

ARI Newsletter

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Concept Exploration for Transforming Command and Control

The Army's ongoing transformation to Future Combat Systems (FCS) entails profound change, particularly in the area of Command and Control (C²). Currently, FCS is essentially a conceptual design featuring an interdependent system-of-systems. This commander-centric force relies on a network of systems including manned and autonomous modules, such as robotic vehicles and "intelligent" agents. The FCS design poses an unprecedented alliance of humans and machines, and a severe challenge in human-system integration.

The process of transforming FCS concepts into reality will not be easy. The Army learns by doing. Transformation environments are needed that afford leaders, soldiers, researchers and developers an empirical venue to explore the concepts of FCS and transform them into viable, adaptive solutions. A case example of a prototype transformation environment for exploring command and control concepts at the small unit level is the FCS C² program.

The FCS C² program is a joint effort led by the Defense Advanced Research Projects Agency (DARPA) and the U.S. Army Communications–Electronics Command (CECOM) Research and Development Center (RDEC). A series of command group-in-the-loop experiments were conducted at CECOM (Oct 01 through Mar 03). As a participating member in this effort, the U.S. Army Research Institute (ARI) serves primarily on the FCS C² Human

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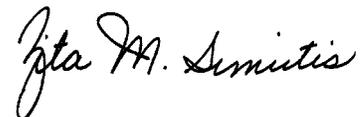
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From the Director

The U.S. Army Research Institute for the Behavioral & Social Sciences (ARI) is responsible for the Army's research to improve its human component, the soldier. Although ARI is part of the Army G-1 family, our research and studies support Army personnel, training, and leader development. Articles in this issue represent a small part of ongoing ARI research and studies on training and developing leader skills that will be needed by our future force. Our lead article describes research that ARI is conducting with DARPA and CECOM on command and control concepts at the small unit level for the Future Combat Systems C² Program. Other articles describe research programs on developing our future leaders' thinking, language, and interpersonal skills. The Army looked to us to assist in a longitudinal evaluation of the pilot programs at Fort Benning for the Basic Officer Leader Course and this issue contains an overview of those findings. We hope that you find some "news you can use" in this issue.



Dr. Zita M. Simutis

Concept Exploration for Transforming Command and Control

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Performance Team and performs multiple research roles:

- Advises on experimental design, measurement, and training issues.
- Analyzes command group behaviors through observation and post hoc analysis of recorded experimental trials.
- Conducts complementary in-house research in a C² transformation environment directed at improving human-system integration in the area of command and control.

The FCS C² Transformation Environment

The purpose of the FCS C² program is to examine how advances in technology enable a new approach to command and control. The FCS C² program created a transformation environment for empirical assessment of command group performance at the Unit Cell level. Currently, the Unit Cell is the smallest combined arms echelon within the FCS structure. The Unit Cell concept proposes that a small command group—a commander and 1-5 additional personnel—can command and control a substantial number of manned and robotic elements performing a wide range of battlefield functions including reconnaissance, surveillance, targeting, and acquisition. Figure 1 depicts the manned and robotic elements of the Unit Cell including the C² Vehicle occupied by the cell’s command group.

The resources and products of three interdependent teams—Operational, Technical, and Human Performance—were required to create this transformation environment for Experiment 1. The Technical Team developed the Commander’s Support Environment (CSE), a hardware and software system, located in the command group’s C² Vehicle. CSE workstations for each member of the command group—Commander, Battle Space Manager, Information Manager, and Effects Manager—allowed them to command and control their Unit Cell elements.

The Technical Team also developed support technologies such as the Collaborative Server so the command group could share information via a common operational picture, and the Collective Intelligence module to ensure the Unit Cell’s elements worked together in a network centric environment. Through the CSE’s links to Distributed Interactive Simulation (DIS), the command group interacted with simulated elements of the Unit Cell, the threat force, and civilian entities in real time.

