1-1-1994

Summary Of The Second Army DIS Data Call: Technical Report

Ronald W. Tarr

INSTITUTE FOR SIMULATION AND TRAINING

Contract Number: N61339-93-K-0001 (CDRL A00D)
STRICOM
February 21, 1994

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ACKNOWLEDGMENTS

The authors would like to thank Mr. Brian Goldiez, Mr. Robert Reed, and Mr. Jim Williams for their assistance in organizing and analyzing the information and data contained in the raw Army DIS Data Call submissions. Appreciation is also extended to Mr. Scott Smith and Ms. Amy Vanzant-Hodges for providing useful suggestions based on their review of an earlier version of this document. In addition, special thanks are extended to the members of the Army DIS Action Officer Review Panel whose efforts are summarized in this report: Major David Vaden, Chairperson (TRADOC); Mr. Bob Sottilare (STRICOM); Mr. John Yuhas (SARDA); Mr. Herb Westmorland (TRADOC); Major John Norwood (TRADOC); Ms. Lauran Winter (TRADOC); Mr. Keith Carson (TRADOC); Ms. Karen Williams (STRICOM): Mr. Frank Regalado (STRICOM): Captain Bruce Simpson (DCSOPS).

EXECUTIVE SUMMARY

A current multi-service program, referred to as Distributed Interactive Simulation (DIS), involves linking independent military simulators and simulations for the purpose of improving outcomes related to training, military operations, and research, development and acquisition (RD&A). Due to the diverse nature of simulators and simulations within the military, the process of establishing links between each is both complex and costly, often requiring hardware and software upgrades to specific simulators/simulations (e.g., enhanced visual displays, etc.), as well as establishing operationally effective communication channels between simulators/simulations, so that required information can be shared.

For the DIS program to proceed in an effective and cost-efficient manner, it is necessary to collect up-to-date information in the form of operational needs and corresponding functional requirements of individual users. That is, information specifying how a particular simulator/simulation will be used, as well as what is needed within the simulation to ensure effective outcomes. When identified, these functional requirements will be summarized and prioritized so that key decision makers, such as the Army DIS General Office Steering Committee (DIS GOSC) can compare user needs to emerging DIS technological capabilities when making decisions related to program funding, equipment availability, development strategies, etc.

In order to collect this information, an effort was made to survey user needs/ requirements. This effort, referred to as the First Army DIS Data Call, was hampered by several factors, including a restricted response time (2 weeks), and the fact that many people responding to the Data Call did not understand the nature and scope of the DIS program. As a result of the First DIS Data Call, an effort was undertaken to educate the user community about DIS and the importance of collecting accurate operational needs information.

This report describes the Second Army DIS Data Call. Like its predecessor, this effort was aimed at identifying user requirements so that effective decisions could be made regarding ongoing DIS development and use.

The major findings of the Second DIS Data Call are summarized below. These findings and additional conclusions and recommendations are based on independent IST assessments and the Army's DIS Action Officer Review Panel. Modifications to some of the findings by the Functional and Technical Managers have since taken place as reflected in the Army DIS Master Plan (Draft - 1994).

- A total of 194 Operational Needs Forms (ONFs) were submitted for review and validation. Forty-four ONFs were duplications or provided redundant information pertaining to a program's operational needs.

- A total of 69 ONF submissions (36%) were categorized in two or more DIS Domains, which include training, RD&A, and military operations. This suggests that there is a large degree of overlap between DIS programs relative to the three DIS Domains.

- While seven Major Army Commands submitted ONFs, 10 Army Commands did not submit any ONFs. This suggests a need to broaden the education of relevant Army personnel concerning DIS and the importance of collecting operational needs information. This is especially true of Army Commands residing outside the United States, and of Army Commands not involved in RD&A activities.

- A total of 107 (55%) ONFs contained either non-valid requirements or were returned to the user for revision/clarification (per recommendation of the Army DIS Action Officer Review Panel). This indicates that specifying operational need information is a complex task and that, in the future, users should be provided additional support and guidance (e.g., through educational work shops, use of a checklist format, automating the collection process, etc.).

- Recommended actions based on the findings presented here include, a) providing information to needed elements within the DIS user community about the nature and scope of DIS and guidance on how to document operational needs; b) modifying the current DIS management structure so that it operates within the current Army chain-of-command protocol; c) developing an automated data collection system; d) presenting a formal scheme (taxonomy) for categorizing functional requirements related to DIS within the Army Modernization Plan; e) presenting an outline for developing a standardized performance assessment system within the DIS Master Plan; and f) presenting a description of the process whereby operational needs are transformed into technical specifications within the DIS Master Plan.

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I. Background and History

In 1991, the Army Science Board Summer Study on Simulation and Modeling Strategy recommended that the Army centrally manage Distributed Interactive Simulation (DIS). The finding was based on the determination that DIS was a very critical, new technology that crossed a broad spectrum of Army activities and programs which most likely would result in fragmented implementation without central control.

On 5 June 1992, the Secretary of the Army approved an "Action Memorandum" submitted by the Army Acquisition Executive to establish DIS as an Army program with a definable management structure. Since approval of the Action Memorandum the program has matured and presently consists of the following key agencies:

- Army DIS General Officer Steering Committee (DIS GOSC). The DIS GOSC provides DIS guidance and addresses issues on requirements, priorities, and programs. The Committee is co-chaired by the Deputy Under Secretary of Army Operations Research (DUSA OR) and Deputy Chief of Staff for Operations and Plans (DCSOPS).

- Functional Manager. HQ TRADOC acts as the Army Users' Representative responsible for requirements integration.

- Technical Manager. HQ AMC through STRICOM is the Technical Manager and is responsible for program execution and modernization, as well as offering guidance on all technical issues.

- Functional Area Representatives (FARs). There are a total of 13 Army Agencies that represent functional aspects of the Army DIS user community, including key warfighter capabilities. Figure 1 presents the 13 functional areas and corresponding Army agencies related to DIS. Each Agency has a representative whose job is to provide expertise within a given functional area.

The Functional Manager initiated the Army's First DIS Data Call on 28 October 1992, requesting potential Army Users to submit Operational needs to the appropriate FAR who would collect, validate, and prioritize the requirements and forward them to the Functional Manager. The Data Call was to be completed on 20 November, 1992.

A total of 144 DIS Functional Requirement Forms were submitted from various, but not all Army organizations (the parallel version of this document for the Second DIS Data Call is called "DIS Operational Needs Form" or ONF). A summary of relevant activities and outcomes of the First DIS Data Call is presented in Appendix A.

Based on the submissions in response to the First DIS Data Call, it was reasonable to assume that the Army DIS user community, as a group, did not clearly understand the basic nature and scope of the DIS program. On 15 January 1993, the

	Functional Area	Army Agency (FAR)
1.	Acquisition (PEO/PMs)	SARDA
2.	Research & Development	SARDA
3.	Training	TRADOC/DCST
4.	Combat Developments*	TRADOC/DCSCD
5.	Testing	OPTEC
6.	Operations Analysis	TRAC
7.	Soldier	ARI
8.	Intelligence	DA DCSINT
9.	Terrain	TEC
10.	Simulation Research	STRICOM
11.	Major Warfighting Commands	DA DCSOPS
12.	National Guard	NGB
13.	Army Reserves	OCAR

* Includes TRADOC Battle Labs

Figure 1. DIS Functional Areas and Associated Army Agencies

DIS GOSC, while in session, directed HQ TRADOC, jointly with HQ STRICOM, to develop and execute an Education Plan for DIS users so as to address shortcomings noted during the Army's first DIS Data Call. The objective of the Education Work Shops was to ensure that users understood DIS sufficiently to articulate their operational needs for the Second DIS Data Call. With support from the University of Central Florida's Institute for Simulation and Training (IST), eleven DIS Educational Work Shops were conducted from February to September, 1993, at various locations and were open to all commands. The location of the Education Work Shops included:

- Aberdeen Proving Grounds, ML;
- Washington, DC (two work shops);
- Fort Knox, KY.
- Fort Rucker, AL;
- Huntsville, AL;
- Fort Leavenworth, KS (two work shops);
- Orlando, FL (three work shops).

Work shops consisted of a classroom presentation lasting approximately six hours followed by a tour and demonstration of a nearby DIS facility. The classroom presentation included an in-depth overview of the Army's DIS program. Each work shop participant received a variety of take-home materials, including a brief video presenting key aspects of DIS, a set of briefing slides, and overview documents of key DIS concepts and issues. Work shops did not include specific instruction on how to

complete the ONF that all users were to submit as part of the Second DIS Data Call. Rather, it described the process ONFs would go through once submitted. The ONF used during the Second DIS Data Call is presented in Appendix B.

Changing the name of the document used to collect user information from the DIS Functional Requirement Form to the DIS Operational Needs Form (ONF) was done to emphasize more precisely the nature of the Army users' task when filling out the form. Specifically, part of the users' task was to state in detailed language their operational needs. For example, an armor unit that is using simulation to train gunnery skills at both an individual and unit level may have the following stated operational need:

> To maintain battle drill proficiency under realistic battlefield conditions that include terrain which is consistent with that found in North Central Iraq, and environmental features, such as patches of dense smoke from wood fire as well as from ordinance delivery. The enemy has 500 total troops, including two armor units (using latest version Soviet built tank), artillery support, and utilizes Soviet tactics/strategies when attacking or defending their position. The enemy also can electronically jam command and control (C^2) node transmissions.

Based on the above operational need, it is possible to derive what functionally needs to take place in the simulated environment to support this operational need. In this example, terrain and environment features must include rolling hills, small trees, and large rocks in the amount and kind found in that particular area of Iraq. Battlefield and wood smoke of a specified density and "patchiness" must also be present in addition to communication interference that is characteristic of the communication jamming capabilities used by the enemy. Enemy forces must also be represented in terms of overall size, types of equipment/weapons being used, tactical/strategic maneuvering capabilities and tendencies, etc.

The functional aspects of operational environment (battlefield) are then used to develop highly specific technical specifications in the form of models and algorithms that guide actions and events occurring within the warfighting simulation. For this example, physical models would be needed to represent hilly terrain, large rocks, trees, etc., and force models would be used to represent movement, resistance, etc., of people, equipment, and weapons, as they interact with various terrain and environmental features. Because a great deal of research is required to develop such models, it becomes necessary to ascertain the relative costs and benefits associated with developing specific models. Is it worthwhile, for example, to develop a highly accurate model of battlefield smoke, or can a more generic model be used (e.g., one that produces a "hazy" visual quality across the entire battlefield)? These types of trade-offs can only be determined when users accurately specify their operational needs. If a large segment of the user community identifies a need for battlefield smoke that accurately mimics that found on the battlefield, then it may be worthwhile to develop a more accurate model, as opposed to one that is more general in its effects.

Once the operational needs of the Army DIS user community are collected, it is the job of the Army DIS GOSC and other high-level decision makers to identify and

prioritize corresponding functional requirements, and to calculate the relative costs/benefits associated with producing the underlying simulation models/algorithms. This information will ultimately be used to determine short- and long-term goals for how DIS should be developed and used. It is imperative, therefore, that operational needs be accurately specified by the entire DIS user community as an initial step in the decision-making process. Stated differently, determining DIS user needs is the engine that drives the overall development process, and allows decisions to be made for achieving both short- and long-term goals.

II. Objective

This report describes the most recent effort to collect and summarize user operational needs information from current and potential users of military simulations, who also elect to participate in the ongoing DIS program. This effort is referred to as the Second DIS Data Call and follows the initial Data Call which occurred in the Winter of 1992. Once operational needs are identified, they can be used to support decision-making processes concerning the development and use of DIS architecture and capabilities (e.g., identify crucial gaps in R&D efforts, plan hardware acquisition, etc.). In general, planning is made more effective when operational needs are clearly specified and prioritized so that redundant effort is reduced and areas of high need are identified and addressed.

III. Approach

The approach for the Second DIS Data Call was similar to the one used to guide the First DIS Data Call. The major difference between the two efforts was an attempt to educate the user community about DIS and the importance of information related to user-defined functional requirements through a series of work shops presented just prior to the formal distribution of the DIS Operational Needs Form (DIS ONF or simply ONF). These work shops provided limited training to attendees on how to identify and specify functional requirements. Appendix B presents a copy of the ONF used to collect needed information for the most recent Data Call.

In addition to information on how to fill out an ONF, users were instructed to send completed ONFs to appropriate Functional Area Representatives (FARs) for review. The task of the FAR was to review the ONF to ensure each was filled out correctly (i.e., that functional requirements were clearly specified, that information was up-to-date and accurate, etc.). If an individual FAR identified errors in the completed ONFs or felt that functional requirements documentation was incomplete, he or she would return the ONF to the user so that revisions could be made. This was not an uncommon occurrence, and due to the complexity of the task, having multiple review-and-revise cycles should be viewed as highly desirable since this process tended to produce useful operational needs documentation.

