

**Battle Command Training Program (BCTP):
Database Specification**

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13. ABSTRACT (<i>Maximum 200 words</i>) The Combat Training Centers (CTCs) have two missions: -Provide tough, realistic combined arms training in which the unit to be trained must exercise all of the battlefield operating systems (BOSs) in accordance with AirLand battle doctrine. -Provide a data source for training, doctrine, organization and equipment improvement. The BCTP is considered to be a CTC, specializing in training exercises for command staff training at the Brigade, Division and Corps levels. These training exercises, known as Warfighter Exercises (WFXs), and the system that supports them, are described extensively in supporting reports, described in the references section of this report. The purpose of this document is to describe how the data from rotations at the BCTP will be integrated into the databases at the CTC Archive at ARI-POM.				
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BATTLE COMMAND TRAINING PROGRAM DATABASE SPECIFICATION

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**BATTLE COMMAND TRAINING PROGRAM
DATABASE SPECIFICATION**

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Battle Command Training Program Database Specification

Background

The Combat Training Centers (CTCs) have two missions:

- Provide tough, realistic combined arms training in which the unit to be trained must exercise all of the battlefield operating systems (BOSs) in accordance with AirLand Battle doctrine.
- Provide a data source for training, doctrine, organization and equipment improvement.

In fulfilling the first mission, the CTCs generate information that can be used to fulfill the second mission. They record the performance of the unit being trained with respect to various processes (e.g performance of tasks) and outcomes (e.g. battle damage assessments), which provides feedback to the unit about the efficacy of its home station training program. This same information, gathered on a series of units over time, can be used to make inferences about the overall status of training, doctrine, organization, leadership, materiel, and soldier services (DOTMLS).

The Army Research Institute for Behavioral and Social Sciences (ARI) is tasked to maintain archives and databases concerning performance at the CTCs in its Field Unit at the Presidio of Monterey (POM). These databases and archives are used to support the second mission of the CTCs.

The Battle Command Training Program (BCTP) is considered to be a CTC, specializing in training exercises for command staff training at the Brigade, Division and Corps levels. These training exercises, known as Warfighter Exercises (WFXs), and the system that supports them, are described extensively in supporting reports, described in the references section of this report. The data that are generated by these exercises are of particular interest to the Field Unit of ARI at Ft. Leavenworth which is tasked to examine issues concerning Command and Control.

Presently, data generated by the BCTP exercises are not part of the ARI-POM Archive data base. The purpose of this report is to establish the framework for integrating the BCTP data into the data base at ARI-POM. The primary advantage to integrating this data into the ARI-POM Archive would be that all echelons operating at the tactical level (see TRADOC PAM 11-9, *The Blueprint of the Battlefield*) would be incorporated into this Archive. Thus, a problem with a tactical-level system (i.e. one of the BOSs) can be examined throughout all the relevant echelons.

Objective

The purpose of this document is to describe how the data from rotations at the Battle Command Training Program (BCTP) will be integrated into the databases at the Combat Training Center (CTC) Archive at ARI-POM.

Overview

Previous work on the development of a BCTP database has identified several sources of information from BCTP that would be of interest to analysts (Briscoe and Burkett, 1993). This document gives details on how those sources will be incorporated into various databases at the CTC Archive. Each BCTP source is examined, and the steps needed to incorporate that source into the records-keeping and database systems in the CTC Archive are described.

We were not successful in obtaining examples of these data types,¹ so the descriptions given below are based on information obtained through informal and formal interviews with BCTP personnel. One of the first tasks to be accomplished under any continuation of this work will be to examine the data from a small set of rotations to determine whether the procedures described in this document are, in fact, applicable and feasible.

Three types of materials are received from the CTCs: Physical materials that must be catalogued and shelved for access by analysts; electronically recorded material that must be catalogued and placed into the appropriate electronic database; and physical materials from which data must be extracted for input into an electronic format, which is then incorporated into an electronic database. The physical materials are maintained in an area that permits three years of data to be accessed readily by using a shelf location system described in handbook/guidance materials available at the Archive. The electronic databases are intended to be available permanently. The Archive also makes available training materials designed to instruct new users in the use of the tools for information retrieval and analysis that are available at the Archive, or through remote access.