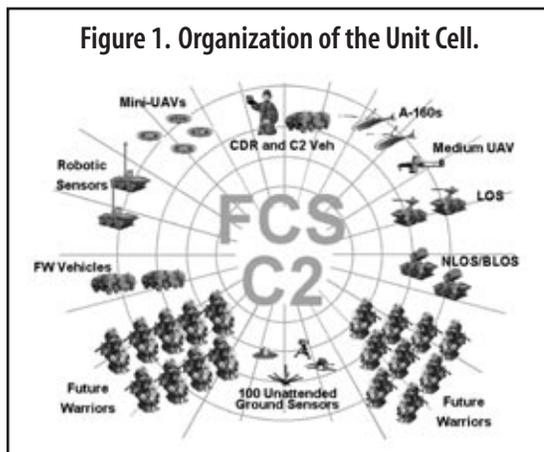
The Operational Team collaborated on CSE design, developed the mission requirements and scenarios for Unit Cell operations, and provided the active duty player participants for Experiment 1. The command group players were four U.S. Army lieutenant colonels deliberately selected to help explore and develop new paradigms for command and control. Those players were ably complemented by the expertise and vision provided by supporting personnel, particularly Friendly and Enemy commanders and an Observer/Controller (O/C) team.

The Human Performance Team devised and implemented training and evaluation methods compatible with an incremental series of experiments designed to explore and document lessons learned for Army transformation and acquisition objectives. Team efforts focused on human-system

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Shaping technology to complement human performance

“The Army learns by doing. Transformation environments are needed that afford leaders, soldiers, researchers and developers an empirical venue to transform FCS concepts into new command and control paradigms.”



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“As a participating member in the FCS C² program, ARI serves on the Human Performance Team and performs multiple research roles.”

integration and stressed that a forceful human-machine alliance requires shaping technology to complement human performance.

Notably, formation and sustainment of an environment for concept exploration and development is required to transform FCS concepts into viable solutions. Experiment 1 assessed only the ability of the Unit Cell to move its elements in order to see the enemy and not be seen (i.e., See/Move). By Experiment 4, Unit Cell missions include Improved See/Move/Strike/ Sustain and Transition requirements.

- Experiment 1—Dec 01—See/Move
- Experiment 2—May 02—Improved See/Move and Strike
- Experiment 3—Sep 02—Improved See/Move/ Strike and Sustain
- Experiment 4—Feb 03—Improved See/Move/ Strike/Sustain and Transition

Similarly, the CSE technologies developed for Experiment 1 represented only about 20 percent of the full functionality envisioned for the Unit Cell’s command group. As the experiments progressed, new technologies were added, and older technologies were refined or abandoned based on lessons learned.

Experiment 1 Overview

The FCS C² Experiment 1 was conducted from 3-14 Dec 01. During the first week, program personnel trained the four command group players on operation of the CSE. During the second week, the actual experiment was conducted. A total of nine (9) experimental trials were run based on the Unit Cell’s See/Move mission. After selected trials, the O/C team led After Action Reviews (AAR) that addressed operational, technical, and human performance issues.

The efforts of ARI in support of training and evaluation resulted in the use of deliberate practice methods, and the manipulation of trial complexity. Experiment 1 required that the players plan and execute essentially the same See/Move exercise across all experimental trials. The deliberate practice design included AAR performance feedback and afforded the players an opportunity to learn a demanding set of new command and control skills. The design also allowed experimenters to vary trial conditions as a function of METT-TC (mission, enemy, terrain, troops, time and civilians) among “Medium,” “High” and “Too High” levels of trial complexity in order to gauge the performance limits of the Unit Cell.

Interim Findings: A Focus on Human-System Integration

Results from each FCS C² experiment are interim findings. These findings serve as benchmarks for subsequent experiments, and lessons learned for formative development of the CSE and new paradigms of command and control. Results include objective and subjective measures of effectiveness and performance by the command group, the Unit Cell and the CSE. Detailed results on such measures are in the Interim Reports for each experiment, available from the Program Manager (PM) FCS C². A sample of such results from Experiment 1 are provided below.

Indicators about the changes needed—technical, operational, and human performance—were collected in data from questionnaires, structured

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Figure 2. In-Place AAR in C² Vehicle.



