDS uses a flexible taxonomy system as the central data base from which to work. AIDS builds a complete data base of behavioral statements (verb, verb-objects), conditions, standards, cues, and other information which may be desired for job task analysis and training system design and development. The data can be modified easily as information changes and is printed out in a variety of formats for job surveys, task learning analysis, curriculum design and development, and personnel and training evaluation (Instructional Science and Development, 1984).

The original AIMS version was hosted on a Radio Shack TRS-80 system. It was designed to generate task statements and provide a means for editing tasks, counting task types, and producing hard copy task lists. A subsequent version was written in CBASIC-80 and hosted on a multi-user CPM-80 system. This version included media selection and syllabus design modules in addition to its ability to develop task inventories. With the introduction of the IBM PC, the system was ported to CBASIC-86 and hosted on MS-DOS compatible machines.

Ease of Use and Operational Readiness: AIDS modules are designed specifically for use by personnel and training analysts. The user interactions are menu-driven and oriented to the analyst's job. The analyst follows a guided and natural flow of data collection, analysis, decision making, and information dissemination and documentation.

To create a task statement, the analyst iteratively specifies to the system (via keyboard entry) an identifier for the task source, a number reflecting whether the statement is new or a revision, an identification number for the statement, the number of the verb from the verb list, the number of the verb object (from the verb object list), and any additional material to be appended to the verb-object. Then, the system shows the analyst the task statement. The analyst enters either "Y" to signify the statement is satisfactory or "N" if it is not. In the later case, the task creation procedure is repeated.

AIDS is very comprehensive, and cumbersome at the same time, in terms of the extensive interactions that have to occur to bring data in and out of the system, move around in the different data base files, and see the results of inputs. However, this is probably in part due to the language in which it was originally written (i.e., Basic). Given the plans for the updated version of AIDS (ISD Tools) to use Windows and mouse technology, the latest version should be easier to use. If so, this may be a very powerful and useful tool for the training analyst.

3.0 RESULTS

3.1 ASTAR Integration With Other DETs

Each of the Device Effectiveness Techniques (DET's) discussed above were designed for the purpose of aiding the training device designer in determining optimum training device configurations. However each DET uses differing methods and points of orientation. Some are designed to assist in media selection, cost estimation, data interfaces, while others are designed for device effectiveness evaluation. The outputs of the DETs, though different in format and content, should specify somewhat identical recommendations. This is true if the premise "one set of training objectives produces one optimal device design" is to be believed.

The goal of DETs is to relieve the designer from tedious tasks and allow him to focus his time on the important issues of determining the design specification. Since the DETs typically lessen the designer's workload, more analysis time becomes available. By using this time savings to perform multiple analyses, a more effective training device design will be the outcome. Employing a multi-directional approach, using more than one DET, allows the designer to become confident that the selected training device is the most effective obtainable, given alternate design approaches.

In the following section each of the computerized DETs previously defined will have an integration methodology with ASTAR. The possible ways in which the two DETs, used together, could support design decisions will be outlined. This has been done to illustrate the power of employing multiple analysis techniques.

3.1.1 **ASTAR/AIMS**. The first DET discussed that will have an integration methodology with ASTAR will be AIMS. This combination of devices could be used sequentially. ASTAR Level 1 would be initiated first to establish and test general training concepts. AIMS could then be employed to help select appropriate media categories for the established training device concept. ASTAR Level 2 would then refine the selected set of media based on task specific information. In essence, AIMS would produce a list of acceptable media candidates, based on the ASTAR established training concepts. This would be followed by an ASTAR analysis, evaluating the training effectiveness of each media choice, given the training objectives selected.

3.1.2 **ASTAR/OSBATS**. The next combination discussed is an ASTAR and OSBATS integration. This methodology would have each DET providing context information and data base items to the other. ASTAR's Level 1 analysis, which helps establish initial design concepts, could be used to orient the OSBATS analysis, i.e., giving the OSBATS evaluator a starting point or a basic set of design objectives. Once OSBATS begins its analysis the first procedure is to cluster the training tasks by simulator type, full mission, part mission or training on the actual equipment. ASTAR Levels 2 and 3 could use this task specific clustering directly in its analysis as the training task and operational task data bases. It is also possible that after a completed ASTAR evaluation yields an effective training solution, OSBATS could be used to obtain device cost estimates and recommendations for integrating the new training device into the existing training structure. The depth of OSBATS and the flexibility of ASTAR make this combination uniquely powerful.

3.1.3 **ASTAR/ISD LSAR DSS**. The ASTAR-ISD/LSAR DSS combination presents an interesting integration methodology. Since the proposed ISD/LSAR DSS is essentially a data link methodology, any proposed utilization pattern would have the ISD/LSAR DSS provide all the relevant data input information required for the ASTAR analysis. Task lists, trainee skill level, device utilization patterns and other content information, training objectives, device descriptions, and trainee performance standards required by ASTAR may easily be provided by the ISD/LSAR DSS. These combinations would utilize ISD/LSAR DSS as the data support mechanism for conducting all three levels of ASTAR analysis.

The Interservice Procedure for Instructional System Development (IPISD) does not presently include DETs. Since ASTAR data base requirements can be satisfied by ISD/LSAR DSS the use of ASTAR, considered a DET, could introduce device effectiveness techniques into the IPISD process.

3.1.4 **ASTAR/TRADS**. The ASTAR-TRADS combination also presents a workable integration methodology. They would be used sequentially to first establish device designs and then have an economic analysis conducted. ASTAR is essentially a design aid to help select the most efficient and effective training device. TRADS is a form of economic analysis. The two can easily support each other. Designs which are developed using ASTAR could have their non-dollar denominated resources evaluated by TRADS, prior to implementation of a full scale procurement. Cost estimates could then be obtained for the new training device design.

3.1.5 **ASTAR/CASDAT**. The ASTAR-CASDAT combination illustrates yet another effective use of multiple techniques. This would have one (CASDAT) provide the data inputs for the other (ASTAR). CASDAT is able to provide automated support for developing task lists, establishing objective hierarchies, and media selection. Each of these tasks can be used to help ASTAR develop its training approach. The developed task list could be inserted manual as part of ASTAR Levels 2 and 3 data bases. The establishing of training objectives (objective hierarchies) could provide baseline information for ASTAR Level 1 tradeoff analysis. Additionally CASDATs' ability to aid in media selection could be used as a cross validating method for any designs suggested by ASTAR. Alternately the media selected by CASDAT could have its training effectiveness evaluated by ASTAR.

3.1.6 **ASTAR/AIDS**. Each of the integration techniques described above were sequential in nature; that is, use of one technique can provide information to guide the analysis of the second technique. The final output of one system could be expanded by being incorporated into the analysis of the second system. The ASTAR and AIDS integration method is more parallel in operation. Initially the AIDS DET could develop the task statements required by deeper ASTAR levels of analysis. But this is where the sequential support ends. AIDS improves the understanding and clarifies the analysts perception of the learning objectives that need to be satisfied by the new training device. While evaluations of alternate configurations and differing training approaches are being conducted with ASTAR the designer could be concurrently running the AIDS system to help increase the understanding of the established learning objectives. Improvement of the analysts understanding of learning objectives is one of the major capabilities associated with the use of AIDS.