In addition, the CTC Archive creates three other databases that coordinate data from multiple sources forwarded to the Archive from each of the CTCs: The Mission Critical Event Sheet (MCES), the Training Research Automated Catalog System (TRACS), and the Battle Damage Assessment Database (BDA). This document presents information about how these databases can be developed from BCTP data so that analysts can use the same systems for identifying applicable missions and computing certain high-level measures of performance (e.g. casualty exchange ratios), no matter what CTC they are examining.

¹ The intervention in Somalia required the attention of personnel at CALL and BCTP, diverting resources from attending to our requests for information. Concerns about the sensitivity of the data required considerable attention to removing references to units and personnel that could not be accomplished with the resources available.

The remainder of this document is divided into two sections. In the first section, we discuss the data that could be made available from BCTP and show how it can be incorporated into the physical holdings and databases at the CTC Archive. In the second section, we discuss how data from the BCTP can be used to feed the Archive databases that provide overall access and summary performance measures for use by analysts in identifying missions.

Data Available From BCTP

OC Observations: In the past, the OCs at the BCTP have used a simple card system to record observations about the performance of the unit being trained during the WarFighter Exercise. A similar card system was used in the project *Determinants of Effective Performance of Combat Units at the National Training Center* (Keesling, Ford, O'Mara, McFann, and Holz, 1992). The OC circles choices and fills in blanks to identify the unit, the type of mission, the date, the location, and the BOS. Then, he records his comment. In the Determinants project these comments also included systematic ratings of performance on BOSs or tasks that were completed at the end of each mission. JRTC currently uses a system in which OCs rate the units at the end of the rotation on the performance of tasks taken from the Training and Evaluation Outlines in the Army's Mission Training Plans. Although the OC observation system is not currently used very systematically at BCTP, we believe it could become a very useful source of material for analysis and recommend that it be reinstated. In Appendix C, we provide a database structure for information that would be taken from such a card system. The structure links the observations to the *Blueprint of the Battlefield* (TRADOC PAM 11-9) at the tactical level.

Automated Journal System (AJS): This system has been used to develop a database from the OC Observations. Since the OC Observations are not used systematically, this system is not used routinely at BCTP. It may be possible to use this system to obtain information about past WFXs so that we can develop databases containing historical information about OC Observations. Some time will have to be devoted to determining whether it is feasible to convert these data into the framework we are proposing for the OC Observation Database (see Appendix C).

Final Exercise Report (FER): The Final Exercise Report is like the Take Home Package (THP) provided from the other CTCs. The paper copy of each THP is catalogued and shelved for ready access in the Archive. The National Training Center (NTC) and the Joint Readiness Training Center (JRTC) also forward electronic copies of their THPs. These are entered into a database, expediting the retrieval of information about unit performance. This information is organized by Battlefield Operating System, Mission and Echelon. Additional details concerning the THP database are given in Appendix B.

The FERs from BCTP will be treated in the same way. The paper copy will be catalogued and shelved, with an expected accessibility of three years. If an electronic copy can be obtained on a routine basis, then this should be stored in a database like those used for the NTC and JRTC THPs. The exact structure of the FER will have to be examined to determine how best to

automate the creation of an electronic database for this information. Historical data may be available in the FER database created and maintained by CALL.

Proficiency Sustainment Package (PSP): This is a paper-based report sent to the unit after it has completed its BCTP exercises. The report contains information about unit strengths and weaknesses and suggests training activities that would enable the unit to build on what it learned at BCTP. Sometimes information of this nature is included in the Take Home Packages provided by the other CTCs. BCTP is the only CTC that produces a stand-alone PSP. This data source will be treated as an augmentation to the unit's FER and be catalogued and shelved beside it in the Archive.

Battlefield Intelligence Collection Model (BICM): This system is used to simulate intelligence operations in the context of the WarFighter Exercise. The command staffs of the opposing forces each input to the system the nature of their intelligence assets and directions for deploying them. BICM then models deployment of these assets (as well as counter-intelligence actions) and determines what information they would be able to gather and send to their headquarters. This system is unique to BCTP and could provide very interesting information about the use of intelligence assets in large-scale engagements.