After reviewing individual ONFs submitted to them by the user community, each FAR forwarded the completed ONFs under their purview to the DIS Functional Manager (TRAC, Fort Leavenworth). Next, the Functional and Technical Managers

commissioned IST to conduct a pre-review of the information contained in the ONFs so that it could be more readily summarized and analyzed. A DIS Pre-Review Committee was formed at IST consisting of subject matter experts (SMEs) from diverse backgrounds, including engineering, management, instructional systems/education, and simulation[1]. Members of the DIS Pre-Review Committee read through the completed ONFs in order to make initial judgments concerning the overall information contained in the ONF documents (i.e., submitting agency/program, DIS domain referenced, etc.), as well as to determine a plan for summarizing this information. The nature of the Pre-Review Committee's task, however, was not to make judgments concerning the number and type of functional requirements contained within the completed ONFs. All judgments related to identifying and specifying valid functional requirements were done by an Army Action Officer Work Shop Review Panel, described next.

The purpose of the Army Action Officer Work Shop Review Panel was to identify valid functional requirements based on information contained in the ONF documents. The DIS Functional Manager, Major David Vaden, chaired the work shop, which lasted lasted four days. The role of IST during the work shop was to provide analytical and administrative support.

In general, the work shop proceedings focused on achieving the following outcomes:

1) Identifying operational needs and corresponding functional requirements based on individual ONF submissions.

2) Determining which functional requirements were valid with respect to the Army's "vision" of how DIS should be developed and used (as stated in the Army Modernization Plan, MDEP, and the Army DIS Master Plan); and

3) Grouping related functional requirements into meaningful categories to aid future decision-making processes.

In summary, it is important for the reader to understand that the ONFs submitted by individual users do not in and of themselves constitute valid functional requirements. Rather, functional requirements resulted from the Action Officer Work Shop Review Panel's discussion concerning the content of individual ONF submissions.

The remainder of this report describes the findings of the Army Action Officer Work Shop Review Panel, as well as general summary information based on the preliminary review and analysis provided by the IST Pre-Review Committee.

Note 1: Members of the IST Review Panel were: Mr. Brian Goldiez, Mr. Ron Tarr, Mr. Jim Williams, Mr. Larry Ziock, and Mr. Robert Reed.

IV. Findings

A. DIS Operational Needs Form (ONF) Submissions - There were a total of 194 ONFs submitted as a result of the Second Army DIS Data Call. Of these, 44 provided redundant information. For example, in some cases individual users submitted more than one Form. This happened if a user felt that their program impacted more than one functional area (e.g., security and terrain). In other instances, two separate users submitted the same (or highly similar) ONF documentation pertaining to the same program area. For example, in one case an ATD Manager and a supporting RDEC Manager each submitted an ONF for the same ATD program. Of the 44 redundant ONFs submitted, three were due to programs submitting dual ONFs to different FARs. The remaining 41 were due to similar (or in some cases identical) ONFs being submitted by a single program area.

Although the information presented within the ONFs is diverse, it can be organized in several ways to facilitate its understanding. The following constitutes a general overview and summary of the content of information collected using the ONFs, as well as important outcomes resulting from the Action Officer Work Shop Review Panel (i.e., identification of functional requirements).

Information was collected concerning what programs (e.g., ATDs, BDS-Ds, etc.) and Army Commands submitted ONFs. This information is useful for determining the extent to which the results of the Data Call are representative of the total (Army) user community. Table 1 presents a listing of ONF submissions by Army Major Commands. Ten Major Commands, listed in Appendix C, did not submit operational need information.

It is also useful to categorize individual submissions according to the Army DIS Domain areas, which include Training, Research, Development, & Acquisition (RD&A), and Military Operations. Table 2 presents the frequency of ONF submissions broken down by DIS Domains. It should be noted that there are a total of 193 submissions when using DIS Domain as a breakdown variable, compared to 194 total submissions presented in Table 1. This is due to one submission not being categorized into any of the three DIS Domain areas. It is evident from the information presented in Table 2 that a large number of the program areas overlap with respect to the three DIS Domain areas. Of the 193 ONF submissions, 69 (36%) are categorized into two or more DIS Domains. The frequency with which individual submissions are categorized within each DIS Domain was: 69 (36%), 147 (76%), and 73 (38%), for training, RD&A, and military operations, respectively.

In the course of reviewing ONF submissions, several FARs provided written documentation concerning the perceived validity of corresponding functional requirements necessary to support a given need, as well as justifications for these perceptions. Other reviewers either mentioned that the functional requirements were

Table 1
Frequency of ONF Submissions

ARMY MAJOR COMMANDS	OPERATIONAL NEED SUBMISSIONS FREQ	(%) PCT
TRADOC		
NSC	4	2%
TRAC	32	16%
CD Centers/Schools	33	17%
Battle Labs	8	4%
TOTAL	77	40%
ATDs, TLs, & PEOs	55	28%
AMC	45	23%
Test & Evaluation Command	7	4%
LAM	5	3%
Space & Strategic Defense Command	3	2%
FORSCOM	2	1%
TOTAL SUBMISSIONS	194	100%

Table 2
Frequency of ONF Submissions
by DIS Domains

DIS DOMAINS	ONF SUBMISSIONS FREQ	(%) PCT
Research, Development, & Acquisition (RD&A) Only	92	48%
Training Only	20	10%
Military Operations Only	11	6%
All Domains (Training, RD&A, and Military Operations)	28	14%
RD&A and Military Operations (Combined)	20	10%
Training and Military Operations (Combined)	15	9%
RD&A and Training (Combined)	7	3%
TOTAL SUBMISSIONS	193	100%

valid without providing any written documentation/justification or simply submitted the completed ONFs without providing any written commentary concerning the validity of the information. Table 3 presents frequency of ONF submissions broken down by Functional Area and corresponding level of review by the FAR.

Table 3
Frequency of ONF Submissions and Level of Review by Functional Area Representative (FAR)

FUNCTIONAL AREA*	ONF SUBMISSIONS (%) FREQ	PCT	LEVEL OF REVIEW BY FAR
Acquisition (PEO/PM)	18	9%	No review or certification provided
Research & Development (ATD & TL)	32	17%	All submissions reviewed and certified in writing
Training	6	3%	All submissions reviewed and certified in writing
Combat Developments	42	22%	All submissions reviewed and certified in writing
Testing	9	5%	All submissions reviewed and certified in writing
Operations Analysis	32	17%	No review or certification provided
Soldier	2	1%	All submissions reviewed and certified in writing
Terrain	15	8%	All submissions reviewed and certified in writing
Simulation Research	37	19%	FAR Action Officer reviewed and provided written comments
TOTAL SUBMISSIONS	193	100%	

* - Information from four FAR's wasn't received.

As stated previously, a major outcome of the Action Officer Work Shop Review Panel was a determination of the validity of derived functional requirements based on the Army's "vision" of DIS. This vision is referred to in several sources, including the Army Modernization Plan (STRICOM, 1993), MDEP, and the Army DIS Master Plan (TRADOC, Draft-1994; see also, Sullivan, 1993; Tarr, 1993; Vaden, 1993). A functional requirement was considered valid if the Review Panel agreed that it supported the Army's vision of DIS. Table 4 presents the outcome of the Review Panel's decision processes concerning validation judgments.

Table 4
Outcome of Work Shop Validity Judgments

DECISION OUTCOME	OPERATIONAL NEED SUBMISSIONS FREQ	(%) PCT
Valid Requirement	87	45%
Non-Valid Requirement	72	37%
Returned to User (due to):	35	18%
- Valid/Needs Re-write	16	8%
- Need Uncertain	16	8%
- Written as DoD Requirement	3	2%
TOTAL SUBMISSIONS	193	100%

In addition, one aspect of this vision involves 12 Elements in Common described in the DIS Master Plan (see also Vaden, 1993). Briefly, these elements are functional capabilities needed for successful implementation of DIS across the three DIS Domains. Table 5 presents the frequency of ONF submissions broken down by the 12 Elements in Common (as perceived by the members of the Work Shop Review Panel).

B. Outcome of Army DIS Action Officer Work Shop Review Panel - The primary outcome of the Review Panel was a determination of DIS functional requirements based on information presented within individual ONFs. After reviewing the ONFs, the Review Panel generated a listing of valid functional requirements and organized them into 14 Functional Areas based on perceived commonalties of individual needs/requirements. Attachment A-1[2] contains raw ONF submissions from the Second DIS Data Call. The 14 Functional Areas are presented below:

1. Security
2. Dynamic Terrain
3. Static Terrain
4. Dynamic Environment
5. Standard Databases
6. Communications
7. Scenarios
8. Data Collection
9. Verification, Validation, & Accreditation (VV&A)
10. Human Factors
11. Semi-automated Forces (SAFOR)
12. Signatures
13. Simulation FAR
14. Hardware

Note 2: Attachment A-1 may contain contractor sensitive material and therefore is restricted in distribution to organizations and individuals approved by STRICOM. Individuals wishing to obtain a copy of this section should contact the appropriate personnel at STRICOM.

Table 5

Frequency of ONF Submissions By DIS Master Plan "Elements in Common"

DIS ELEMENTS IN COMMON	ONF SUBMISSIONS FREQ	(%) PCT
1. Represents all phases & entire spectrum of conflict	27	22%
2. Verification, validation & accreditation (VV&A)	4	3%
3. Computer generated forces (CGF)	27	22%
4. Environmental effects (natural & manmade)	40	32%
5. Security of classified material	5	4%
6. Linking classified & unclassified simulations	2	2%
7. Dual standardized data bases	10	8%
8. Standardized library (e.g., data bases, icons, algorithms, etc.)	3	2%
9. Standardized collection and recording of relevant data	3	2%
10. Re locatable suite of simulation interfaces	3	2%
TOTAL SUBMISSIONS	124	100%

To get an indication of the frequency with which functional requirements fall within both the 14 Functional Areas and the three DIS Domains, a matrix was constructed. Table 6 presents the frequency of Functional requirements broken down by Functional Area and DIS Domain.

When constructing this matrix, redundant program information was minimized. For example, within the Functional Area labeled "Dynamic Terrain," ONF submission #46 was cited five times as supporting five unique operational needs (i.e., tank ditches, bomb craters, vegetation, etc.). Submission #46 information accounted for a total of three entries within the Dynamic Terrain "cell," one entry for each of the three DIS Domains (i.e., Training, RD&A, and Military Operation). If each of the five unique operational needs were counted separately, submission #46 would contribute a sum of 15 entries (i.e., five cited needs multiplied by the three Domains) to the Dynamic Terrain cell total (see Appendix D and Attachment A-1).

Table 6
Frequency of Functional Requirements By Requirement Category and DIS Domain

FUNCTIONAL REQUIREMENT CATEGORIES	DIS DOMAIN AREAS			TOTALS	
	TRNG	RD&A	MO	FREQ	(%) PCT
1. Security	1	3	2	6	5%
2. Dynamic Terrain	1	5	1	7	5%
3. Static Terrain	2	7	1	10	8%
4. Dynamic Environment	2	9	2	13	10%
5. Standard Database	2	10	2	14	11%
6. Communications	0	7	0	7	5%
7. Scenarios	0	10	0	10	7%
8. Data Collection	2	1	0	3	2%
9. VV&A	2	2	2	6	5%
10. Human Factors	0	1	0	1	1%
11. SAFOR	1	7	2	10	7%
12. Signatures	0	5	0	5	4%
13. Simulation FAR	4	7	5	16	13%
14. Hardware	0	13	7	20	16%
TOTALS FREQ:	17	87	24	128	
TOTALS (%) PCT:	13%	68%	19%		100%

In addition, there were a number of recurring functional requirements specified by various users that were not readily categorized under one of the 14 Functional Categories just mentioned. Initially, these requirements were viewed as being non-valid by members of the Work Shop Review Panel, but on the last day were reinstated as valid requirements. Table 7 presents the frequency with which these "additional" requirements were mentioned by the various user groups.