3.2 ASTAR INTEGRATION WITH THE IPISD MODEL

A report conducted by Martin, Rose, and Wheaton in 1988 outlined the training device acquisition process of the Armed Services to suggest ways in which ASTAR could be used in these processes to facilitate the acquisition of effective devices. They suggested points in each services training device acquisition process (Army, Navy, and Air Force) where ASTAR could be utilized. In an effort to continue the analysis of how ASTAR could be used to improve the effectiveness of the device acquisition cycle this report will illustrate the usefulness of combining the ASTAR evaluation technique with the Interservice Procedure for Instructional Systems Development (IPISD). The measure of ASTARs usefulness must come from successful integration into the procurement cycle. Since IPISD is the approved technique and procedure to be followed in the development and conduct of effectiveness training it is within this framework that ASTAR must exhibit its worth.

The following sections will describe the IPISD and review the merits of the ASTAR analysis technique. Included is an analysis of how and where ASTAR could be integrated into the IPISD process will be presented.

3.2.1 **IPISD**. Interservice Procedure for Instructional System Development (IPISD) is the systems engineering approach to training. IPISD consists of a structured series of analytical steps that break down a weapon system's operational, maintenance, and support requirements into specific tasks, activities, skills, and knowledge. IPISD considers the relative need and appropriate method to train each task, task element, skill, and knowledge to a target student population. Using an iterative building block approach IPISD determines the training system design requirements for the weapon system.

The ISD design is the description of approved techniques and procedures to be followed in the development and conduct of effectiveness training. These approved techniques are derived from baseline procedures documented by the Interservice Training and Review Organization (ITRO). Therefore, the ITRO doctrine is currently the approved Interservice Procedure for ISD (although service-specific applications are implemented). The IPISD process is divided into five phases, each containing a number of process steps (Dynamics Research Corp., 1988):

Phase I - Analyze

Block I.1:	Analyze Job
Block I.2:	Select Tasks/Functions
Block I.3:	Construct Job Performance Measures
Block I.4:	Analyze Existing Courses
Block I.5:	Select Instructional Setting

Phase II - Design
- Block II.1: Develop Objectives
- Block II.2: Develop Tests
- Block II.3: Describe Entry Behavior
- Block II.4: Determine Sequence and Structured

Phase III - Develop
- Block III.1: Specify Learning Events/Activities
- Block III.2: Specify Instruction Management Plan and Delivery System
- Block III.3: Review/Select Existing Materials
- Block III.4: Develop Instruction
- Block III.5: Validate Instruction

Phase IV - Implement
- Block IV.1: Implement Instruction Management Plan
- Block IV.2: Conduct Instruction

Phase V - Control
- Block V.1: Conduct Internal Evaluation
- Block V.2: Conduct External Evaluation
- Block V.3: Revise System

All information presented in following sections, concerning descriptions and definitions of the IPISD phases, were taken wholly or in part from the ITRO executive summary (TRADOC PAMPHLET 350-30, 1975).

Phase I, **ANALYZE**, presents procedures for defining what jobs are, breaking these down into statements of tasks, and using numerical techniques to combine the best judgement of experienced professionals to select tasks for training. Phase I also presents processes for construction of job performance measures and the sharing of occupational and training information within and among the services. It provides a rationale for deciding whether tasks should be trained in schools, on the job, or elsewhere, and also requires consideration of the interaction between training and career progression.

Phase II, **DESIGN**, deals specifically with the design aspects of the training program within selected settings. Design here is considered in the architectural sense in which the form and specifications for training are laid down in careful detail. Phase II reviews the considerations relating to entry behavior of two separate kinds: general ability, and prior experience. A rationale is presented for establishing requirements based on the realistic evaluation of both of these factors.

Phase III, **DEVELOPMENT**, refers to the actual preparation of instruction. Determinations are made about how the students shall be managed, the kinds of learning experiences they will have, the activities in which they will engage, and the form and content of the instructional delivery system. Techniques are presented for the careful review and adaptation of existing materials. Procedures for the systematic design of instruction which can be delivered in a variety of media are also included. Phase III terminates with a carefully developed procedure for testing and evaluating instruction to insure performance meets expectations.

Phase IV, **IMPLEMENTATION**, specifically treats the necessary steps to implement the instruction according to the plan developed in Phase III. Two important steps highlight Phase IV, that of training the staff in the procedures and problems unique to the specific instruction and actually bringing the instruction on-line and operating it. The Phase IV effort continues as long as there is a need for the instruction.

Phase V, **CONTROL**, deals with procedures and techniques for maintaining instructional quality control standards and for providing data from internal and external sources upon which revisions decisions can be based. Data collection, evaluation of the data, and decision making about the implications of the data represents the three principal functions described in Phase V. Emphasis is placed on the importance of determining whether the trainees are learning what was intended, and upon determining whether what they have learned is of the expected benefit to the receiving command. A negative answer to either of these would suggest revisions in the content or procedures in order to make the instruction meet the need it is intended to serve.

Based on a large number of successful demonstrations, there is now evidence to support that competent use of the ISD approach can greatly improve training in at least three distinct ways (TRADOC Pamphlet 350-30, 1975):

1. Effectiveness. Through the design and development procedures, a careful selection of what is to be trained, the measurement and evaluation of training, and the revision of the training program until it meets its objectives should greatly increase training effectiveness.

2. Efficiency. Several military applications of ISD have indicated that effective instruction can be offered in a much more time-efficient way than has been true in the past. The application of ISD procedures to instruction in order to make it more time-efficient has paid off dramatically.

3. Costs. It is not reasonable to believe that the use of ISD procedures will always result in lower cost. It is unrealistic to expect lower costs per student on all existing completely effective courses. However, the ISD procedure does provide a systematic way of viewing costs of training and considering whether additional resources

are justified in view of the output.

3.2.2 **ASTAR**. ASTAR helps the analyst evaluate a training approach by asking questions about the learning difficulty or transfer of training to the job environment. It converts the judgements provided by the analyst about various facets of the training system into a forecast of the system's training effectiveness. The analyst responds to a series of questions and assigns the training device under evaluation a subjective rating with a value between zero and one hundred. This value represents the analyst's perception, on a percentage basis, of the effectiveness of the training device.

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 are combined to provide a summary score of Training Effectiveness. The ASTAR program has three levels of evaluation based upon the level of detail provided by the analyst.

3.2.3 **ASTAR/IPISD**. Information collected during most phases of the IPISD process can be used as qualitative inputs, directly or indirectly, for the ASTAR analysis. The methods used and outputs produced from the IPISD process adequately match the information requirements of ASTAR. Thus only those blocks within the IPISD phases which contribute directly to the information required by ASTAR are outlined below. Figure 1 presents a graphic view of the phases within the IPISD where ASTAR can be applied.

3.2.3.1 IPISD Phase I. ASTAR has the possibility to be utilized during Phase I of the IPISD process, Analyze. ASTAR appears to work effectively in four out of the five blocks of Phase I, Analyze: select task/functions, construct job performance measures, analyze existing courses, and select instructional setting.

The outputs of the IPISD procedure, Select Task/Functions (block I.2), is the first place where information can be shared with the ASTAR method. This step is the ISD procedure for selecting tasks for which training will be given. All tasks performed in the operational environment are examined and selected for training based on predetermined criteria. Thus, the edited list becomes the task list for which a training scheme must be developed. The edited task list could directly be used as the main data base inputs (task data) required for ASTAR Levels 2 and 3.