It was not possible to determine whether this system maintains a complete record of all input and output transactions that can be retrieved at the end of the exercise. This information could be used to develop a database that would be unique to BCTP. There is a report available in hardcopy format from BICM:

Intelligence Journal System (IJS) is an automated, paper-based report from BICM on the activities of the intelligence assets on the battlefield.

For the present, pending receipt of other information about what can be retrieved from the BICM, the IJS reports will be treated as material that will be catalogued and shelved for each rotation. The hardcopy format will require considerable analysis by subject matter experts to develop any lessons learned or trends. If a data tape containing the information about the deployment of intelligence assets, counter-intelligence actions, and intelligence reports can be obtained from BICM, then the IJS reports may not be needed because it should be possible to recreate them on demand.

If the data described above are not available from BICM at this time, it may be worth some additional effort in the future to gather and record information in electronic format about the actual deployment of assets and what they can 'see' in order to support ARI research projects such as the 'Commander's Visualization of the Battlefield'.

Corps Battle Simulation (CBS) Data Tapes: These data tapes contain the information about the movement of all forces and the resolution of engagements throughout the course of the WarFighter Exercise. At present, the CTC Archive does not have a way to read the data on these tapes. However, the CBS runs on a VAX computer system and there is a VAX computer

available at the CTC Archive. This should make it possible to read these tapes if the data structure can be described to programmers at the Archive.

The availability of position/location data for the forces throughout the exercise should make it possible to replay the battle graphically. Programmers at the CTC Archive have applied this technology to the data obtained from the NTC, allowing analysts to conduct graphic replays of battles on inexpensive PC systems. Again, if the structure of the data on the CBS tapes could be provided, it might be possible to develop a similar capability to replay BCTP missions.

There are two other kinds of information extracted from the CBS at BCTP that are available in hard-copy format:

Analyst Generated Data:

This consists of reports and graphics related to unit performance (e.g. casualty exchange ratios) that the analysts extract from CBS on an occasional, irregular basis.

WarFighter After Action Report System (WAARS):

These are computer listings that appear to be 'dumps' of the data contained in the CBS.

If the structure of the data on the CBS tapes can be provided, it should be possible for programmers at the CTC Archive to develop software that would provide for the capability to replicate the Analyst Generated Data as well as the WAARS. The advantage to the analyst at the Archive would be that he or she could generate a series of reports representing a time sequence of interest for the purposes of analysis, rather than relying on the analysts at BCTP to have created reports at those exact times. Furthermore, it would obviate the need to maintain large quantities of hardcopy material in the Archive: Desired reports could be generated on demand from electronic databases. These reports could be tailored to the question/issue of interest, which should further reduce the amount of paper required for each one.

Unit and OPFOR-generated data (plans, orders, etc.): The CTC Archive receives similar data from the other CTCs. At this time, the CTC Archive uses an optical scanner to create electronic images of three items from each mission (when these are available):

- The Task Force OPORDER
- The Execution Matrix
- The Task Force Overlay

It is likely that there are equivalent documents produced for an exercise at the BCTP and these can be scanned into electronic images and stored in databases, as are their counterparts from the other CTCs. The software for retrieving these images will have to be modified to incorporate pointers to the BCTP files, which is not difficult to accomplish.

While OPFOR graphics from any of the CTCs are not scanned at present, it might be useful to have these graphics available in electronic form.

After-Action Review (AAR): As with the other CTCs, the AARs conducted at BCTP are documented on video tape and paper. At the CTC Archive, this material is catalogued and shelved for retrieval by analysts. The BCTP materials will be treated similarly.

White Cell Directives: These items are generated when the BCTP Commander wants to alter the flow of action (to improve the training quality of the exercise). These are in paper format (although some version of this information may be in the CBS tapes). Information of this nature will be critical to developing the MCES (Mission Critical Event Sheet: a data gathering system used at the Archive across all missions at all CTCs). After the data needed for the MCES has been extracted, the White Cell Directives will be catalogued and shelved for use by analysts at the Archive.