Table 7
Frequency of Additional Functional Categories

	ADDITIONAL FUNCTIONAL CATEGORIES	ONF SUBMISSIONS FREQ	(%) PCT
A.	Reconfigurable Simulators	7	21%
B.	Required DIS Linkage Between Specific Simulations	7	21%
C.	Funding Support	7	21%
D.	Signatures in DIS (e.g., Thermal, IR, Jamming, etc.)	5	15%
E.	New Simulator Hardware	4	12%
F.	Improved Simulator Visuals (CIGs)	2	6%
G.	Human Factor Elements (e.g., Heat, Stress, Fatigue, etc.)	1	3%
	TOTAL SUBMISSIONS	33	100%

The data generated by the ONF submissions were examined carefully in order to determine the existence of commonalties and trends. As with any complex set of data, determining logical categories often facilitates a deeper understanding of the information and serves to illuminate issues or concerns that may otherwise go undetected. Although information related to the raw ONF data can be summarized in a variety of ways, we chose three categorization schemes to assist the reader in understanding this complex information set. Keep in mind that the information presented in the following three appendices is based on judgments made during the Army Action Officer Work Shop Review Panel and thus may not be directly perceived by reviewing the raw ONF submissions presented in Attachment A-1.

Appendix D presents a sequential listing (according to submission number) of individual ONF submissions along with its title, domain affiliation, reviewer (FAR), common elements to which it is related, and a determination of its fit within the overall DIS "vision." This information was identified during the early part of the Army Action Officer Work Shop Review Panel meeting. Appendix E presents a summary of functional requirements broken down by the 14 functional categories discussed previously (information from appendices D and E was combined when constructing Table 6). Finally, Appendix F presents a summary of functional requirements broken down by selected functional areas and functional categories (including, but not limited to, those presented in Table 6). Appendix F was produced by the Review Panel's chairman, Major David Vaden (TRAC, Fort Leavenworth) after the Work Shop had ended.

V. Conclusions and Recommendations

The following conclusions and recommendations must be viewed with caution due to the inherent limitations of the overall data collection effort, including:

- 10 Major Army Commands did not submit Organizational ONFs during the Second DIS Data Call; and
- 35% of the Data Call submissions were returned to the originating program due to lack of clarity and/or need for additional information.

These limitations are themselves interesting because they indicate that the Army DIS user community, as a group, is not sufficiently knowledgeable about the nature and scope of the DIS program or of the importance of specifying up-to-date information concerning their operational needs and functional requirements. Despite these limitations, a number of conclusions can be made concerning the Second DIS Data Call effort reported here along with recommendations for future action.

A. Identifying and Specifying Operational Needs - It is evident from the information concerning the ONF submissions, that the majority (76%) of users responding to the Second DIS Data Call are involved in RD&A activities. This isn't surprising given that DIS is currently in a developmental phase and must seek answers to numerous technical and functional questions through ongoing research activities. As mentioned previously, a key to effective and efficient development of DIS is having accurate, up-to-date knowledge of user operational needs/functional requirements. This information is critical because it allows decision makers to determine commonalties and trends within the Army user community and to establish priority levels so that important questions are answered without undue duplication of effort and research results are "leveraged" to support the largest number of users.

Because identifying and specifying operational needs and functional requirements are such important components in the ongoing development of DIS, several conclusions can be made about the way in which these critical activities were accomplished during the Second DIS Data Call. First, the overall response rate was lower than expected. It is important that all Major Army commands provide input so that accurate trends can be identified which reflect the needs/requirements of the entire user community. Second, users must accurately identify and specify operational needs and functional requirements. This is not an easy task, as demonstrated by the substantial number (18%) of ONF submissions sent back to the originating program for revisions. Related to this concern, users should receive needed support from the DIS Management Structure by having their questions answered, receiving guidance and feedback when submitting ONFs, and so on. Currently, Functional Area Representatives (FARs) are responsible for reviewing ONF submissions to ensure the information contained in the form is appropriate and that operational needs and functional requirements clearly stated. The level of review provided by individual FARs, however, was not consistent (as noted in Table 3).

Based on the findings and conclusions concerning the ONF submissions described in

this report, the following recommendations are presented to improve the overall effectiveness and efficiency of the data collection effort.

An important and urgent concern based on the response to the Second DIS Data Call is the need to educate the Army user community about DIS, including how to accurately specify operational needs. This concern is currently being addressed through a series of planned Educational Work Shops offered by IST at numerous sites across the United States. These work shops should be modified to include direct instruction on how to identify and specify operational needs. A key component of this instruction should include the use of relevant examples, both as a way to explain important concepts, issues, etc., and to provide learners with an opportunity to acquire relevant skills through guided practice with feedback. It is also suggested that additional sites outside the United States (i.e., Europe, etc.) be considered to facilitate participation of Major Army Commands located outside the US.

Another area of concern involves how to collect critical user information in a more effective and efficient manner. The findings presented here indicate that changes to the ONF which is currently being used to collect this information are worth exploring. Specifically, it is recommended that additional "structure" be provided by doing one or more of the following: a) expanding the current instructional guide that explains how to fill out the form; b) creating a new form that uses a checklist format; and c) automating the data collection process by developing an on-line computer system. Option "C" is more suited to a checklist type format and thus should be implemented only if option "B" is also chosen. Each option is discussed in more detail below.

The first recommendation, providing a comprehensive users guide, should be done regardless of what format (open ended or checklist) is chosen. Ideally, the instructional guide should include both a brief overview of what information is required as well as specific, in-depth instructions on how to complete each part of the document. Examples demonstrating both correct and incorrect ways to specify needed information should also be provided. Finally, a list of key DIS personnel, organizations, etc., who can offer guidance to users should be included.

A checklist format for collecting important user information offers a number of benefits over the current "open-ended" format, the most obvious being that it provides additional structure during the data-collection process. The challenge of converting to a checklist format is making apriori judgments concerning how to break down information into useful categories and subcategories that combine to "capture" all relevant aspects about a given program, as well as how it fits into the DIS architecture. A checklist format facilitates consistent and complete documentation of relevant user information and can speed up data analysis and reporting because information is provided in discrete "chunks." As mentioned above, this option should be accompanied by a comprehensive instructional guide that will aid users when completing the checklist.

It is conceivable, using a checklist format, to automate the data collection process by developing an on-line computer system, whereby users can directly input required information at regularly scheduled intervals (e.g., quarterly, yearly, etc.). A great deal of advance work and planning (not to mention additional funding) would be needed before such a system could be developed and implemented. The benefits of such a system, if properly designed, would

include the ability to quickly and accurately identify user needs/requirements. Such a system would also provide information about new/ongoing developments that would be of use to decision makers and to the user community as a whole. Finally, an automated system would offer the potential for providing on-line guidance to users for the purpose of facilitating data collection and report generation. Due to its reliance on a checklist format, this option would be faced with the same challenges as those related to option "B" discussed previously, in addition to the challenges inherent in developing an automated computer system. Also, the potential for providing on-line guidance is made more appealing given that computer applications designed to facilitate decision processes, such as expert systems, already exist.

Regardless of the what format is used to collect data, it is important that the Army user community be able to effectively communicate among themselves and with key personnel within the Army DIS Management Structure. For this to occur, the Army DIS Management Structure should be organized in a way that supports the overall DIS development effort. The current Army DIS Management Structure, presented in Figure 2, was established during the First DIS Data Call. As can be seen from the figure, Functional Area Representatives (FARs) play an integral role in the data collection effort by reviewing and certifying individual submissions, answering questions pertaining to their area of expertise (i.e., Functional Area), as well as by providing needed organization and guidance throughout the data collection process.

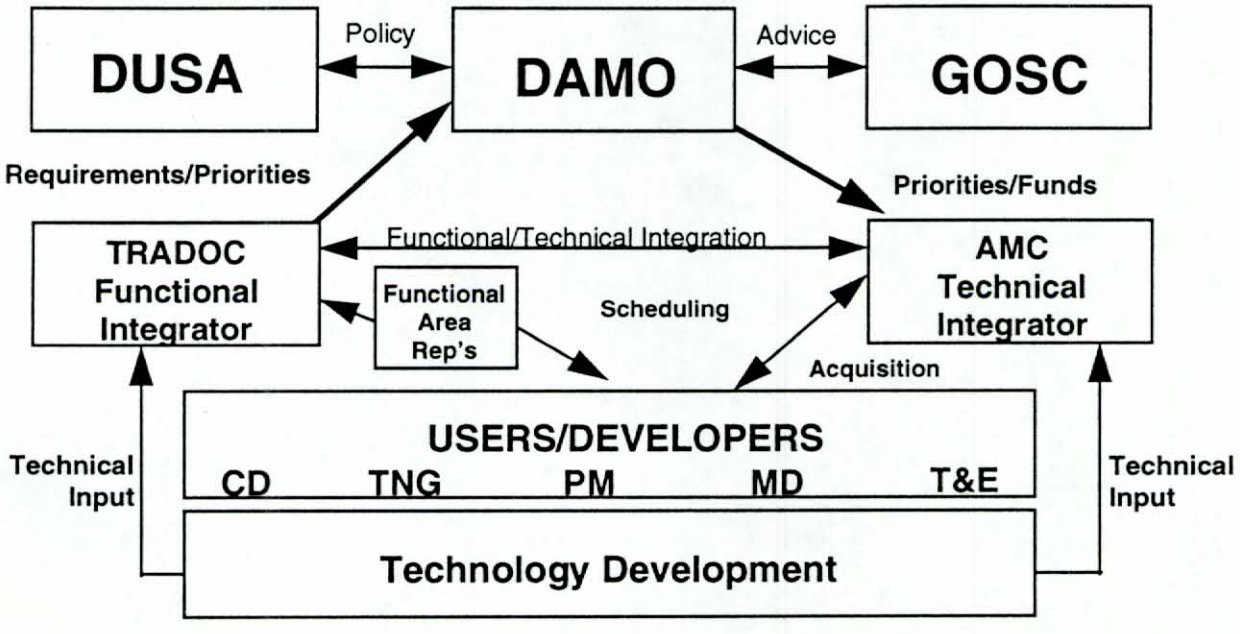

Figure 2. Current Army DIS Management Structure

A unique aspect of the current Army DIS Management Structure is that individual FARs receive and prioritize numerous submissions within their specified Functional Area, including ones they submit themselves. Also, because submissions are grouped according to Functional Area, individual FARs receive submissions from various Army Commands. Thus, each FAR is placed in a potentially awkward position of having to determine the priority level of functional requirements originating within his or her own command (including Requirements based on their own submission documentation), as well as those originating from other commands.

To eliminate potential conflicts by individual FARs, it is recommended that the Army DIS Management Structure be modified to take advantage of existing Army chain-of-command protocol. The position of FAR should be maintained, however, the duties of the FAR should be changed to that of a consultant or advisor.

B. Functional Requirements and Related Issues - It is evident from the combined results of the First and Second DIS Data Call that the operational needs information, once gathered, requires thoughtful analysis for it to be of use when making decisions concerning the future development and use of DIS. Initially, user defined operational needs must be converted into individual functional requirements, and later these requirements must be organized according to some useful taxonomy. As noted previously, functional requirements are the basis for identifying specific technical design specifications used when developing and modifying related equipment, software, and simulations/simulators. Additionally, as DIS is put into use and expanded across the three user Domains of training, RD&A, and military operations, critical outcome information must be collected and analyzed as a means of providing feedback about the overall effectiveness of DIS, as well as the effectiveness of its major components (i.e., architecture, simulation models, data bases, etc.).

The key to setting up an effective system for analyzing DIS related information relies on selecting an appropriate organizational scheme. By their nature, organizational schemes or taxonomies separate complex behaviors, events, etc., so as to facilitate understanding. To be effective, a taxonomy should not distort the behavior, event, etc., to which it is applied, and should organize information into independent (discrete) groupings or categories. For the purpose of DIS, one logical taxonomy involves grouping individual functional requirements into specified functional areas or categories. An initial attempt at describing useful categories was done during the Work Shop Review Panel, as presented in various tables and appendices within this report. These categories, however, are not consistent and in some instances overlap considerably (see for example Appendices E and F).

It is recommended that a formal taxonomy be specified within the Army Modernization Plan that is currently being developed. The purpose of the taxonomy would be to guide future analysis and planning activities involving DIS, both from a functional and technical orientation. This taxonomy should express in clear language the defining characteristics of selected functional categories and include selection criteria that can then be used to place individual requirements into one and only one functional category. Finally, the taxonomy should be broad enough in scope to incorporate functional requirements within each of the three DIS Domains.

Measuring and expressing performance outcomes is also problematic. As DIS is used by a growing number of diverse segments within the military, determining the relative

effectiveness of both warfighting entities (e.g., soldiers, weapons systems, etc.), as well as the effectiveness of DIS technological capabilities (e.g., fidelity levels, modeling characteristics, etc.) becomes increasingly more important. Without a standardized system for measuring relevant performance outcomes, the vision of shared resources, leveraged research findings, etc., that is supposed to be the hallmark of the DIS program is just that; only a vision.