In the construction of performance measures (block I.3) clear statements of expected job performance standards are produced for each of the tasks selected for training. The performance measures necessary for determining job proficiency for each task are also selected. The determination of required performance level expected

Interservice Procedures for Instructional Systems Development (IPISD)
ISD Model Flow Chart

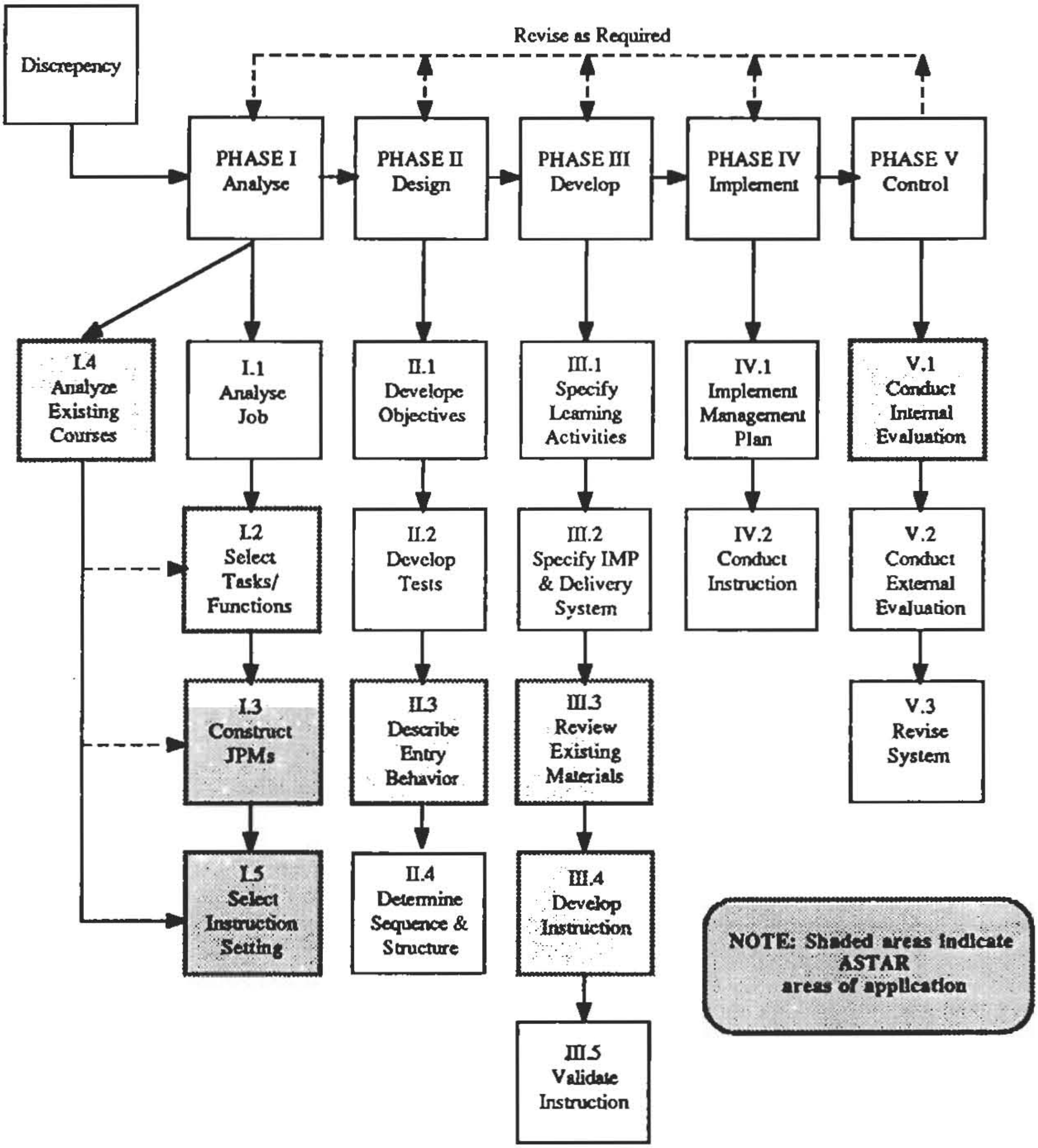

Figure 1: ASTAR IPISD Application Areas

from training becomes qualitative inputs for all ASTAR level analysis. Further, ASTAR requires judgements to be made on levels of anticipated performance in addition to the training attained by the new training method.

In block I.4, Analyze Existing Courses, a careful analysis of the courses existing within and among the services is conducted to determine if any existing courseware or training facilities can accommodate the training needed for the tasks outlined in block I.2. The first procedure is to locate the existing courseware followed by an effectiveness for training analysis to determine if the existing courseware is sufficient to provide training. The analysis portion can be either completed entirely by ASTAR or outputs of block I.4 could be cross validated by ASTAR. Block I.4 also requires the documenting of procedures and major decisions derived. ASTAR Level 2 analysis results can assist in the latter by providing the rationale on a task by task basis by which existing courses are excluded from consideration.

Block I.5, select instructional setting, assigns the training tasks to the instructional setting (or settings) in which they will be trained. The optimal setting is one that provides the most effective and efficient training. Each instructional setting can be evaluated on a general level by ASTAR Level 1. Each task, or subset of tasks, can have an instructional setting evaluation conducted by ASTAR Level 2. The selection of instructional setting begins the concept formulation of the training device design. ASTAR was developed to help select the most efficient training device design solution. Additionally, block I.5 requires documentation and rationale for the selection of instructional setting; ASTAR can support these functions.

3.2.3.2 IPISD Phase II Phase II of the IPISD process, Design, provides much of the qualitative data needed for rating in the three ASTAR analysis levels. Two of the four blocks within Phase II provide information to ASTAR: Develop Objectives and Describe Entry Behavior. It should be recognized that ASTAR outputs from Phase I contribute to the input requirement of Phase II, but provide no analysis assistance.

Block II.1 of Phase II is the development of objectives. The inputs required for block II.1 consist of the total outputs from Phase I. Since ASTAR has been determined helpful in four out of the five Phase I blocks, it can provide inputs for the development of objectives. Terminal learning objectives are analyzed to specify all the knowledge levels and skills necessary to learn the training objectives. These skills and knowledge information derived for each training task will serve as excellent qualitative data required for making rating judgements during subsequent ASTAR Level 2 and 3 tradeoff analysis.

Part of Phase II (block II.3) of IPISD describes the entry behavior of the trainee. Block II.3 assumptions made about trainee initial aptitudes and abilities are verified. All ASTAR level analyses require accurate information on trainee entry behavior to be encoded during the ratings portion of the analysis. In other words, ASTAR requires qualitative ratings of trainee entry and exit knowledge and skill levels to be estimated for each design alternative being investigated. These information items are not encoded into the data base, but rather are included as part of the input analysis. Thus, outputs of block II.3 can be used directly as inputs for all three levels of ASTAR analysis, i.e., IPISD outputs from block II.3 directly feed ASTAR data requirements.