Databases Created at the CTC Archive to Facilitate Analysis

Mission Critical Event Sheet (MCES): Brings together information about each mission conducted at each CTC, including: The rotation, the mission sequence number, the type of mission, the task force organization, the terrain on which the battle was fought, and the times at which critical events took place. An example of a Mission Critical Event Sheet is presented in Appendix A.

Information to complete an MCES on each mission conducted during a WFX would be derived from the FER, the AARs, White Cell Directives, and from the CBS (if the structure of the data can be provided to the CTC Archive). Standard MCES completion procedures applied to other CTCs would be applied to the data from BCTP.

Training Research Automated Catalog System (TRACS): An overall guide to the information available about each mission within each rotation from all of the CTCs. It contains the information in the MCES and is capable of identifying what supporting information is available in other databases (e.g. graphics, replays, etc.). This system is used to identify missions that can contribute information to the development of a particular analysis.

Information to complete a TRACS entry for each mission would be derived from the MCES and from the completion of other databases such as Graphics, Replays, and BDA. Standard TRACS completion procedures would be applied to BCTP data.

Battle Damage Assessment (BDA) Database: This database is used to derive information about casualty exchange ratios, effectiveness of weapon systems, etc. At the 'dirt' CTCs (NTC, JRTC, CMTC) there are real troops maneuvering on the ground and the OCs must report starting strengths and losses for both the BLUFOR and OPFOR (at NTC they also attribute the losses to particular weapon systems used by the other side).

In the case of the NTC, this information is usually presented in the Take Home Package (THP), but is sometimes only available in the After Action Report (AAR) video or paper materials. In the case of the JRTC and CMTC, these data are extracted from the THPs and input into the BDA database (described by Baldwin and Gower, 1992).

The development of a parallel database for BCTP data depends upon whether this information is recorded in the FER, or can be derived from the CBS. Since the troops only exist in the simulation, the extent of the data about the combat systems (e.g. combat vehicles such as M1A1 tanks) starting a mission, those damaged and destroyed, and the reasons for those losses (e.g. which enemy system caused the damage) may be limited. An early task under any follow-on work should be to determine whether suitable information to fill a BDA database can be derived from the BCTP data sources.

References

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Appendix A

MISSION CRITICAL EVENT SHEET

CTC:	NTC	MISSION ID:	N901-V14
ROTATION:	90-1	MISSION SEQ:	02
MISSION:	Hasty Attack	ECHELON:	TF
DATE:	14 Oct 1989	FORCE TYPE:	CAV (V)
TERRAIN:	OP 2	HISTORY:	Mech

Task Force Mission: 2/3 ACR attacks along Axis Ajax 140630 Oct 89 to seize OBJ JILL in order to rupture the enemy security zone and destroy enemy security zone elements; continues the attack along Axis Ajax to seize OBJ KIWI; on order, continues the attack to PL MARRIN to seize OBJ PEAR.

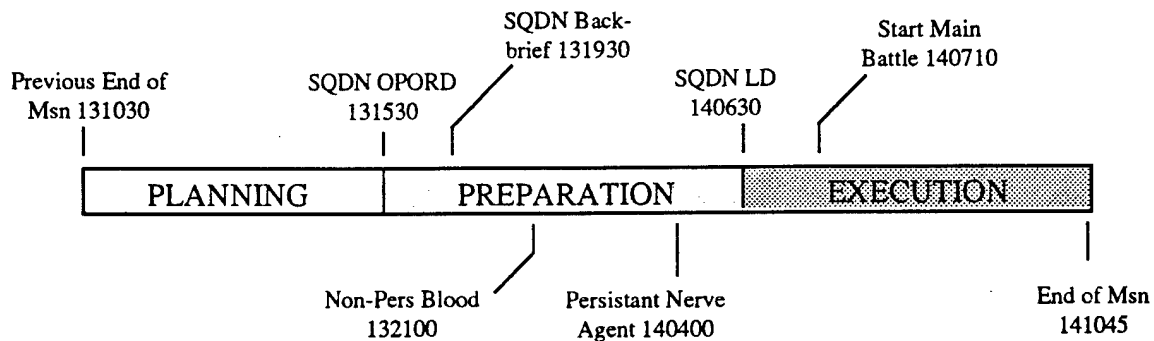
Mission Performance: The squadron was "piecemealed into an MRP fire sack" and "was defeated in detail."