In order to develop a standardized performance measurement system applicable across the three DIS Domains and across the various service branches, we recommend that an assessment center approach be employed. Assessment centers are used in business and industry to determine managerial strengths and weaknesses in order to guide critical human resource decisions (e.g., selection, identify training needs, etc.). While assessment centers often employ a variety of assessment tools, such as standardized personality or intelligence measures, a central assessment center component involves placing participants in simulated work situations. Very often, these work simulations are in the form of scripted role play scenarios in which participants interact with a trained role player. During the role play, trained assessors observe the interactions and rate the participants' performance within the simulation relative to critical managerial skills, such as leadership, decision making, analysis, communication, etc. Skills, as opposed to tasks, are the focus of performance assessment within the simulation because skills are viewed as allowing participants to successfully carry out the various individual tasks. For example, the skill of leadership allows the participant (manager) to provide effective coaching or establish realistic expectations in conjunction with his or her subordinate (who is played by a trained confederate during the simulation). Leadership in this instance is defined as the ability to influence the thinking and actions of others (see also Jacobs & Dempsey, 1993).

In keeping with the general assessment center approach, we believe that by focusing performance assessment on critical warfighting skills, such as leadership, tactical/strategic decision making, analysis, etc., and expanding it to include group performance (e.g., team, unit, etc.), a standardized performance assessment system can be developed that can be applied in a variety of situations and that can incorporate existing and future warfighting systems, tactics, etc. It is recommended that such a system be described in the Army DIS Master Plan that is currently being developed. To provide maximal support to the ongoing DIS program, the system should have the potential to be automated (e.g., placed within a PC environment), and should incorporate wherever possible a checklist format. In addition to describing a standardized performance assessment system, it is recommended that the Army DIS Master Plan describe the process by which operational needs are converted into functional requirements and ultimately become expressed as technical specifications. By describing this process, it is hoped that individuals within each of the DIS Domains will come to appreciate the need for sharing information and resources. Finally, to facilitate the sharing of information, it is recommended that this report and any related decisions or actions involving the Second Army DIS Data Call be communicated in a timely manner to appropriate DIS user/developer groups (e.g., participants of the upcoming 10th Workshop on Standards for the Interoperability of Defense Simulations, etc.).

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APPENDIX A

Summary of First Army DIS Data Call

First Army DIS Data Call

Time Frame:	51 near-term; 104 mid-term; 55 far-term.
Domains:	107 training; 107 analysis; 109 RD&A; 29 other
Category:	66 simulation research; 88 upgrade environment; 76 new functionality, application; 2 others.
Type Simulation:	118 virtual; 55 live; 53 constructive; 12 across all types.
Funding Needs:	45 reported funding needs; Total funding needs was $306M.
Funding Available:	19 reported some funding; Total - $124M.
Classification:	2 unclassified; 1 confidential; 17 secret; 6 top secret & SAPs.
Location:	26 Fort Knox alone; 11 Fort Rucker alone; 17 at both sites.
Supporting LAM:	19 total.
Difficulty:	Requiring significant changes - 100 hardware; 125 software; 97 coms.
Technology:	115 new or undetermined technologies.
Visibility:	16 appear to be high visibility.
Definition:	141 submissions involve construction of new laboratory nodes.
New LabNode:	21 submissions require construction of new LabNodes.
New ComNodes:	6 submissions require construction of new ComNodes.

OVERALL NOTE. The First Data Call did not reach all potential Army users.

APPENDIX B

DIS Operational Needs Form (ONF)

IDENTIFICATION OF OPERATION NEED AND/OR USAGE NEED FOR DISTRIBUTED INTERACTIVE SIMULATION (DIS)

1. **Title.** Self-explanatory.

2. **Origin.** Identify why the need exists. If a higher authority (e.g., JCS, OSD, CINC, HQDA, HQ MACOM) has issued guidance and/or a directive which mandates this need, cite the authority (e.g., DoD Directive, Army Regulation, Test and Evaluation Master Plan (TEMP), program decision memorandum, command directive, etc.). If this need was self-initiated by you or your parent activity, describe its justification in your own terms.

3. **Submitting Activity and Point of Contact.** List the primary and alternative action officer (originator of requirement). Also list the individual in the organization that reviewed the operational need. Provide complete mailing address, E-mail address (if appropriate), PROFS address (if appropriate), fax number (if available), DSN number, and commercial number with alternates.

4. **Timeframe.** Identify when (by month(s) and year) the product is required or the usage must occur. Describe when the effort must be accomplished in order to satisfy the operational need and/or fulfill the usage need. Identify any significant relevant milestones that drive the timeframe of this need. Identify any flexibility in the timeline (i.e. if the project can start anytime during a fiscal year, so indicate).

5. **Funding.** It is very important to fully and accurately identify funding information. It is vital that all funding information be distinguished as to the status of the funds: sunk versus required verses programmed versus available versus unfunded; and the appropriation category and year. If known, identify the amount and type of funds required to fulfill this need. If known, describe the means to which funding shortfalls may be overcome.

6. **Performing Organizations.** If possible, identify the agencies, activities, and/or units expected to be involved in fulfilling this need and /or participating in the required utilization.

7. **Related, Dependent Efforts.** Identify and describe known projects and efforts which are related to this need and/or usage. Indicate whether your need is a prerequisite to other efforts and must be completed before them, whether is must be done concurrently with other efforts, or whether it must wait for another effort to be completed first and cannot begin until then. Indicate if this operational need is a follow-on to an existing or past project and if so, attach a document to describe the /past/on-going project.

8. **Operational Need.**

a. Identify and describe the mission that you must accomplish or a current deficiency that must be corrected. Describe in your own terms the objective that will be met by satisfying this need. Define the need in terms of the mission that you face with respect to your day-to-day job and or a project that must be accomplished. What is the desired result? Why is it relevant to DIS and important to the ARMY? What does it contribute? What is the impact if not met?

b. It is not necessary to define the solution. However, if you have a specific solution in mind, you may identify it as an alternative to assist in more articulating the need.

9. **Deliverables.** Identify in your own terms what you expect to receive as a product when the operation need is met and/or the expected usage takes place. Identify documentation, reports, hardware, software, etc.

APPENDIX C

Major Army Commands Not Submitting ONFs

Major Army Commands

Army Europe

Army Pacific

Army South

Eighth Army

Army Staff Field Operating Agencies

Army Reserve organization

National Guard organizations

Information Systems Command

Army Special Operations Command

Army Intelligence and Security Command

APPENDIX D

Sequential Listing of ONF Submissions With Related General Information

The following is a sequential listing of ONF submissions along with related general information pertaining to that particular program. Numbers correspond to submission numbers presented in the raw data (see Attachment A-1).

Legend:

Domain - DIS Domain
O - Military Operations
R - Research, Development and Acquisition
T - Training

Vision - Consistent with Army's "vision" of DIS
Yes - Consistent with vision
No - Not consistent with vision
TBR - To be returned (to the submitting agency)
Unsure - Insufficient information
Partial - Certain aspects within vision

FAR - Functional Area Representative
ACQ - Acquisitions
CD - Combat Developments
OA - Operations Analysis
SIM - Simulation
SOL - Soldier
T -Training
T&E -Test and Evaluation
TER -Terrain

Elements in Common
1 - Representation of all warfare phases from mobilization through high intensity warfare
2 - A verified, validated & Accredited (VV&A) program
3 - Computer generated forces
4 - All environmental effects including dynamic terrain
5 - Security protection (classified & proprietary)
6 - Interface of classified and unclassified simulators
7 - Standardized databases
8 - Library of common items (data, icons, algorithms, terrain, etc.)
9 - Automated collection/recording system
10 -Transportable DSI nodes
UNK - Valid requirement, but "elements in common" unknown
NA - Not applicable
All - Satisfies all "elements in common"

ID#	Title	Domain	FAR	Elements In Common	Vision
1.	Standardize Data Requirements and Communications for Training and Testing Field Instrumentation Systems	All	SIM	2	Yes
2.	Integration of Threat IR Simulators into DIS	T,R	SIM	3	Yes
3.	Integration of the Threat Radar Adapter Unit into the Virtual Environment	T,R	SIM	3	Yes
4.	Integration of Threat Command, Control, and Communications (C3) Simulators in the DIS Environment	T,R	SIM	3	Yes
5.	Integration of the Threat Directed Energy Weapon into the Virtual Environment	T,R	SIM	3	Yes
6.	DIS Systems Engineering Integration (SEI) Support Services	All	SIM	All	Yes
7.	Visual System Database R&D	UNK	SIM	UNK	TBR
8.	R&D of Terrain Databases for DIS	All	SIM	All	Yes

ID#	Title	Domain	FAR	Elements In Common	Vision
9.	Research and Development for DIS Standards	All	SIM	All	Yes
10.	DIS Testbed	All	SIM	NA	Yes
11.	Implementation of the Absolute Timestamp in DIS	All	SIM	NA	TBR
12.	Research and Development for Real-Time Data Filtering and Compression in Wide Area Simulation Networks	T,O	SIM	NA	TBR
13.	Research for Modeling and Evaluating Different Topologies for the Virtual Network of Distributed Interactive Simulation Architecture	All	SIM	NA	TBR
14.	Development of a Reconfigurable Ground Vehicle Test Bed - Phase I	R	SIM	NA	TBR
15.	Modular Semi-Automated Forces (ModSAF)	All	SIM	3	Yes
16.	Real Time Rotorcraft Flight Simulation Laboratory	R	SIM	NA	No
17.	Intelligent Autonomous Behavior by Semi-Automated Forces in Distributed Interactive Simulation	T,R	SIM	3	Yes
18.	Increasing the Realism of the DIS Battlefield with Semi-Automated Forces Dismounted Infantry	T,R	SIM	3	Yes
19.	Aggregate-Level Simulation Protocol (ALSP)	T	SIM	3	Yes
20.	Warfighter's Simulation 2000 (WARSIM 2000)	T	SIM	NA	No
21.	Dynamic Terrain Testbed Research and Development	T,R	SIM	4	Yes
22.	Integrated Eagle/BDS-D Enhancement	All	SIM	1	Yes
23.	Improved Utilization of Secure Wide Area Communications for Distributed Interactive Simulation(DIS)	All	SIM	NA	Yes
24.	Intelligent Mine Field (IMF) Advanced Technology Demonstration (ATD)	R	SIM	NA	No
25.	Precision Guided Mortar Munitions/Man Portable Fire Control ATD	R	SIM	4	No
26.	DIVERSE/VP-DIS (Distributed Interactive Virtual Environment For Real-Time Simulation Evaluation/Virtual Prototyping for Distributed Interactive Simulation)	R	SIM	NA	No
27.	Generic Smart Indirect Fire Simulation (DIS Version): GENESIS-DIS	R	SIM	NA	No
28.	Target Acquisition ATD	R	SIM	NA	No
29.	Crewman's Associate ATD	All	SIM	1,4	Yes

ID#	Title	Domain	FAR	Elements In Common	Vision
30.	Composite Armored Vehicle Advanced Technology Demonstrator (CAV ATD) Distributed Interactive Simulation(DIS) Operational Needs	R	SIM	4	Yes
31.	Advanced Vehicle Technologies (AVT) Top Level Demonstration (TLD)	R	SIM	10	Yes
32.	Common Ground Station (CGS) ATD	R	SIM	10	No
33.	High Resolution, Real-Time Target Acquisition Demonstrator/ Simulator	R	SIM	NA	TBR
34.	Target Acquisition Ray Tracing Simulation	R	SIM	NA	TBR
35.	The Advanced Vehicle Technologies (AVT) Hit Avoidance (HA) Advanced Technology Demonstrator	R	SIM	NA	Yes
36.	Accurate Depiction of Mine Warfare Capabilities	T	SIM	4	Yes
37.	Accurate Depiction of Detecting, Identifying and Tracking Targets	T	SIM	4	Yes
38.	Hardware Infrastructure	R	SIM	10	Yes
39.	Joint Ammunition Logistics Simulation	R	SIM	UNK	TBR
40.	Combat Model and Simulations Laboratory US Army Logistics Management College	All	SIM	NA	Yes
41.	Anti-Armor Advance Technology Demo	R	TER	4	TBR
42.	Standard Digital Terrain Databases to Support Future Constructive Simulations	T	TER	4	Yes
43.	Upgrade of the Target Acquisition Fire Support Model (TAFSM) to Access, Use and Effect Dynamic Electronic Battlefield Terrain Data	R	TER	4	Yes
44.	Crewman's Associate ATD	R	TER	4	Yes
45.	Theater Missile Defense (TMD) and National Missile Defense (NMD) Distributed Interactive Simulations	R	TER	NA	No
46.	Dynamic Environment and Terrain Modeling in DIS	All	TER	4	Yes
47.	DTAD (Level 1) Digital Terrain Database to Support Future CBS, TACSIM, and TSSCSS Simulations	T	TER	4	Yes
48.	21st Century Land Warrior/Generation II Soldier	R	SOL	NA	No
49.	Advanced Airdrop for Land Combat (AALC) ATD	R	SOL	NA	No
50.	Develop an Army Wide Exercise/Simulation Architecture for General Headquarters (GHQ)	T,O	OA	1	No
51.	LAM Strategic Preparedness and Force Readiness Analysis	T,O	OA	1	Unsure