3.2.3.3 IPISD Phase III Phase III, Develop, is the first place where ASTAR analysis techniques can almost completely be substituted for an IPISD Phase block. In the Review/Select Existing Materials (block III.3) a search is made to locate candidate instructional materials. Once the materials are collected an evaluation is made to determine if the existing materials are adequate for use, given the stated learning objectives and trainee characteristics, or if slight modification of the instructional material will be sufficient to satisfy training needs. ASTAR could conduct the evaluation of collected media alternatives for the purpose of selecting the ones which are most effective for training. Therefore, analysis conducted at ASTAR Level 1 could narrow the field of options. Subsequent task level analysis could be conducted at Levels 2 or 3, depending on the amount of information available on the selected media alternatives.

An alternate method for employing ASTAR analysis techniques within Phase III is possible. Rather than utilizing ASTAR as a substitute for the analysis portion, ASTAR could be used either in unison or as a method of cross-checking media selections made during customary IPISD procedures. Additionally, ASTAR outputs could be used as a method for documenting the rationale used in the exclusion and inclusion of media alternatives.

Block III.4 of Phase III develops the instruction to accomplish the specified learning objectives. This is one of the larger efforts conducted in the IPISD process. The outputs from block III.4 includes all the materials, procedures, plans, and media necessary to conduct instruction. Those materials which have been marked as needed to be developed are designed in block III.4. First drafts scripts are prepared to inform appropriate production specialist of design requirements for production. These scripts can either be general to allow flexibility, or highly specific including the steps to be followed.

ASTAR can be used for developing the scrips in block III.4 of the IPISD Phase III. Alternate generalized task level device configurations for these scripts can be examined in ASTAR Level 2.

Specific control and display configurations can be outlined in Level 3. ASTAR is not capable of developing these scripts directly. However, the type of ratings required in the advanced levels of analysis (Levels 2 and 3) requires highly detailed information about the developing media item to be known by the analyst. ASTAR's need for specific device design information will help structure the design process of the new media sources. Additionally, while the development process is taking place, alternate tradeoff solutions can be examined iteratively.

It is at this stage of training device design that ASTAR becomes useful. Within this development stage numerous uses for the ASTAR analysis technique present themselves. It is at this stage that design of new training materials takes place. A large number of alternatives need to be evaluated prior to empirical validation. Tradeoffs made at this point will help increase the effectiveness of the training device designed. It cannot be stressed enough that creative use of the ASTAR technique at this point will help designers make informed tradeoff selections.

3.2.3.4 IPISD Phase IV Phase IV of the IPISD process, Implement, consists of two blocks: Implement Instructional Management Plan and Conduct Instruction. Neither of these two blocks relate directly to known uses of the ASTAR technique. Data collected from conducting the instruction will be used in the next phase of the IPISD process; ASTAR may not have uses in Phase V, Control, of the IPISD process.

3.2.3.5 IPISD Phase V The block V.1 in the Phase V, Control, requires the conduct of an internal evaluation. This is an empirical evaluation method which is designed to be the basis upon which instructional accountability is based. The degree to which the IPISD course development has been accomplished is assessed. ASTAR has only a limited role in block V.1. ASTAR is essentially a analytic tool for assisting in device design and evaluation. It could be used by an independent evaluator only familiar with the end design. The results obtained by the independent evaluator could be compared with the designer's results (to determine if adequate correlation exists).

The remainder of the blocks in Phase V, eonduct External Evaluation, are empirical methods that are too far removed from ASTAR application principles to use ASTAR.

5.0 CONCLUSIONS

The three main objective of this study were: (1), to identify and select candidate DETs: ASTAR, AIMS, OSBATS, TRADS, AIDS, CASDAT, and ISD/LSAR DSS; (2), to assess the ability of each surveyed DET to be used in conjunction with ASTAR; and (3), to assess the optimal role and appropriate phases for application of the ASTAR technique within the IPISD model for training device procurement.

Discussions in this study outlined possible methods for integrating ASTAR analysis with other DETs for the purpose of decreasing analysis time and increasing the effectiveness of tradeoff decisions. In general, the goal of DETs is to relieve the designer from tedious tasks to allow him to focus his time on the important issues of determining the design specification. Since the DETs typically lessen the designer's workload, more analysis time becomes available. By using this time savings to perform multiple analyses a more effective training device design may be procured. The results of this portion of the analytic study revealed that strategies that require multiple DETs can be implemented.

The computerized DETs integration methodology, along with ASTAR, helped illustrate the power of employing multiple analysis techniques. Results indicated that the ASTAR technique could theoretically, based on system definitions provided by the DETs' design, be used in tandem with other DETs. The methodologies examined employed a full scale ASTAR design process, followed by extended analysis to include device cost estimates or training program information (i.e., ASTAR/OSBATS, ASTAR/TRADS). ASTAR may also work well when other DETs provide the necessary data for an ASTAR analysis (e.g., ASTAR/AIMS, ASTAR/ISD-LSAR DSS, ASTAR/CASDAT). Additionally, ASTAR may work well when used in parallel with other DETs (e.g., ASTAR/AIDS).

The final goal of this study was meant to illustrate the usefulness of combining the ASTAR evaluation technique with the IPISD process. Since ITRO doctrine is the accepted IPISD method for training device design and procurement it is within this framework that ASTAR must exhibit its worth. The measure of ASTAR's usefulness must come from successful integration into the procurement cycle.

ASTAR may be useful in three of five IPISD phases. Phase I of the IPISD process, Analyze, indicates ASTAR will work effectively in four out of the five blocks of the Analyze phase: Select Task/Functions, Construct Performance Measures, Analyze Existing Courses, and Select Instructional Settings. Phase II of the ISD process, Design, provides much of the qualitative data needed for rating in the three ASTAR analysis levels. Two of the four blocks within Phase II provide information to ASTAR: Develop Objectives, and Describe Entry Behavior. Phases I and V of the IPISD process, Implement and Control, do not relate directly to known uses of the ASTAR technique.

The IPISD does not presently include DETs. The ISD/LSAR DSS is being developed to fill this gap. However, the ISD/LSAR DSS does not provide estimates of training effectiveness. ASTAR was earlier shown to be compatible with the ISD/LSAR DSS data base (sec 3.1.3). Hence, ASTAR could be used to augment the ISD/LSAR DSS to provide a better overall decision support system for the IPISD.

The following summarizes some of the major areas within the IPISD process where ASTAR could be used to assist the training device designer and where IPISD outputs could be utilized as data inputs by ASTAR:

I. ASTAR uses within IPISD:
- a. examine training effectiveness of existing materials
- b. structure development of training objectives
- c. document procedures and major decisions derived
    - 1. document the rationale used in the exclusion and inclusion of the media alternatives.
    - 2. document the rationale on a task-by-task basis by which existing courses are excluded from consideration
- d. support development of device scripts
    - 1. develop task level device configurations for scripts
    - 2. develop specific control and display configurations
- e. iteratively examine alternative tradeoff solutions

II. Data input Provided by IPISD
- a. edited task lists
- b. performance level expected from training
- c. knowledge levels and skills necessary
- d. entry characteristics of the trainee.
- e. material, procedures, plans and media necessary to conduct instruction.