Task Organization:

<u>TF A/299 Eng (-)</u>	<u>E/2/3 ACR</u>	<u>F/2/3 ACR</u>	<u>G/2/3 ACR</u>
FAC Team	2 Sct Plt	2 Tk Plt	2 Sct Plt
	2 Tk Plt	2/43 Eng	2 Tk Plt
<u>H/2/3/ACR</u>	1/A/299 Eng	2/3/B/5-62 ADA (s)	3/A/299 Eng
2 Sct Plt	1/3/B/5-62 ADA (s)	2 Tm/GSR Tm/66 MI	3/3/B/5-62 ADA (s)
2 Tk Plt			
4/3/B/5-62 ADA (s)			
SQD/A/299 Eng			

BATTLE FLOW EVENTS

(Hasty Attack - 14 Oct 89)



Appendix B

THP Database Description

The THP Database System consists of two components -- individual ASCII files with names assigned to reflect their contents and software which allows users to access individual or individual files by specifying categories.

The file names consist of two parts. The first seven characters reflect the composition of the file, and the extension is always the three characters THP. The initial seven characters are assigned according to the following table:

Table 1 - THP File Name Composition

Character(s)	Description	Possible Values
1	CTC Code	N (NTC) J (JRTC) C (CMTC)
2-3	Fiscal Year	86-92
4	Rotation Number	1-9,A(10),B(11), C(12),D(13),E(14)
5	Organization	See Table 2
6	File Type	See Table 2
7	BOS Code	See Table 3

Table 2 - THP Codes

Code	Organization	Code	File Type
B	Brigade	T	Performance trends
A	Armor	S	Operating systems lessons learned
M	Mech	X	Operating systems LF lessons learned
I	Light Infantry	C	Company/team AAR lessons learned
F	Fire Support	M	Mission statement
L	Forward Support Bn	N	NCO observations
V	Aviation	D	Statistics

Table 3 - BOS Codes

Code	BOS	Code	BOS
0	Executive Summary	5	MCM
1	Intelligence	6	CSS
2	Maneuver	7	Command & Control
3	Fire Support	8	NBC
4	Air Defense	9	Other
X	Not Applicable		

For example, the mission statement for the armored task force for the eleventh NTC rotation of FY89 would be named N89BAMX.THP, built as follows. The initial N is for the NTC. The 89 shows the fiscal year. The B tells us it's the eleventh rotation (per Table 1). The A is for the Armored Task Force (Table 2); the M for Mission Statement (Table 2), and, since the mission statement is not BOS-specific, there is an X in the BOS spot.

The second component of the THP database is the software which supports access to the THP files. The program, named VIEWTHP, was written in Turbo Pascal and is listed in the Appendix. It operates by first indexing all THP files in the specified (or default) directory. Next, it presents a menu to the user allowing a major category to be selected, after which a submenu appears allowing the user to make a choice within the category. The process is cumulative; each selection further narrows the number of files in the selected set. When the user has narrowed the number of files down to 18 or less, a list of the selected files appears on the screen. The user may select any of the files for review.

During the review process, the user may scroll through the file (PgUp, PgDn, Home, End) freely. The user may also perform a word/phrase search. When the user presses S (search) key, he/she is prompted to enter a word or phrase. The program will then perform a case insensitive search for all matches, after which a screen containing the first occurrence will be displayed. The user may then scroll freely as before, or may press S to view the screen containing the next occurrence.

Appendix C

BCTP OC Observation Database (Proposed)

The BCTP OC Observation Database is proposed to have two tables that will capture the information on the OC Observation Cards and allow it to be linked with appropriate classifications of unit, mission, task, etc. so that analysts can develop trendlines of performance and detailed profiles of strength and weakness. These data tables are: Mission Table; Observation Table. In addition, a set of tables representing the Blueprint of the Battlefield will be developed to allow the information from the observations to be tagged with full descriptions derived from TRADOC PAM 11-9 and other sources. These tables are described in terms of their data structure.