ID#	Title	Domain	FAR	Elements In Common	Vision
52.	Seminar System/Capability for CSA, Service Components above CINCs (Title 10)	T	OA	1	No
53.	Virtual Reality/Virtual Prototyping	All	OA	1	Yes
54.	VV&A of DIS	All	OA	2	Yes
55.	Advancing the State of the Art in DIS	T,O	OA	All	TBR
56.	Integrate CASTFORM with DIS	O	OA	3	No
57.	Integrate Janus with DIS	R	OA	NA	No
58.	JANUS/EAGLE Interface	R	OA	NA	No
59.	1 Meter DIS	All	OA	4	Unsure
60.	An Enhanced Architecture of Intelligent Computer Generated Forces	All	OA	3	Yes
61.	Combat Service Support Analysis, Experimentation and Evaluation Capability (CSS AE2CAP)	R	OA	1	Yes
62.	Database Library of 3-D Standard Feature Icons	All	OA	8	Yes
63.	DIS Support ACQSIM	R	OA	1	Yes
64.	Electronic Sandtable	T	OA	NA	No
65.	Icons for the Standard Nomenclature Database	All	OA	8	Yes
66.	JANUS Fast Movers	T,O	OA	NA	No
67.	Requirement for Capability to Collect and Analyze Data from DIS Training Exercises	T	OA	9	Yes
68.	Support to Analysis of Brigade/Battalion C2	O	OA	NA	No
69.	Theater Missile Defense (TMD) and National Missile Defense (NMD) Distributed Interactive Simulations	R	OA	NA	No
70.	Enhanced Terrain	R	T&E	4	Yes
71.	Representation of Environmental Factors	R	T&E	4	Yes
72.	Enhanced Simulators	R	T&E	NA	Yes
73.	Improved Semi-Automated Forces (SAFOR)	R	T&E	3	Yes
74.	DIS Validation, Verification and Accreditation Methodology	All	T&E	2	Yes
75.	Improved Computer Image Generator Hardware	R	T&E	NA	Yes

ID#	Title	Domain	FAR	Elements In Common	Vision
76.	Wide Area Mine (WAM) IOTE	R	T&E	4	Yes
77.	Anti-Armor Advanced Technology Demo	R	T&E	NA	TBR
78.	Light Helicopter/RAH-66 Comanche Force Development Test and Experimentation	R	T&E	NA	No
79.	Evolution of DIS Protocols to Support Integration of Theater Air and Missile Defense Simulations	R	ACQ	NA	No
80.	Advanced Tank Armament System (ATAS)	R	ACQ	NA	No
81.	Armored Gun System (AGS) with Advanced 105mm Ammunition	R	ACQ	NA	No
82.	Army TACMS Joint Precision Strike Demo (JPSD) FY94. Army TACMS Preplanned Product Improvement (P3I) Anti-Material (APAM) Engineering, Manufacturing, and Development (EMD) Program FY94-FY95	R	ACQ	NA	No
83.	Intelligent Minefield	R	ACQ	NA	No
84.	Longbow Apache (MDHC) Engineering Development Simulator (EDS)	R	ACQ	NA	No
85.	Sense and Destroy Armor (SADARM) Simulator	R	ACQ	NA	No
86.	PALADIN Simulator	R	ACQ	NA	TBR
87.	Smart Terminally Guided 155mm Projectile Simulator	R	ACQ	NA	No
88.	National Training Center DIS Compatibility	T	ACQ	NA	No
89.	Huntsville Area DIS Compatibility with the Acquisition Process	R	ACQ	NA	Yes
90.	Air-to-Ground Missile System (AGMS) Project Office (PO) DIS Requirements	R	ACQ	NA	No
91.	Comanche Force Development Test (FDT) I and II	R	ACQ	NA	No
92.	Comanche Participation in Anti-Armor Advanced Technology Demonstration (A2ATD)	R	ACQ	NA	No
93.	Javelin	R	ACQ	3,4	Yes
94.	Bradley Stinger Fighting Vehicle	R	ACQ	3,4	Yes
95.	DIS Slides - Not a requirement	---	------	----	-----
96.	Combat Model and Simulations Laboratory US Army Logistics Management College	R	ACQ	NA	Yes

ID#	Title	Domain	FAR	Elements In Common	Vision
97.	DIS Interface to the Advanced Field Artillery Tactical Data System (AFATDS)	R,O	CD	NA	No
98.	Reconfigurable Fire Support Team Vehicle (FISTV)Simulator	R,O	CD	NA	No
99.	Reconfigurable Artillery Cannon Simulator	R,O	CD	NA	No
100	Reconfigurable Artillery Missile Simulator	R,O	CD	NA	No
101	Automated Deep Operations Coordination Cell (DOCC) for Corps and Echelons Above Corps (EAC)	R,O	CD	NA	No
102	Reconfigurable Artillery Resupply Vehicle Simulator	R,O	CD	NA	No
103	Logistics Command System (LCS)	R,O	CD	NA	Unsure
104	Advanced Warfighting Demonstrations(AWD) for Division and Corps Digitization of the Battlefield	R,O	CD	NA	No
105	Combat Model and Simulation Laboratory USA Logistics Management College	R,O	CD	NA	Yes
106	Military Police Distributed Interactive Simulation Cell	R,O	CD	NA	Partial
107	Advanced Rotary Wing Aircraft (ARWA) Initiative for Aviation Test Bed	R,O	CD	NA	Yes
108	Comanche Force Development Test (FDT) I &II	R,O	CD	NA	No
109	Embedding of DIS into Army Lab Nodes	R,O	CD	1	Yes
110	Contributions of Reconnaissance -Integration of Eagle and SIMNET	R,O	CD	1	Yes
111	Aviation Combined Arms Tactical Trainer (AVCATT)	T	CD	NA	No
112	Integration of Dynamic Atmospheric Thermal Environments into Distributive Interactive Simulation	All	CD	4	Yes
113	Embedded Training	T,O	CD	4	Yes
114	Integration of Janus and BDS-D	O	CD	NA	NO
115	Janus/DIS Network Interface	O	CD	NA	NO
116	BBS Interface with AIRNET/SIMNET	O	CD	NA	No
117	The Command and Control Manpower and Personnel Integration (C2 MANPRINT) Laboratory	R,O	CD	NA	No
118	Simulation Information for Training Developers	T	CD	7-10	Yes
119	Patriot/THAAD Reconfigurable Tactical Operations Simulators (RTOS)	T,O	CD	NA	No

ID#	Title	Domain	FAR	Elements In Common	Vision
120	Extended Air Defense Testbed (EADTB)	All	CD	1	Yes
121	Forward Area Air Defense System (FAADS) Modeling Capability	T,O	CD	UNK	No
122	Weapons of Mass Destruction	O	CD	NA	No
123	Prairie Warrior 94	T,O	CD	NA	No
124	Joint Precision Strike Demo	R	CD	NA	No
125	Battlefield Digitalization (Task Force I-70)	O	CD	NA	TBR
126	Corps SAM Future Air Defense System	R	CD	NA	No
127	Ulchi Focus Lens	T,O	CD	NA	No
128	Operation Team Spirit	T,O	CD	NA	No
129	Zen Regard (Warbreaker)	T,O	CD	NA	No
130	European Command Tactical Missile Defense	T,O	CD	NA	No
131	Combat Service Support - Joint Ammunition Logistics Simulation (JALS)	T,O	CD	NA	No
132	Combat Service Support	O	CD	NA	No
133	Intelligent Mine Field (IMF) Advanced Technology Demonstration (ATD)	R,O	CD	NA	Partial
134	Breacher	R	CD	NA	No
135	Countermine Top Level Demonstration	R	CD	NA	No
136	Smoke Model Interface to DIS	All	CD	4	Yes
137	NBC Effects in DIS	All	CD	4	Yes
138	DIS Com Node at Fort McClellan to Support USACMLS and USAMPS	All	CD	NA	No
139	Rotorcraft Pilot's Associate (RPA) Advanced Technology Demonstration (ATD) FY93-98	R	ACQ	1	Yes
140	Multi-Sensor Aided Targeting-Air (MSAT-Air) ATD, FY92-FY95	R	ACQ	NA	Partial
141	Radar Deception and Jamming ATD (FY92-FY95)	R	ACQ	1	Yes
142	Survivable Adaptive System (SAS) ATD (FY91-FY95)	R	ACQ	NA	No
143	Advanced Airdrop for Land Combat (AALC) ATD	R	ACQ	NA	Yes
144	Common Ground Station (CGS) ATD	R	ACQ	NA	No

ID#	Title	Domain	FAR	Elements In Common	Vision
145	Battlefield Combat ID ATD FY94-FY98	R	ACQ	NA	Yes
146	Close-In Man Portable Mine Detector (CIMMD) Advanced technology Demonstration (ATD)	R	ACQ	NA	Yes
147	Bistatic Radar for Weapons (BRWL)Advanced Technology Demonstration (ATD) (FY92-FY96)	R	ACQ	1	Yes
148	Joint Precision Strike Demonstration (JPSD) FY 94-99 Advanced Technology Demonstration	R	ACQ	NA	Yes
149	Line of Sight Anti-Tank (LOSAT) Tech Demo FY93-FY95	R	ACQ	4,3,7	Yes
150	Anti Armor Advanced Technology Demonstration (A2 ATD) FY93-FY94R	R	ACQ	NA	Yes
151	Off-Route Smart Mine Clearance (ORSMC) Advanced technology Demonstration (ATD)	R	ACQ	NA	Yes
152	Total Distribution Advanced Technology Demonstration (TDATD) Schedule for FY 93-97	R	ACQ	NA	Yes
153	Global Grid ATD FY94-99	R	ACQ	4,7	Yes
154	Rapid Force Projection Initiative (RFP) Top Level Demonstration (TLD) FY94-FY99	R	ACQ	1	Yes
155	Intelligent Mine Field (IMF) Advanced Technology Demonstration (ATD) May 1993 to Sept 1996	R	ACQ	NA	Partial
156	Enhanced Fiber Optic Guided Missile Advanced Technology Demonstrations (1QFY94-3QFY97)	R	ACQ	NA	Yes
157	Light Contingency vehicle (LCV) ATD (FY94-99)	R	ACQ	1,3,4,5	Yes
158	Precision Guided Mortar Munition/Man Portable Fire Control ATD (FY94-FY97)	R	ACQ	1,3,4	Yes
159	Scout Sensor Suite ATD, FY94-FY98	R	ACQ	1,3,4	Yes
160	Remote Sentry ATD FY94-FY96	R	ACQ	1,3,4	Yes
161	Advanced Vehicle Technologies (AVT) Top Level Demonstration (TLD) (FY93-99)	R	ACQ	3,4	Yes
162	The Advanced Vehicle Technologies (AVT) Hit Avoidance Technology Demonstrator (ATD)	R	ACQ	NA	Yes
163	Crewman's Associate ATD FY93-95	R	ACQ	1,3,4	Yes
164	Target Acquisition ATD, FY95-FY98	R	ACQ	1,3,4	Yes