This analytic survey demonstrates the possibility of multiple DET integration and establishes areas within the IPISD model where one of these techniques (ASTAR) can make a contribution. It is through a competent understanding of employing the DET that effective training devices can be developed. Training device designers may want to combine different DETs into the IPISD process to develop successful training device designs. It is through the skillful and continued integration of various device effectiveness techniques, within the IPISD model, that the goal of procuring and developing effective training devices can be accomplished.

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LONGITUDINAL STUDY

USMC M60A1 Tank Trainer

Technical Interim Report
CDRL AOO9

February 22, 1990
Prepared under Contract Number 61339-89-C-0029
for
Naval Training Systems Center

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LONGITUDINAL STUDY:

M60A1 MAIN BATTLE TANK

Technical Interim Report

CDRL A009

Stephen Gibbons

Michael A. Companion

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ABSTRACT

A longitudinal study evaluating changes in user attitudes with increased familiarization time of ASTAR (Automated Simulator Test and Assessment Routine) was conducted with the assistance of a Project Director from NAVTRASYSCEN familiar with training analysis and design, and a contractor representative from a simulator manufacturer. The subjects were asked to use and evaluate ASTAR, over an extended period of time, and to compare it to other known methodologies. ASTAR analyses were applied to three candidate training devices of the Marine Corps M60A1 main battle tank. A combination of interviews, questionnaires, self-initiated logs and actual evaluation results of the ASTAR technique provided data for the study. The findings indicated that the concept behind the technique was perceived to be sound and to have benefit. Definite shortcomings in the concept implementation were identified as items to be corrected for achieving wide acceptability. Users attitudes changed only slightly over time. The method of implementation received increasingly lower ratings while the users' confidence level and belief in the ASTAR concept increased steadily.

1.0 INTRODUCTION

A longitudinal study was conducted to assess the changes in the use of and attitudes about the Automated Simulator Test and Assessment Routine (ASTAR) with extended use. The longitudinal study was an extension of the effort reported as Operational Study #1: M60A1 Main Battle Tank. The study spanned a total of seven months during which ASTAR was used to evaluate three training devices. In addition, early in the study, ASTAR was used in two different formats on a single training device.

This study of ASTAR decision aid 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 a series of studies conducted on a variety of emerging and operational weapon systems, is to evaluate the utility and impact and the long range user attitudes of the ASTAR technique when exercised in a operational setting. The studies applied ASTAR to the comparative evaluation of the Marine Corps Tank Full-crew Interactive Simulator Trainer (MCTFIST), the Guard Unit Armory Device Full-crew Interactive Simulator Trainer (GUARD FIST I), and Simulation Networking (SIMNET) as potential training devices for the M60A1 tank. A brief description of the decision aid 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 armored vehicles, the M60A1 and the M1A1 tanks, and different training requirements, Army versus Marine Corps and crew versus gunnery. Though each device is specified to its application, there is a significant degree of overlap and similarity between some devices. If a single device could be used to meet these related needs, the potential exists for cost and logistics savings through a reduction in the total number of devices needed to satisfy tank training requirements.

The MCTFIST was developed to meet specific Marine training requirements for the M60A1 main battle 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 longitudinal study was designed to compare the training effectiveness of MCTFIST, GUARD FIST I and SIMNET on a common subset of the Marine M60A1 main battle tank training objectives. The results from the study should provide insight about whether GUARD FIST I or SIMNET provides an acceptable training device alternative to MCTFIST.

The longitudinal aspect of the study follows a case history approach and is non-analytical. User attitude questionnaires were obtained from subjects as they repeatedly applied ASTAR to the differing training devices. Self initiated logs, actual results derived from the use of ASTAR, and a study termination interview were used to gather data.

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 sub tasks 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, training 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 Study Devices

Three devices, MCTFIST, GUARD FIST I and SIMNET were used used as candidate training devices in the longitudinal study. Brief descriptions of the three devices are provided in the following sections.

1.2.1 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 including:

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

b. Videodisk Players - provides the scenery for the training exercises.

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

d. <u>Optical Corrective Components</u> - ensure proper presentation of visual effects.

e. <u>Sound Equipment</u> - 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 unstabilzed modes, and the TC and Gunner may use precision, battlesight, or degraded gunnery techniques.

1.2.2 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 to 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 engagement 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, or navigational engagements with the .50 caliber machine gun. Nor does it include the manual fire mode. Exercises are designed to train combat gunnery and crew interaction activities only.

1.2.3 SIMNET

SIMNET is an advanced, high technology, research and development program designed to invent a brand new technology consisting of large scale interactive **SIM**ulator **NET**working (SIMNET). The war fighting system undergoing test by the army is a testbed to evaluate the ability of these technologies to support large-scale land battle collective (force-on-force) maneuver training. SIMNET is being developed by the Defence Advanced Research Projects Agency (DARPA) and the US Army TRADOC.

Tactical units operate combat simulators that have crew positions, controls, vision blocks and sights and weapons. Crews move and fight on terrain, which they see from their unique perspective. All mission critical vehicle controls, vision blocks, and weapons systems operate as expected. The performance characteristics of the vehicle are realistic. Separate crews can actually see each other as they maneuver in the field. The effects of crew actions can be seen and heard as though they were in the real world.

When maned appropriately, SIMNET allows force-on-force engagements from platoon to battalion task force level and provides training of selected command, control, combat support, and combat service support tasks at battalion level. Each SIMNET training device is created as a live interactive vehicle within a common simulated training environment. The SIMNET device used for evaluation in this study was configured to simulate the M1 main battle.

2.0 APPROACH

The operational exercises of the ASTAR decision aid were conducted, sequentially, on three tank crew gunnery trainers: the Marine Corps MCTFIST simulator, which is designed for installation on a M60A1 main battle tank, and the Army GUARD FIST

I simulator, designed for mounting on an M1 main battle tank, and M1 main battle tank Simulator Networking (SIMNET) device. The study was designed to assess the operational utility, and to evaluate, compare, and rank the three devices in terms of their effectiveness as trainers for M60A1 main battle tank crews. This was done to help establish ASTAR as a viable standardized decision aid for use by DoD in the Instructional System Development process. A discussion of the overall study is presented below.

The longitudinal study evaluated changes in user attitudes with increased familiarization time on the use of ASTAR. ASTAR analyses were applied, over a period of seven months, to the three candidate training devices of the Marine Corps M60A1 main battle tank. The purpose of this study, which is a series of operational studies conducted on a variety of emerging and operational weapon systems, is to evaluate the long range user attitudes of the ASTAR technique when exercised in an operational setting. User attitude questionnaires were obtained from subjects as they repeatedly applied ASTAR to differing training devices. The study follows a case history approach and is non-analytical. Changes in user attitudes were noted as familiarization time increased.

2.1 Subjects

Two subjects participated in all phases of the longitudinal study of the three training devices: a Project Director from NAVTRASYSCEN familiar with training analysis and design, and a contractor representative from the simulator manufacturer, who was familiar with the device and the M60A1 main battle tank. These subjects were augmented with SMEs from the Marine Corps Reserve unit in Tallahassee, Florida and PM TRADE during different portions of the study. This particular mix of subjects provided a good balance of relevant background and experience for the study. The two prime 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.

2.2 Procedure

ASTAR evaluations of the three candidate training devices were conducted independently, over a period of seven months. All trainers received ASTAR level 1 and level 2 evaluations. Two separate MCTFIST applications of ASTAR were conducted. During the course of the first MCTFIST study, 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.