A data table may be conceived of as a matrix of rows and columns. The rows are the different items being observed or classified (military units, for example) and the columns are the categories that classify or describe every item (the unit identification, the BOS, the mission, etc.). In the case of free-form observations, each row would have a column position that can be filled by the text of the observation.

Mission Table: Contains information about the mission enabling analysts to determine whether the mission type, location, rotation, or force type are suitable for his/her analysis. All columns are considered to be in 'character' format. If needed, character format data that contain numbers exclusively may be translated for computational purposes later.

<u>Column Name</u>	<u>Length</u>
Rotation ID	4
Location (of mission)	20
Mission ID (key)	10
Unit (highest echelon)	10
Heavy/Light	1
Mission Type	10
Start Date/Time Group	12
End Date/Time Group	12

Observation Table: Contains information about the specific unit being observed/rated on a particular mission. Identifies the Tactical level of the observation using the scheme described in TRADOC PAM 11-9, *Blueprint of the Battlefield*. This scheme was determined to require four levels of classification -- a fifth was provided to accommodate subheadings that may be developed in the future. For example, if the Mobility and Survivability BOS is the top level (it is given the number '6' in PAM 11-9 to indicate it is the 6th BOS), then Enhance Survivability is at level 1 below the BOS; Provide Battlefield Hazard Protection is at level 2; Remove Battlefield Hazards is at level 3; and Decontaminate Personnel and Systems is at level 4. Level 5 could be a reference to specific Mission Training Plan tasks, for example.

<u>Column Name</u>	<u>Length</u>
Mission ID (key)	10
Unit ID	
Corps	10
Division	10
Brigade	10
Bn/TF	10
(additional unit id fields may be incorporated to accommodate specialized units, such as scouts)	
Operating System	
BOS	3
PAM 11-9 Level 1	2
PAM 11-9 Level 2	2
PAM 11-9 Level 3	2
PAM 11-9 Level 4	2
PAM 11-9 Level 5	2
Observation Text	Up to 1000 characters
Evaluation (Optional) (Adequate/Borderline/Inadequate)	1 (A/B/I or 1/2/3 for example)
Keyword (Optional)	10

The Keyword column is provided to allow for other keyword schemes to be applied to these observations. This could be used to indicate whether the observation was related most to Doctrine, Organization, Training, Materiel, Leadership, or Soldier Services (DOTMLS). Or, it could be used for a scheme such as the Army Lessons Learned Management Information System (ALLMIS) keywords. If the keyword scheme requires levels (to identify a subset of keywords).

then this column could be converted to a set of columns similar to those used to identify the appropriate PAM 11-9 level of the tactical operating system.

Blueprint Tables: These tables relate the codes entered into five levels of classification required to identify specific tasks within the *Blueprint of the Battlefield* to the task names themselves. The Observation Table will contain codes, while the Blueprint Tables will contain the code and the corresponding descriptive name of the level/task. In this table, we will be able to provide additional relationships relating the codes to reference publications, or to other schemes for classifying tasks, such as the Critical Combat Functions being developed at ARI-POM in concert with CALL and CTID. The structure of these tables is outlined below.

BOS Table:

<u>Column Name</u>	<u>Length</u>	<u>Example</u>
BOS Code	3	MCS
BOS Label	40	Mobility and Survivability

PAM 11-9 Level 1 Table:

<u>Column Name</u>	<u>Length</u>	<u>Example</u>
Level 1 Code	2	03
Level 1 Label	40	Enhance Survivability

PAM 11-9 Level 2 Table:

<u>Column Name</u>	<u>Length</u>	<u>Example</u>
Level 2 Code	2	01
Level 2 Label	40	Provide Battlefield Hazard Protection

PAM 11-9 Level 3 Table:

<u>Column Name</u>	<u>Length</u>	<u>Example</u>
Level 3 Code	2	02
Level 3 Label	40	Remove Battlefield Hazards

PAM 11-9 Level 4 Table:

<u>Column Name</u>	<u>Length</u>	<u>Example</u>
Level 4 Code	2	01
Level 4 Label	40	Decontaminate Personnel and Systems

PAM 11-9 Level 5 Table:

<u>Column Name</u>	<u>Length</u>
To be designed, based on need.	