ID#	Title	Domain	FAR	Elements In Common	Vision
165	Composite Armored Vehicle Advanced Technology Demonstrator (CAVATD) Distributed Interactive Simulation (DIS) Operational Needs	R	ACQ	1,3,4	Yes
166	Combined Arms Command and Control Advanced Technology Demonstration (CAC2-ATD) DIS requirements (FY 93-FY96)	R	ACQ	3	Yes
167	21st Century Land Warrior Top Level Demonstration	R	ACQ	NA	No
168	Generation II Solider advanced Technology Demonstration	R	ACQ	1,3,4	Yes
169	Advanced Image Intensification (AI2) ATD FY93-FY96	R	ACQ	4	Yes
170	Stingray Electro-Optic Counter Measure (EOCM) Simulation	R	ACQ	1,3,4	Yes
171	Security Standards for DIS	T	T	5,6	Yes
172	Standards for After Action Review Systems	T	T	9	Yes
173	DIS Protocols Linking Live and Constructive Simulations	T	T	1	Yes
174	Standard Digital Terrain Databases to Support Future Constructive Simulations	T	T	8	Yes
175	Battle Simulation Support - XVIII Airborne Corps and Fort Bragg	T	T	9	No
176	The Integration of Differing Simulation Models, (CBS,BBS,JANUS)	T	T	9	Yes
177	Countermine Systems and Related Terrain Needs	R	TER	4	Yes
178	Environmental Effects for Distributed Interactive Simulation (E2DIS)-Environmental Effects and Embedded Processes Task Area	R	TER	4	Yes
179	NATO Reference Mobility Model (NRMM) Mobility Specific Terrain	R	TER	4	Yes
180	ASCO (Advanced Systems Concepts Office)	R	TER	4	Yes
181	Bradely Stinger Fighting Vehicle	R	TER	4	Yes
182	Javelin	R	TER	4	Yes
183	U.S. Army Signal Center and Fort Gordon Distributed Interactive Simulation (DIS) Requirements in Support of SIGGEN Training and Analysis	O,T	OA	1	No
184	Virtual Simulation of Heavy Brigade Operations	O	OA	1	Yes
185	Realistic Command, Control, Communications, Computer and Intelligence (C4I) Nodes in Computer Generated Forces (CGF) or Semi-Automated Forces (SAF)	All	OA	3	Yes

ID#	Title	Domain	FAR	Elements In Common	Vision
186	Combat Support and Combat Service Support Elements in Semi-Automated Forces (SAF)	O	OA	3	Yes
187	Vehicle Performance Modeling and Verification and Validation and Accreditation (VV&A)	All	OA	2	Yes
188	Validation and Certification of System Design Parameters for Operation in Classified and Unclassified Modes	O, R	OA	5	Yes
189	Facility Expansion and Certification for Simultaneous Classified and Unclassified Experimentation	O,R	OA	6	Yes
190	Reconfigurable Simulators	O,R	OA	NA	No
191	Improved Image Generators	O,R	OA	NA	No
192	Horizontal Integration for TF 1-70	T	OA	NA	No
193	Project SWORD Instruction to Saudi Arabian Students	T	OA	NA	No
194	Vehicle Integrated Defense System (VIDS)	O	OA	NA	No

APPENDIX E

Summary of Functional Requirements Broken Down By Functional Categories

The following presents functional requirements broken down by functional categories. They are not in a prioritized order. The requirements listed within each functional category are related to individual requirements submitted by individual users along with the expected delivery date. Numbers in parentheses indicate sequential submission numbers (as presented in Appendix D).

SECURITY

Overview Requirement: Multilevels of security are required in multiple, simultaneous exercises beginning in April 1994.

1. Develop DIS at classified level to support RDA, Military Operations, and Training (# 188).	April 1994
2. Develop DIS at the secret level to support the Rotorcraft Pilots Associate (RPA) ATD (# 139).	4th QTR, 1995
3. Appropriate security level on DIS for large scale training exercises. Being worked by ARPA (# 171).	1st QTR, 1996
4. Multilevel Security in multiple, simultaneous exercises in support of Fort Knox MWTD and MWSTC (# 189).	April 1994

SIGNATURES

Overview Requirement: N/A

1. Thermal, IR jamming, EMI, & lasers (# 71)	September 1995
2. Thermal signatures for features and vehicles (# 140)	1st QTR, 1994
3. Represent full spectrum of threat counter measures (applies to 1 and 2 above) (# 140)	1st QTR, 1994
4. Noise in 3D (# 143)	March 1995
5. The effects of camouflage, concealment, and deception on signatures (# 147)	August 1994
6. Seismic signatures portrayed in munitions concussions (# 151)	1st QTR, 1995

DYNAMIC TERRAIN

Overview Requirement: Improve the interaction between simulation entities and terrain (land; natural and cultural features).

1. Tank ditches - multiple requirements (#46)	October 1995
2. Bomb craters, indirect fire effects - multiple requirements (#43 & #46)	October 1994/5
3. Building/Structural alterations - multiple requirements (#46)	October 1995
4. Vegetation - multiple requirements (#46)	October 1995
5. Bridges - multiple requirements (#46)	October 1995
6. Ability to dig in a fighting position - (# 70)	4th QTR, 1995
7. Rocks; Ability of rocks/terrain to reflect heat and thereby affect multi-spectral sensors (# 140)	1st QTR, 1994
8. Affects of foliage and urban structures on LOS and movement (# 151); and (# 70)	1st QTR 1995 4th QTR 1995

STATIC TERRAIN

Overview Requirement: Improve resolution and realism for fixed terrain features.

1. One meter terrain resolution - (# 59)	4th QTR ,1995
2. Terrain elevations averaged over 25 meters vice 125 meters (# 70); and (# 174)	4th QTR, 1995 1st QTR, 1996
3. Ground LOC's (roads, bridges, railroad, power lines, fences, & antennas) (# 140)	1st QTR, 1994
4. Soil type (sand, clay, dry, wet) (# 151)	1st QTR, 1995
5. 10 Meter terrain resolution (# 154)	2nd QTR, 1996
6. 0.1 Meter resolution for a 6 x 6 km terrain area (# 162)	3rd QTR, 1998
7. Culverts (# 156)	1st QTR, 1994

DYNAMIC ENVIRONMENT

Overview Requirement: N/A

1. Atmospheric Conditions up to an altitude of 30 km (# 162); and smoke, clouds, aerosols, and fogs (# 46).	3rd QTR, 1995 October 1995
2. Fire, explosions, dust, wind blown sand, haze, mist, snow, Humidity (# 46); and Rain (# 71)	 October 1995 September 1995
3. Smoke (# 136)	September 1994
4. Day/Night effects and all variations with moon and stars (# 71)	September 1995
5. Battlefield clutter (vehicles in all states) (# 140)	1st QTR, 1994
6. All "seasons" (# 140)	1st QTR, 1994
7. Artificial and natural illumination (# 145)	3rd QTR, 1994
8. CHAFF (# 147)	2nd QTR, 1995
9. Temperature range - 25F degrees to +125F degrees (# 155)	April 1994
10. Sun glare for varying time of day (# 170)	3rd QTR, 1994

HARDWARE

Overview Requirement: N/A

1. Improved CIGs (vehicles must "fire-on-the-move" and dynamically changing terrain is required) (# 170); and (# 75)	 3rd QTR, 1994 3rd QTR, 1995
2. Four MI simulators, two M2 simulators (# 149)	March 1994
3. Two LOSATs, two NLOS, two Apaches, one Comanche, two AGS, two JAVLINs and four M2 simulators (# 150)	 1st QTR, 1994
4. EFOGM simulator (# 156)	1st QTR, 1994
5. PALADIN simulator (# 158)	June 1995
6. Reconfigurable simulators (FISTV, Artillery Common MLRS, Artillery Resupply Vehicle) (#s 100-105); and ARWA simulators (# 107)	 October 1994 October 1995

STANDARD DATABASES

Overview Requirement: N/A

1. Standard icons to represent natural and man-made terrain features (# 62)	4th QTR, 1995
2. Standard icons and data description for weapon systems, platforms, munitions, and unit symbols (# 65)	4th QTR, 1995
3. Standard terrain DB for desert, northern forest (# 140); and	1st QTR, 1994
Jungle (# 142); and	March 1995
Arctic and tropical (# 145) ; and	2nd QTR, 1994
Farms (# 147); and	2nd QTR, 1995
Coastal and marshes (# 140);	1st QTR, 1994
4. Central Europe, SW Asia, and Central America (# 145)	3rd QTR, 1994
5. North East Asia and South America (# 148)	August 1994
6. Ft Hood terrain database (# 150)	1st QTR, 1994
7. Standard mine database (# 151)	1st QTR, 1995
8. Hunter-Liggett terrain database (# 139)	4th QTR, 1995

COMMUNICATIONS

Overview Requirement: N/A

1. Upgrade SINCGARS (# 151 & # 153); and	1st QTR, 1995
create voice and multimedia PDU's (# 139)	4th QTR, 1995
2. Satellite capability (primarily for intelligence) (# 139)	4th QTR, 1995
3. Data links (real and simulated) (# 139)	4th QTR, 1995
4. Electronic warfare (# 139)	4th QTR, 1995
5. Real time video (# 142)	March 1995
6. Degradable communications (# 142)	March 1995
7. DSI network and nodes to support A2ATD (# 150)	1st QTR, 1994
8. Location fidelity consistent with GPS (# 151)	1st QTR, 1995
9. DSI network and nodes to support TDATD (# 152)	June 1995
10. Identification friend or foe (IFF) (# 158)	June 1995

SCENARIOS

Overview Requirement: Develop a list of DIS compatible scenarios.

1. TRADOC high resolution scenarios 24 and 27 (# 139); and	4th QTR, 1995
TRADOC standard scenario 42 (# 158); and	June 1995
Scenario 29 (# 150); and	1st QTR, 1994
Scenario 30 (# 150); and	March 1995
Scenarios 31,33,38, & 41 (# 143)	March 1995
2. Battalion level scenario with 20 aircraft (SAFOR ok) in a 20 x 20 km terrain box (# 140)	1st QTR, 1995
3. Realistic SAFOR threat (tactical vehicles, rotary wing aircraft with same capability as live entities; 360 degrees mobility and fire control and detection capability for the threat-applies to both static and moving platforms) (# 140)	1st QTR, 1994
4. Brigade through corps battle areas represented with all battlefield functional areas (# 142)	March 1995
5. A 50km x 50km with 30 meter terrain posting including dismounted soldiers (# 143)	March 1995
6. Common ground station (# 144)	September 1995
7. Theater of operation down to brigade-level scenario for common ground station and IEW simulations (# 144)	September 1994
8. Scenario in sufficient detail to provide realistic individual mine warfare and model temporary blindness (# 146)	3rd QTR, 1994
9. NBC (# 145 & # 139); and	3rd QTR, 1994
protective clothing (# 167)	October 1997
10. Post 2005 threat (# 165)	January 1995

HUMAN FACTORS

Overview Requirement: N/A

1. Fatigue, heat, stress, panic, load bearing on human performance (# 154)	1st QTR, 1996

SAFOR

Overview Requirement: N/A

1. Intelligence forces routines (reacts as individual entities); ADA, indirect fire weapons, electronic warfare emitters, sensors, CSS equipment and fratricide effects (# 73)	3rd QTR, 1995
2. SAF man-in-the-loop has appropriate viewpoint and tactics, techniques, & procedures (TTP), and rules of engagement (ROE) from soldier up to brigade (# 73)	3rd QTR, 1994
3. Soviet, Chinese, South West Asia (Iraq, Iran) and Janes' list of OPFORs (# 145)	3rd QTR, 1994
4. Dismounted Infantry accurately portrayed by CGF (# 148 & # 145)	3rd QTR, 1994
5. Battalion level representation by CGF to include T-80s, T-64As, T-72s, BMP-1s and 2s, Hind-Es, M-102s, and Logistics Vehicles (# 149)	March 1994
6. MODSAF at DIS 2.0 Standards (# 150)	1st QTR, 1994
7. Threat counter - mine and full functionality mine capability (# 161)	3rd QTR, 1996
8. Model digital communications in SAFOR (ARPA working) (e.g., IVIS Commo with SAFOR) (# 185)	April 1995
9. CS/CSS functionality into SAFOR (# 186)	April 1995

DATA COLLECTION

Overview Requirement: N/A

1. Data collection for individual-level to battalion-level training assessment (# 67)	4th QTR, 1994
2. Data collection to provide an AAR capability for CSS (# 61); and for WARSIM 2000 AAR (# 172)	3rd QTR, 1995 1st QTR, 1996

SIMULATION FAR

Overview Requirement: N/A

1. Standards for terrain databases for use in constructive simulations (# 42)	1st QTR, 1995
2. Live simulations linkage to constructive simulations (# 147)	2nd QTR, 1995
3. Virtual simulations linkage to live simulations (# 148)	August 1994
4. Live, virtual, constructive simulations linkage (# 173)	1st QTR, 1996
5. TAFSM Interfaced to DIS (# 43)	October 1994
6. Virtual linkage to constructive (# 158)	July 1995
7. DIS interface to the Advanced Field Artillery Tactical Data Systems (AFATDS) (# 97)	December 1994
8. DIS Standard 2.0 for Army DIS Labs at Forts Knox and Rucker (# 109)	March 1995
9. Enhanced play of CSS (# 61)	3rd QTR, 1995
10. "Fast Movers" linked into Janus (# 66)	1st QTR, 1996
11. Theater High Altitude Area Defense (THADD); DIS interface (# 119)	1st QTR, 1994
12. DIS must support 8,000 entities (# 184)	April 1995