The GUARD FIST I and SIMNET applications of ASTAR were also conducted in Orlando by the Navy project director and the contractor representative. The GUARD FIST I and SIMNET applications used the updated version of ASTAR software developed for the second MCTFIST application. Tank general task listings and control and display lists developed during the MCTFIST application were modified to an M1 tank application. The candidate device, SIMNET, and GUARD FIST 1 were evaluated using the identical data bases initially constructed for the GUARD FIST I application.

Following each ASTAR analysis of the candidate training devices, debriefing sessions were 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. Personal logs of were kept on several factors concerning, evaluation method, and time spent in technique familiarization and actual analysis. After completion of the seven month series of evaluations, a final end interview was conducted with the Project Director from NAVTRASYSCEN to assess his current views of ASTAR.

2.3 <u>Study Materials</u>

Most of the basic data base items for the ASTAR model were developed by the subjects working together at the Marine Corps Reserve Center in Tallahassee prior the initial evaluation of the MCTFIST device. The task list and controls and display lists, for all phases of the longitudinal study, were developed in a committee mode. Worksheets for the operational tank and the training system were also completed prior to the start of the longitudinal series of evaluations.

Eleven major operational tasks (see Table 1) were selected for all phases of the longitudinal study. The number of tasks was limited to eleven in order to keep the time required for the subjects to enter data within manageable boundaries. The tasks selected were representative of a complete mission, beginning with preparation for tactical operation, cycling through four different firing modes, and concluding with shutdown from tactical operations.

Prior to the study sequence, several tasks were undertaken to facilitate the data collection process, increase the validity of the results, and reduce the time and effort required of the subjects. This effort included development of an ASTAR Workbook to assist 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 informed manner. The workbook items were reviewed and/or actually filled out off-line before performing the analysis. Preparation of user's manuals for ASTAR was also undertaken to provide detailed instructions on execution of the technique. With ASTAR a simplified manual was made available to the subjects as well as a more detailed version. Some minor reprogramming of portions of the software were

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 required in order to remedy a number of problem areas and make the programs more user friendly.

3.0 RESULTS

3.1 ASTAR Evaluation

Three full-crew tank training devices, MCTFIST, GUARD FIST I, and SIMNET were compared and evaluated for their effectiveness as trainers for the Marine Corps M60A1 main battle tank. The goal, for evaluating multiple training device, was to have the subjects apply the ASTAR technique to a variety of situations over an extended period of time. The subjects conducted ASTAR Level 1 and Level 2 evaluations of the training devices, comparing them with the operational tank system. Subjects conducted ASTAR Level 1 and Level 2 evaluations for all training devices, comparing them with the operational tank. Evaluation summaries were produced for each ASTAR level application of the three trainer options. Discussion of the two MCTFIST studies and the comparison of all three training devices' ASTAR summary scores follows (no subtasks were used in this study).

An attempt was made to conduct an ASTAR Level 3 analysis as part of this operational study. Subjects, during the second MCTFIST portion of the study, encountered problems during the data base development and while conducting the ASTAR 3 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 compiler 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 the remaining training devices. Figure 3 provides the results of the ASTAR Level 3 analysis conducted for MCTFIST on a PC/XT class computer.

3.1.1 Two MCTFIST Applications

The first MCTFIST application was conducted at the ASTAR 2 evaluation level only. During the course of the study, 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. Subject reentered rating judgments based on this new ASTAR orientation.

The overall summary scores, ASTAR outputs, between the two ASTAR level 2 evaluation of MCTFIST showed virtually no difference, less then one point on any scale. Subscore ratings did show a small difference between the two applications. The subscore rating based on the acquisition problem was about 2.5 points higher with the multi-person crew version of ASTAR. However, the rating for transfer problem was approximately 1.8 points lower for the multi-person crew version of ASTAR. Hence, the net effect on this application of the modified ASTAR was negligible. It is not necessarily surprising to see these difference in the subscores. The increased specificity from addressing the training objectives for each crew position could cause subjects to rate the acquisition problem as more complex. The decrease in the transfer problem, on the other hand, may reflect a better concept of which tasks, for each crew member, after completing training would transfer adequately. Given the offsetting effects of from this comparison the need for a modified version of ASTAR to accommodate multi-person crew trainers seems debatable. The modified version is more complex and time consuming, so that if no impact is realized, the additional effort is not warranted.

3.1.2 Comparison of Three Devices

Both the ASTAR Level 1 and ASTAR Level 2 summary analyses predicted MCTFIST to be more effective at training the Marine tank task requirements identified for this study. MCTFIST was followed by SIMNET and GUARD FIST I in order of predicted training effectiveness. The ASTAR Level 1 total scores were 66.70 for MCTFIST, 105.46 for GUARD FIST I, and 82.08 for SIMNET. For the ASTAR Level 2 analysis, the total scores were 56.88 for MCTFIST, 96.19 for GUARD FIST I, and 77.70 for SIMNET. Figure 1 graphically summarizes the summary scores for the two levels of ASTAR analysis.

When comparing the summary scores between level 1 and level 2, all three trainers received lower scores at the level 2 analysis. The difference in scores were not that great, but do revel a general trend. This trend indicates that with an increase in supporting evaluation data, increased knowledge about the training device being evaluated, a more accurate analysis of effectiveness is reached. The devices surveyed were all fielded trainers and not truly in the concept formulation phase; where ASTAR 1 is typically applied. Since each of the three trainers were designed to train main battle tank crew interaction, it is not surprising that an increase in data items, level 2 analysis, suggested a more effective training device.

The prediction that SIMNET would be more effective than GUARD FIST I seems questionable, since GUARD FIST I is physically and functionally closer to MCTFIST. Subjects appeared to have trouble evaluating SIMNET because it was designed for a much different training objective. Therefore, examination of the acquisition and transfer subscores appears justified. Figures 2 and 3 graphically illustrate the summary and subscores for the ASTAR Level 1 and Level 2 analyses respectively. This