VERIFICATION, VALIDATION & ACCREDITATION (VV&A)

Overview Requirement: N/A

1. V&V of simulators (MMI, computational algorithms) (# 74)	3rd QTR, 1994
2. V&V of SAFOR (# 74)	3rd QTR, 1994
3. V&V for vehicle dynamics (failure and mechanical breakdowns) (# 187)	April 1995

APPENDIX F

Summary of Functional Requirements Broken Down By Selected Functional Areas/Categories

ACQUISITION

GENERAL AREA	OPERATIONAL NEED	DELIVERY DATE
ENVIRONMENTAL ENHANCEMENTS	-weather (sleet, snow, rain, etc..); obsurants (smoke, fog, etc..);(93,94)	1QTR, FY96
TERRAIN	-high fidility level II(93,94)	1QTR, FY96
CGF	-a realistic CGF that represents behaviorally and physically a close combat system(93,94)	1QTR, FY96
DIS PROTOCOLS TO SUPPORT TAMDS	-to provide the necessary DIS standards and protocols necessary to implement interoperability between live, virtual and constructive TAMD simulations(79) -expand the protocols to include specific message types and info needed for exchange of TAMD real-time C2 -a need to evolve simulation protocols to permit the interface and interoperability of dissimilar simulations: live, virtual, constructive. -convert interfaces between live, constructive and virtual simulations -a tactical data link translator which allows CADEX to communicate via tactical data protocols on tactical communications networks -embed simulation in tactical operations center -methodology for verifing timing synchronization of message traffic	1QTR, FY94 to 4QTR, FY95

COMBAT DEVELOPMENTS

GENERAL AREA	OPERATIONAL NEED	DELIVERY DATE
ADVANCED FIELD ARTILLERY TACTICAL DATA SYSTEM	-develop a DIS protocol converter between the DIS network and AFATDS (97)	1QTR, FY94
RECONFIGURABLE SIMULATORS	-an easily modified, physically and software wise, reconfigurable Fire Support Team Vehicle (98)	1QTR, FY94
	-an easily modified, physically and software wise, reconfigurable Artillery Cannon simulator that simulates the Paladin or the Advanced Field Artillery System (99)	1QTR, FY94
	-an easily modified, physically and software wise, reconfigurable Artillery Missile Simulator that simulates MLRS, ATACMS, or HIMARS (100)	1QTR, FY94
	-an easily modified, physically and software wise, reconfigurable Artillery Resupply Vehicle simulator that simulates the FARV-A, FAASV, and HEMTT (102)	1QTR, FY94
AUTOMATED DEEP OPERATIONS COORDINATION CELL FOR CORPS & ECHELONS ABOVE CORPS	-a JSTARS ground station simulator (101) -scalability between corps and various EAC -interfaces between different combinations of live, virtual and constructive simulations -collecting and analyzing human-machine performance data -interface/protocol converters between and for TIBS, UAV RVT, FDDM, and AFATD -capability to run real-time with a switchable man-in-the-loop/simulator-in-the-loop/stand alone capability	1QTR, FY94

COMBAT DEVELOPMENTS

GENERAL AREA	OPERATIONAL NEED	DELIVERY DATE
LOGISTICS	-develop and establish realistic logistics play in the synthetic environment (103) -develop and provide the interface for CSSCS linkage to DIS	3QTR, FY95
RECONFIGURABLE SIMULATORS	-an easily modified, physically and software wise, reconfigurable Advanced Rotary Wing Aircraft simulator that simulates FAST, RAH-66, AH-64 Longbow, and OH-58D Kiowa (107) -a visual system module -ability to use SAFOR or MODSAF for real-time or faster than real-time analysis	2QTR, FY94 to 3QTR, FY95
EMBEDDING OF DIS INTO ARMY LAB NODES	-convert both Knox and Rucker from SIMNET to DIS2.0+ protocols (109)	2QTR, FY95
INTEGRATE EAGLE WITH BDS-D SIMULATORS	-develop methodologies and processes for integrating a constructive aggregated model with a virtual distributed simulator (55) -develop and test a set of protocols for use in variable resolution models that link the constructive and virtual domains -a very high resolution soldier-system performance of reconnaissance information gathering and C2 tasks as input to the Corps level battlefield modeling capabilities of Eagle (110)	3QTR, FY94
INTEGRATION OF DYNAMIC ATMOSPHERIC THERMAL ENVIRONMENTS INTO DIS	-provide atmospheric thermal conditions for the synthetic environment to allow soldiers to train and fight with FLIER, IR, and NVG using the same developmental algorithm (112)	1QTR, FY95

RESEARCH & DEVELOPMENT

GENERAL AREA	OPERATIONAL NEED	DELIVERY DATE
TERRAIN	-desert, northern forest (139-170) artic, tropical (145,161,165) -high clutter (trees, rocks, clouds), man-made cultural features (roads, buildings, fences,powerlines,antennas) vehicle hulks (139-170) -1 meter postings (140,155,159,164) -desert, mountain, urban, jungle(139-170) -30 meter posting (143); .25 meter post spacing (145) -high fidelity in S1000 or compatible format with MODSAF, 20 X 20 KM BOX, 400 polygons/sq km, IR textures of at least 12 bit precision (149) -level 2 terrain for Ft Hood and SWA (150) -10 meter posting (154,156,157,158,166-170) -.25 meter postings(160) -10 centimeter resolution (162)	1QTR, FY94
ATMOSPHERES	-FLIR, TV, MILLIMETER WAVE (139-170) -capability to simulate a full spectrum of visual, IR,radar, and noise signatures (139-170)	1QTR, FY94
ARTIFICIAL LIGHT	-flares, muzzle flash, burning vehicles, explosions, fires,missile exhaust, sodium and mercury lights (145,158,159,160)	1QTR, FY94
OPFOR	-threat systems that can move, shoot and communicate, survive and be tactically employed (140) -Chinese,Iraq, Iran (145) -post 2005 side & top attack smart mine (151)	1QTR, FY94

RESEARCH & DEVELOPMENT

GENERAL AREA	OPERATIONAL NEED	DELIVERY DATE
SCENARIO DEVELOPMENT	-company combined arms exercise (139) -battalion level, armed recon/light attack (140) -various lighting conditions (bright sunlight to moonless night) (139-170) -different types of illumination (natural and man-made) (139-170) -HRS 24,25.1,27,29,30,31, 33,37, 38,41 & 42 (139-170) -US Bde vs Rebel Militia Co & Mech Inf Bn (143,154,156,157) -Joint Task Force\Corps level and below; threat post 1997 (148)	3QTR, FY95
ENVIRONMENT	-synthetic environment should simulate sleet, snow, hail, rain , fog (139-170) -capability to simulate soldiers affected by fatigue, heat stress, panic and load (139-170) -simulate dismounted soldiers(157,160,161,167,168,169,170) -capability to simulate target interrogation through MMW IFF/CID (158)	4QTR, FY95
SECURITY	-operate at a secret level security classification (139,157,164) -capability of running various combinations of classified and unclassified exercises (139-170)	3QTR, FY95
ENTITIES	-item to Corps level (139-170)	4QTR, FY95

RESEARCH & DEVELOPMENT

GENERAL AREA	OPERATIONAL NEED	DELIVERY DATE
SECURITY	-a security site survey to certify the simulation system and it's various components to determine current limitations and future design criteria to facilitate classified operations (188)	3QTR, FY94
SIMULTANEOUS EXERCISES	-capability to conduct multiple simultaneous classified, unclassified, or combination of each exercise without security compromise (189)	3QTR, FY94
PDUs	-development and approval for PDUs that include IEW sensor emissions (communication & non-communications), signal, obscurants, and common ground station entity (144) -develop MODSAF 2.0 (150)	3QTR, FY94
MINES	-capability to simulate over 2000 different combinations of conventional and scatter anti-tank, smart, anti-personnel, and non-conventional devices consisting of booby traps, homemade mines, and similiar devices (146,151) -capability to simulate mine detection equipment to include the sensor interaction, radar, IR, magnetic;the aural and visual output; display within display; helmet mounted display; mine/minefield marking and GPS connection for digital input of minefield boundaries; false positive as well as false negative targets; variability of accuracy with soil and weather; detection of tripwires (146,151)	3QTR, FY94

RESEARCH & DEVELOPMENT

GENERAL AREA	OPERATIONAL NEED	DELIVERY DATE
OBSCURANTS	-should accurately simulate all types of obscurants , smoke and dust (139-170) -1-14K visibility, 50-80% /km IR transmission (140) -level 2 obscurants (139 - 170)	1QTR, FY94
COMMUNICATIONS	-should simulate air/ground communications and datalinks (139,148) -should accurately simulate satellite intelligence and electronic warfare (140,148) -a suite of diverse sensors that provides real-time intelligence in the cockpit for mounted forces (141) -a single, cohesive & survivable battlefield system which will allow the transmission of C2 on the move, including voice, data, digital and video imagery (142,153) -capability to simulate wireless communications systems and network protocols for various types of communication modes (142) -capability to simulate the effects of thruput vs delay, bit-error-rate, and comm impairments due to multipath fading and frequency selective fading (142,153) -capability to simulate battle damage assessment (148) -capability to conduct intelligence correlation and analysis (148) -capability to integrate live and actual sensors, weapons, processors, and communications with simulations and simulators (148,151) -DIS network must provide digital C3 in the form of CVCC through SINGARS simulators or directly over the network (149) -capability to simulate real time voice, multi-resolution video and high resolution imagery, and integrated services over mobile and satelite comm systems (153) -voice and digital comm systems up to 10 kms (139-170) -capability to simulate a Bde TOC, Bn, Co and Plt TOCs (166) -capability to rapidly change communications media, protocols, net structure and routing algorithms (166) -all entities for CLW/GEN II should have GPS/Digital compasses and maps for navigation (167)	1QTR, FY94

RESEARCH & DEVELOPMENT

GENERAL AREA	OPERATIONAL NEED	DELIVERY DATE
HARDWARE	-upgrade all simulators, CIG, SAFOR, and terrain databases at Knox and Rucker to a level II fidelity (141,150)	3QTR, FY96
	-DSI connectivitiy at Benning (150)	3QTR, FY95
	-DSI connectivity at U.S. Army Combined Arms Support Command, U.S. Army TEC, CECOM, U.S. Army WES (152,153)	4QTR, FY94
AIRDROP OPERATIONS	-capability to conduct airdrop operations in a DIS environment (143)	4QTR, FY95
INTELLIGENCE	-capability to simulate a ground processing station capable of receiving, storing, processing,, correlating, and reporting/displaying , in Near Real Time, Radar, IMINT, SIGINT, and HUMINT obtained from multiple sensors and processors (144)	4QTR, FY95
VIEWPORT	-capability to detect incoming targets with a 90 degree azimuth field of view (147)	4QTR, FY95
CLOCK	-capability of running real-time or faster than real-time with no noticable transport delays (139)	1QTR, FY94
	-ability to update the synthetic environment 5 times per second (147)	
	-24 hour day environment (159,160	
	-realistic realtime video representation of the .6-.9 micron spectral band of the intensifier(169)	
SAFOR	-need capability to model T80, T72,T64A, BMP 1 & 2, M1, M2, LOSAT, friendly & enemy artillery, and dismounted infantry (149)	2QTR, FY94

OPERATIONS ANALYSIS

GENERAL AREA	OPERATIONAL NEED	DELIVERY DATE
AUTOMATED DATA COLLECTION FROM TRAINING EXERCISES	-provide the capability to automatically collect, analyze, and assess performance data from the individual soldier through brigade level (67) -ability to capture data, down load it into a simulation, and repeat the simulation in real time or faster than real time -ability to isolate variables of choice for data collection and analysis	4QTR, FY94
ANALYSIS OF BDE/BN C2	-a processor that receives the combat state information and translates the vectors into information depending on the echelon to receive the information and the issues being addressed. This processor would capture trigger decisions (68) -a decision processor that uses the info output of the combat state information translator and produces orders for implentation by lower units -a processor that could receive the orders and take action -a feed-back mechanism that captures cause and effect relationships between execution and closure	4QTR, FY95
JANUS FAST MOVERS	-provide analysis and summary of investigation/research of seamless integration of Janus with virtual fixed wing simulation (66) -provide a realistic portrayal of fixed and rotary wing aircraft characteristics for the Janus model and semi-automated forces	1QTR, FY96

COMBAT DEVELOPMENTS

GENERAL AREA	OPERATIONAL NEED	DELIVERY DATE
EMBEDDED TRAINING	-capability to replicate threat radar, infrared, ultraviolet and laser systems (113)	4QTR, FY94
C2 MANPRINT	-a synthetical capability to simulate an operationally and synergistically effective tactical operations center for the aviation brigade, battalion and separate company (117)	2QTR, FY94 to 4QTR, FY96
DIS COMPLIANCE	-provide the interface to make Patriot and THAAD simulators DIS compliant 119)	4QTR, FY94
EXTENDED AIR DEFENSE TESTBED	-requisite software to enable the EADTB to become DIS compliant (120) -a synthethic environment that is object-oriented, data-driven, open-ended, symmetric, and interactive; that allows anti-tactical ballastics missile defense operations, satellite-ground and air-based sensors, land-based and sea-based air operations, explicit, adaptive C3I, atmospheric and terrain phenomena.	4QTR, FY95
COMBAT SERVICE SUPPORT	-provide capability to simulate ammunition supply, missile system maintenance, EOD and TMDE support (132) -interface with Standard Army Ammunition System; impose controlled supply rates; exercise automated Class V architecture; determine ammunition transportation requirements -simulate number of unexploded ordnance incidents requiring support; number of requests for EOD support; how often are area denial munitions encountered -simulate TMDE support; type of supported weapon system; diagnostic time; repair time; reliability of TMDE	3QTR, FY96

COMBAT DEVELOPMENTS

GENERAL AREA	OPERATIONAL NEED	DELIVERY DATE
ENGINEER OPERATIONS	-capability to simulate in the synthetic environment engineers breeching natural obstacles (streams, dry gaps, tree falls), simple obstacles (wire, craters, berms, abatis, minefields) and complex obstacles (any combination of simple and natural) (134)	4QTR, FY97
DYNAMIC TERRAIN	-capability to simulate in the synthetic environment natural obstacles (streams, dry gaps, tree falls), simple obstacles (wire, craters, berms, abatis, minefields) and complex obstacles (any combination of simple and natural) (134)	4QTR, FY95
SMOKE	-develop smoke PDUs for the synthetic environment (136) -ensure all types of smoke are represented	4QTR, FY94
NBC	-develop NBC PDUs for the synthetic environment (137) -ensure accurate portrayal of weapons of mass destruction	4QTR, FY94
COMMUNICATION NETWORKS	-local area networks that provide a minimum of 8,000 entities (objects, vehicles, aircraft,etc) per demonstrated exercise (184)	3QTR, FY94
SAFOR	-a realistic Command, Control, Communication, Computer and Intelligence SAFOR (185) -SAFOR elements that are responsive to digital messaging systems covering the BOSS with emphasis on IVIS, AFATADS, and ATHS -must adequately portray the CSS vehicles and equipment; requirement to perform key functional capabilities on the battlefield interactively with other SAFOR or manned simulators (186)	3QTR, FY94

COMBAT DEVELOPMENTS

GENERAL AREA	OPERATIONAL NEED	DELIVERY DATE
SECURITY	-a security site survey to certify the simulation system and it's various components to determine current limitations and future design criteria to facilitate classified operations (188)	3QTR, FY94
SIMULTANEOUSLY EXERCISES	-capability to conduct multiple simultaneous classified, unclassified, or combination of each exercise without security compromise (189)	3QTR, FY94

OPERATIONS ANALYSIS

GENERAL AREA	OPERATIONAL NEED	DELIVERY DATE
VV&A	-develop, test, and document the DIS integrated verification process to include network traffic system integrity, simulation compatability, new protocols, certification methods for data consistency among simulators/simulations, and an evaluation of the effectiveness and completeness of the process (54)	2QTR, FY94 to 4QTR, FY95
	-develop, test, and document the DIS integrated verification process for the intended use	2QTR, FY95 to 4QTR, FY95
	-recommend accreditation procedures for large scale, joint, distributed applications	4QTR, FY95
	-complete VV&A implementation guide	4QTR, FY95
INTEGRATE JANUS INTO DIS	-complete and more adequate quantification of human target acquisition (57) -results will enhance the surveillance and target acquisition algorithms -provide the groundwork for semi-automated forces	3QTR, FY94
INTEGRATE EAGLE WITH BDS-D SIMULATORS	-develop methodologies and processes for integrating a constructive aggregated model with a virtual distributed simulator (55) -develop and test a set of protocols for use in variable resolution models that link the constructive and virtual domains	3QTR, FY94
INTEGRATE JANUS WITH EAGLE	-provides the basis for a smooth transition from the aggregate to disaggregate to virtual simulators (58) -provides the interface that takes the output from Janus and EAGLE to DIS and vice versa	3QTR, FY96

OPERATIONS ANALYSIS

GENERAL AREA	OPERATIONAL NEED	DELIVERY DATE
1 METER TERRAIN	-provide object-oriented, near-reality database and 3d view perspective (59) -a more realistic representation of terrain features viewed in their actual location -increased target identification	1QTR, FY96
INTEGRATE JANUS INTO DIS	-complete and more adequate quantification of human target acquisition (57) -results will enhance the surveillance and target acquisition algorithms -provide the groundwork for semi-automated forces	3QTR, FY94
CSS AE2CAP	-initial condition computerized data templates for input of CSS data during the warfight setup phase (61) -interactive DIS send/receive capability for responding to warfight dynamics (changes in combat and combat support state variables) with CSS responses (changes in CSS state variables) -automated collection of simulation events (warfight environmental conditions, CSS requirements and response transactions) for post-processing analysis	4QTR, FY94
DATABASE LIBRARY OF 3D STANDARD FEATURE ICONS	-develop a database library of standard icons to represent terrain features that support a single real world view in a DIS environment (62) -focus on terrain features that affect movement, concealment, intervisibility	3QTR, FY94
ICONS FOR STANDARD NOMENCLATURE DATABASE	-provide a point and click graphic user interface to present weapon system data map unit symbols, and standardized icons of systems visually represented in models and simulations (65)	3QTR, FY94

OPERATIONS ANALYSIS

GENERAL AREA	OPERATIONAL NEED	DELIVERY DATE
GENERAL HEADQUARTERS	-a title 10 laboratory (equivalent of a CTC) (50) -integrate and represent the peacetime/wartime mobilization, deployment, and warfighting procedures/actions -develop a game plan for implementation above	3QTR, FY96 1QTR, FY94
LAM STRATEGIC PREPAREDNESS & FORCE READINESS ANALYSIS	-develop an army model that allows strategic preparedness and force readiness analysis to be modeled (51) -interfaces with real world hardware, real world databases (class & unclass); modular design; item system resolution; individuals manned or unmanned; HQ staff represented at functional level as separate actors; individual staff functions either manned or unmanned; voice message, digital communication; real time or faster speeds; cause and effect analysis capability; telescoping to allow closer examination of units; user friendly AAR that is quick, fully automated data collection on either real or simulated actors, automated data reduction into standard statistical forms	2QTR, FY95
SEMINAR SYSTEM FOR CSA	-develop and build a battlefield/combat seminar trainer (52) -capability for HQDA and CSA to run or see the results and effects of TRANSCOM, FORSCOM, and AMC models and simulations	4QTR, FY96
VIRTUAL REALITY/VIRTUAL PROTOTYPING	-develop a virtual reality capability that allows modeling the system and subsystems engineering and physical science characteristics; views the system and subsystem in 3d; move inside the system for soldier suitability; conduct human factors assessments; perform engineer and developmental type tests; investigate the ram, sustainment and logistics issues; integrate virtual reality (engineering science level of detail) for CD and soldier in the loop evaluations (53)	3QTR, FY95

RESEARCH & DEVELOPMENT

GENERAL AREA	OPERATIONAL NEED	DELIVERY DATE
TEMPERATURE	-variance between -25 to +125 degrees F (139-170)	3QTR, FY94
SIGNATURES	-acoustic signatures and propagation, seismic signatures and propagation (139-170)	3QTR, FY94
VISUAL SPECTRUM	-4 inch cell or better (155)	3QTR, FY94
WEATHER	-dynamic, high fidelity weather including temperature and wind speed v.s. altitude profiles (162,165) -battlefield conditions;wind velocity as a function of time(162,165)	3QTR, FY94
ENVIRONMENT	-dynamic, holes created by explosive charges with update rates on the order of seconds (162,165)	3QTR, FY94

RESEARCH & DEVELOPMENT

GENERAL AREA	OPERATIONAL NEED	DELIVERY DATE
TERRAIN	-capability to simulate and depict dynamic terrain,i.e. terrain changes the way real terrain changes after events like plowing, digging, explosions, etc...(163) -polygonyal terrain that handles digitized data (163)	1QTR, FY94

TERRAIN

GENERAL AREA	OPERATIONAL NEED	DELIVERY DATE
ENVIRONMENTAL EFFECTS	-DIS environment that supports the use of MMW radar, laser range finders, and 2nd GEN FLIRS (178) -radiation hazards from active sensors -capability to communicate through Army standard radios -be able to send and receive voice and digital data -communicate ground-to-ground, ground-to-air, and air-to-ground -common terrain databases (NTC,JRTC,CMTC)	2QTR, FY94
NATO REFERENCE MOBILITY MODEL	-mobility specific terrain (179)	4QTR, FY94
STANDARD DIGITAL TERRAIN DATABASES	-a set of standards for terrain databases to support constructive simulations (42)	1QTR, FY95
DYNAMIC ELECTRONIC BATTLEFIELD TERRAIN DATA	-upgrade TAFSM to access, use, and effect this terrain (43) -develop standard DIS protocol data units -ability to send dynamic updates via DIS as TAFSM events effect the terrain (craters, destroyed terrain features, etc...	1QTR, FY94
THEATER AND NATIONAL MISSILE DEFENSE	-data from distributed sensors and simulators at high bandwidths must be time synchronized for data fusion (45)	1QTR, FY96

TERRAIN

GENERAL AREA	OPERATIONAL NEED	DELIVERY DATE
DYNAMIC ENVIRONMENT AND TERRAIN MODELING	-environmental effects include atmospheric and smoke clouds, dust atmospheric and aerosol fogs, fire, smoke, explosions, and haze (46) -dynamic terrain includes tank ditches, bomb craters, building/structural alterations, and ability to modify terrain/vegetation	4QTR, FY94

TEST AND EVAL

GENERAL AREA	OPERATIONAL NEED	DELIVERY DATE
TERRAIN	-exact replication of existing terrain (photographic quality) (70) -terrain resolution where elevations are averaged closer than 125 meters -3D foliage and buildings -more realistic effects of cross-country traveling on vehicle speeds -ability to dig-in positions (dynamic terrain)	3QTR, FY95
ENVIRONMENTAL FACTORS	-varying light levels (day,night,dusk,dawn,etc..) (71) -weather conditions like dust, haze, fog, rain, and snow -electro communication jamming for both blue and red forces -smoke on the battlefield, -representation of laser effects	3QTR, FY95
SIMULATORS	-simulators that closely represent actual vehicle performance characteristics(72) -must exactly replicate hardware functions and crew interactions like an actual system -reconfigurable with minimal changes to software or hardware -vehicle simulators must respond to changes in soil type/cone index and gradients -vehicle movement sensation platform -development of high fidelity simulators for air defense, indirect fire, engineers, sensor system, countermeasure devices, and threat .	1QTR, FY95
VV&A	-methodology for V&V of simulators, including man-machine interface and computational algorithms (74) -SAFOR, to include interaction with manned simulators,man-in-the loop simulator perception of SAFOR, correct algorithms	3QTR, FY94

TEST AND EVAL

GENERAL AREA	OPERATIONAL NEED	DELIVERY DATE
SAFOR	-same performance methodologies as manned simulators (73) -intelligence for CIG routines that allows SAFOR to move and react as individual entities -development of pre-blessed rules of engagement, tactics, doctrinal responses accessed by SAFOR controlled during battle -capability for fratricide -methodology that allows SAFOR to more closely replicate vehicle dynamics -computer image graphics that replicates the profile and coloring of the actual vehicle/system -increased number of SAFOR operators -evaluation of proper mix of SAFOR to manned simulator	4QTR, FY95
CIG HARDWARE	-improved to much greater than 48 vehicles and/or battlefield activities (mirror actual battlefield activity)(75) .	4QTR, FY95

TRAINING

GENERAL AREA	OPERATIONAL NEED	DELIVERY DATE
SECURITY	-a set of security standards and PDUs (71)	1QTR, FY96
AAR	-a set of standards for AAR systems to support training events involving live, virtual and constructive simulations (172)	1QTR, FY96
LINKAGES	-a set of PDU standards for linking constructive and live simulations (173)	1QTR, FY96

ATTACHMENT A-1*

Raw ONF Submissions for Second DIS Data Call

(*Note: Due to possible restrictions involving the distribution of information contained in this attachment, copies of the raw ONF submissions must be obtained through STRICOM.)