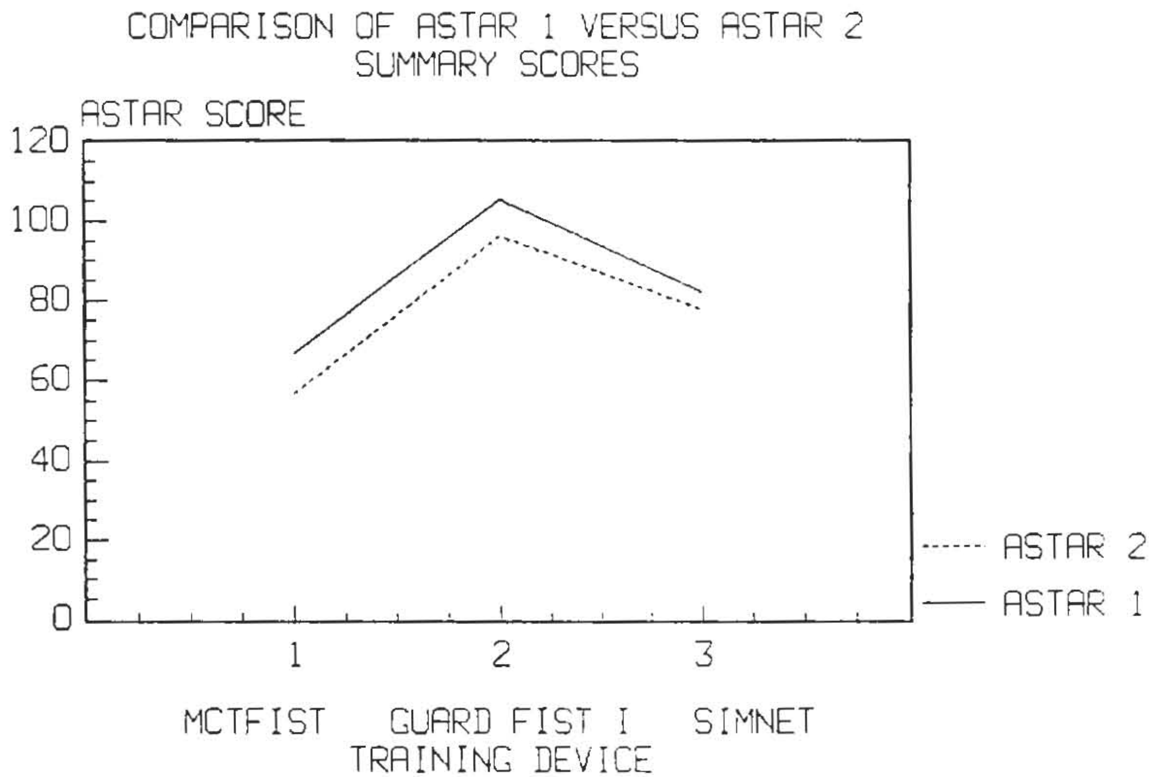

Figure 1. Comparison of ASTAR 1 and ASTAR 2 Summary Scores

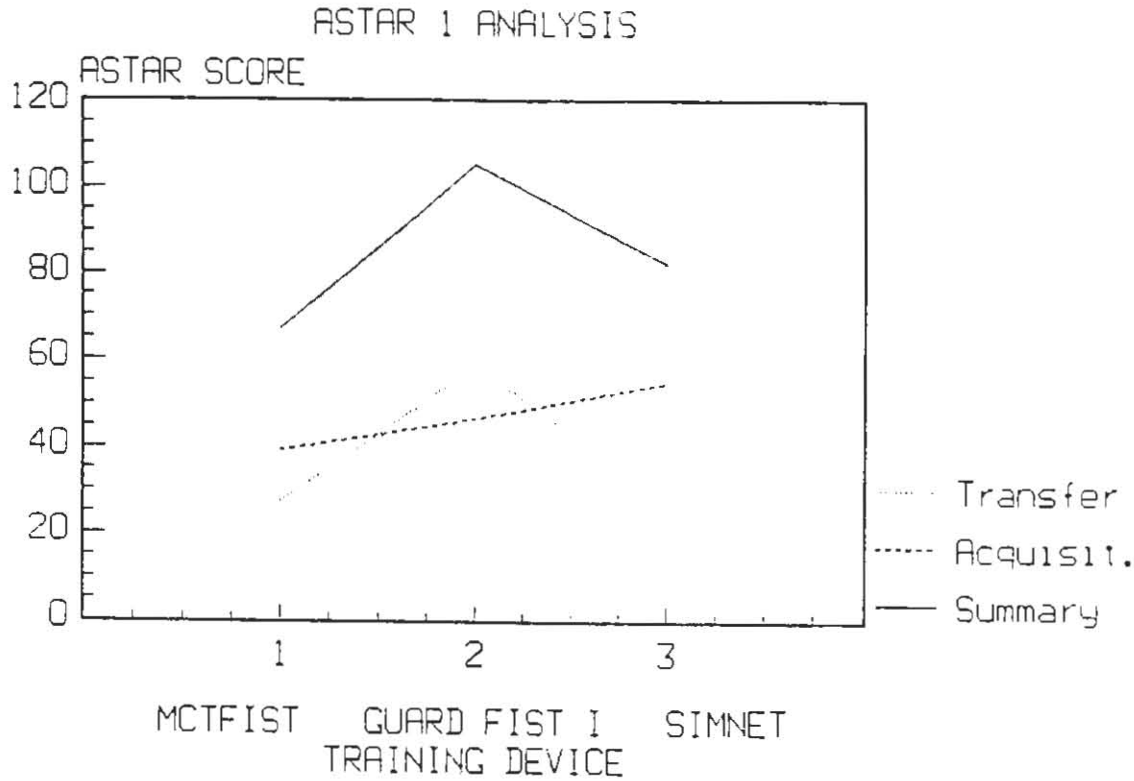

Figure 2. ASTAR 1 Summary and Subscores

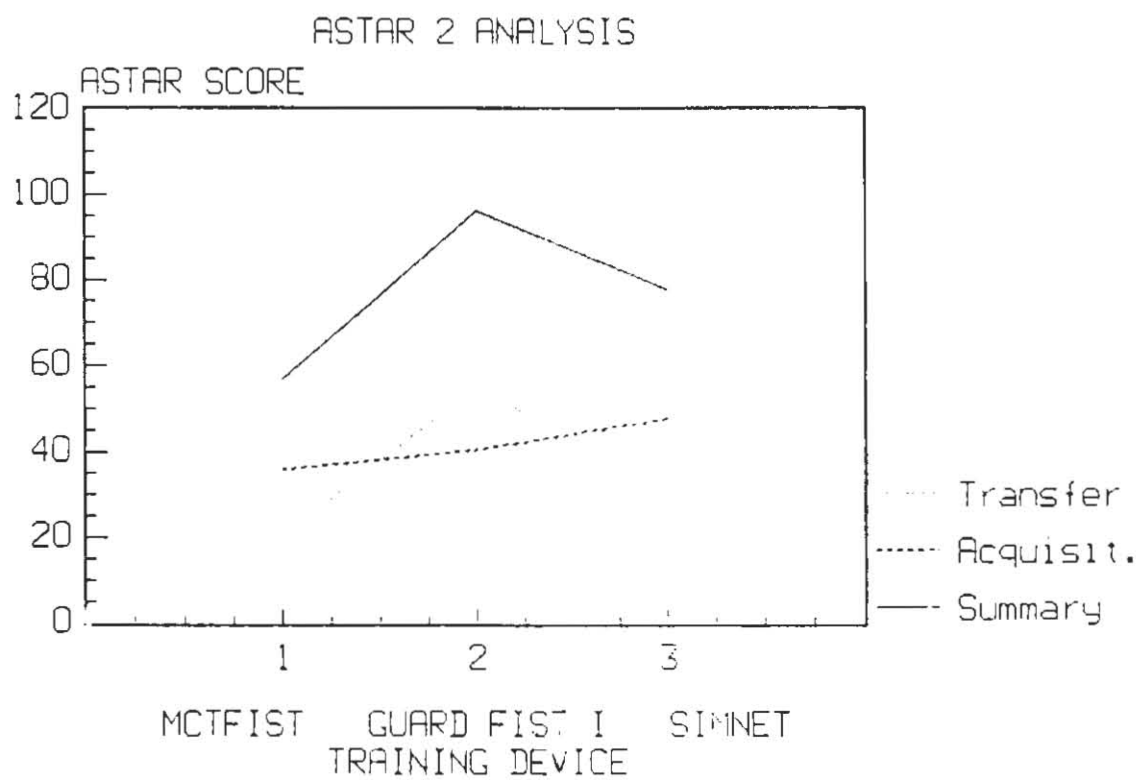

Figure 3. ASTAR 2 Summary and Subscores

examination revealed that the summary scores are driven by the transfer portion of the ASTAR score. Much of the problem subjects had in evaluating SIMNET seemed to focus on the transfer of tasks to the operational environment. Hence, this portion of the score is probably not valid. The acquisition portion of the ASTAR score reflects the expected ranking of the three devices. On the acquisition subscore, for the ASTAR Level 1 analysis, MCTFIST was rated best with a subscore of 39.29, followed by GUARD FIST I at 46.69 and SIMNET at 55.0. The ASTAR Level 2 analyses showed the same ranking on the acquisition subscore.

3.2 User Attitude Questionnaire

A user attitude survey was developed for the study to assess the subject's reactions to the use of the ASTAR techniques. The questions addressed the analysts'/SME's acceptance of and attitudes toward the user friendliness and overall usefulness of the decision aids. It also assessed subjects general background and comfort level in working with computers. The subjects were asked to complete the survey questionnaires following each ASTAR application. Changes in perception across the series of applications were the point of interest. The results of questionnaire items which reflected a change in user perception are presented in the comments below.

ASTAR was initially perceived as being difficult to use. This perception changed slightly, subjects eventually felt ASTAR was only moderately difficult to use. Users noted that ASTAR appeared to be less effective over the continued application. Ratings of ASTAR effectiveness grew consistently lower over time. Initial overall reactions of ASTAR rated the program as being moderately useful, satisfying and of adequate power for its application. This overall reaction changed with continued use and familiarization. Eventually subjects obtained the opinion that ASTAR is ridged, frustrating and generally the use of ASTAR is unproductive.

The organization of the menus was viewed as more illogical, confusing and the prompts were seen to be more unhelpful with increased familiarization. Yet, the presentation method for the questions was consistently considered to be very clear. The consistency of the terminology and language used in the program was rated better over time. Learning to operate and work with ASTAR was perceived to be more difficult. It became harder to learn the new features by trial and error. Instructional materials were considered to be less helpful, but more complete then on first inspection.

Marginal ratings, given on the use of ASTAR, consistently changed with further use. Lower ratings were given for ASTAR's use of feedback, memory requirements, and helpfulness of the error messages. The perception of the usefulness and understandability of the outputs continually changed to reflect a negative opinion. Users felt that they could work with ASTAR, but could see few applications of it in their daily work. Initially the subjects felt that use of ASTAR would be as good or better then conventional methods. The subjects eventually felt that they could conduct their job tasks just as well with some other method. Using ASTAR was not seen to increase job effectiveness. They eventually expressed that they would not feel comfortable working with ASTAR in its present format.

The aspects of ASTAR which users liked most, were the overall concept of an automated system to perform training effectiveness evaluations of multiple training devices. It was felt that the use of such a technique could result in cost, time, and manpower savings. They also liked having a tool to provide quantitative data which can be used in making decision during the design and development process of training systems.

The aspects of ASTAR where considerable criticism was most often stated was in the output data, or ASTAR results, as presented in the final summary. It was felt that the lack of definition of the data rendered the summary data meaningless. The general tenor of the comments indicated that the subjects did not know what the data was telling them. No documentation or screen presentations told them how to interpret the different scores. 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. 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 and then return to the same point at a later time. This could be done, of course, but not quickly and conveniently. Instead, the user was forced to work his way through a time consuming, complex procedure to arrive at his point of interest.

Subjects felt that to improve ASTAR it should be reprogrammed to make it more user friendly and to provide a more meaningful output. Generally speaking, the subjects felt that the system should be made more user friendly by adding capabilities which simplify and increase the utility of the menus to allow easy editing, addition, and deletion of controls and displays, and task and subtask data. It was felt that a method to save data on both hard drive and floppy disks was needed.

An item included in the "User Attitude Survey" was a series of statements designed to determine how experienced and comfortable the subjects of the study were in working with computers. The user were to indicated the four choices which best fit his background. Choices ranged from "Strongly Agree" to "Strongly Disagree". The results indicate that the subjects who participated in the MCTFIST operational study were experienced with computers and were quite comfortable using them. The six statements about computer use presented to the subjects were all answered with the most positive choice possible for each portion of the study.

3.3 Termination Interview

A interview was conducted with the Project Director from NAVTRASYSCEN at the completion of the final study application. The following section addresses his present conceptions of ASTAR.

The system (ASTAR), in itself, does not help to increase user confidence. The continuing discussions and interactions with the experimenters, ASTAR SME, is what increased the user confidence level. ASTAR user manuals were not used. They were too long and did not have a good summary format. A strong desire to better understand the end output was expressed. It was felt that a lack of good explanations of the results summary, ASTAR outputs, exits. A method to help translate the output data is needed. The questions themselves were written and presented in straight forward manners, yet it is difficult to identify the items which are the most important in driving final output data.

Through continued use of ASTAR the level of understanding and acceptance had definitely increased. The subject did not become discouraged with ASTAR over the entire six months of employing the program. Inherent benefits from using ASTAR were quite apparent right from the start. This did not change, the subject still felt that ASTAR could easily become a valuable technique. If ASTAR were redone, to update the user interface portions, the subject would use it and reconsider the areas of feasible application. Further developmental changes to improve the interaction with the user would be highly supported. Also, it became clear, through consistent use of ASTAR, who the target population may be and where ASTAR could be utilized effectively.

The subject feels confident in teaching or explaining to a new user how to effectively use ASTAR. He became comfortable with applying ASTAR on his own in a new area. The subject also became familiar with the type of assumptions that need to be made to run the program. The power of ASTAR may lie in the forced and structured interaction of SMEs in making ratings and tradeoff decisions. This is the team approach that ASTAR suggests. If the program is used in its present state, it was suggested that a third party ASTAR expert be present to help new analysts through the evaluation. The third party may help organize the data inputs.

4.0 CONCLUSIONS

This longitudinal study of ASTAR conducted by NTSC and contractor personnel provided an appropriate test environment. The study provide an ongoing use and evaluation of ASTAR over a seven month period. The M60A1 weapon system selected for the study, and the MCTFIST, GUARD FIST I, and SIMNET training devices provided a good application of the technique since they permitted the analysts to compare the merits of the three simulators as M60A1 full crew tank trainers as well as to evaluate the utility and usability of the decision aid.

Overall, the user acceptance of ASTAR was rather low. It is evident that ASTAR is considered quite worthwhile in concept, however it is unsatisfactory in terms of user friendliness. The user interface is clearly the major factor in determining future acceptance of the two methodologies.

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. Proper application of ASTAR should result in considerable savings in time, cost and man hours during the analysis phases of training development. However, they would prefer not to use the program as it presently exist because of its unfriendly nature.

The findings of this longitudinal study indicate that ASTAR will require modifications before implementation as a standard evaluation technique. 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.

In summary, this longitudinal study of the ASTAR decision aid demonstrated that while ASTAR is not user friendly as presently programmed, it has the potential to become a useful and widely accepted decision aid for evaluating candidate trainer suites and selecting training system media.

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