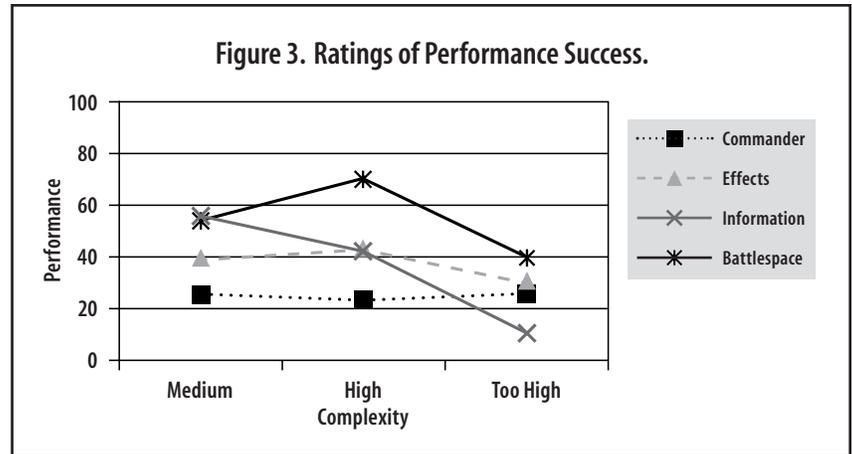
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interviews, and fully recorded trials and AARs. These results provided numerous recommendations from the command group players and AAR facilitators for improving CSE and command group performance. Many of those results were based on the data collection and analysis efforts of ARI that focused particularly on the issue of human-system integration. Researchers from ARI observed Experiment 1 training and trials (Figure 2), and administered three data collection instruments: an In-Place AAR and After Exercise Survey immediately after each trial, and an Exit Interview after all trials were completed.

The After Exercise Survey, for example, contained seven items that asked the command group players to assess key research issues (e.g., “What CSE features require more automation, and why?”). Sample player responses on CSE automation requirements included:

- Need easier and more flexible re-tasking capability for robotic assets.
- Need some sort of automated battle damage assessment (BDA).
- Improve planning collaboration among the command group’s workstations.

The After Exercise Survey also asked players to rate their perceived workload and performance success (i.e. “How successful were you in accomplishing what you needed to do?”). Summary results on successful performance as a function of trial complexity are provided in Figure 3. Across the three subordinate members of the command group, there is a notable decrease in estimates of success at the Too High level. In contrast, the Commander’s ratings are relatively low and constant across trials, perhaps indicating higher performance standards.



Conclusions

The FCS C² program is a decisive first step in the empirical assessment of FCS command and control concepts at the Unit Cell level. The interim findings provide benchmarks and direction for future FCS efforts. The FCS C² program created and endeavors to sustain an empirical environment with interdependent user, developer, and researcher teams for transforming FCS concepts into viable solutions.

For additional information, please contact Dr. Carl W. Lickteig, ARI—Armored Forces Research Unit, AFRU@ari.army.mil.

What Makes a Good Linguist?

Factors that increase levels of effort and enthusiasm

Because of the high demand for military linguists in today's world and their high training costs, ARI scientists studied what predicted language learning success among a set of students learning one of seven major languages at the Defense Language Institute Foreign Language Center (DLIFLC), Presidio of Monterey, CA. The scientists also asked students what motivated them and what helped them to learn their assigned foreign language. Data were collected through questionnaires, group interviews, and routine records at four points in time during the students' training. This study was sponsored by the Office of the Deputy Chief of Staff for Operations and Training, U. S. Army Training and Doctrine Command.

Students

Of the 237 students in the study, about one half were in the Army, one quarter were in the Air Force, and one quarter were in the Navy or Marines. They were enrolled in Fall classes in Arabic, Korean, Mandarin Chinese, Persian Farsi, Russian, Serbian-Croatian, or Spanish, all starting within a three month time period. There were about three male students for every two female students on average. Eight different interview groups were formed, one from each language class, plus a second interview group of students learning Russian which was added for a more in-depth look at a high density language. Each interview group was randomly chosen from its language class and consisted of seven students, five from the Army (including the reserve components) and two from the other military services.

Prediction of Training Success

Language learning success was measured in terms of whether a student graduated on time or, for the longer courses, whether a student was still progressing well at the time of last data collection. The scientists judged that success might depend on a large number of factors. These factors

included the personal background and education of the students, their scores on the Armed Service Aptitude Battery (ASVAB) and Defense Language Aptitude Battery (DLAB), their military background, motivation, cohesion, perceived leadership, and classroom experiences. However, the scientists found that, overall, there was only one effective predictor of individual student language learning success: the student's score on the DLAB. DLAB scores were not only good predictors of student course completion but also of end-of-course scores on tests such as reading comprehension.

Foreign languages are divided into four categories based on the degree of difficulty a typical student would have in learning a language. The least difficult languages are in Category I; the most difficult are in Category IV. Each language category has a minimum DLAB score associated with it. A student normally would need to have at least that minimum DLAB score to be accepted for language training. Minimum DLAB scores for the languages being learned by the students in the study are shown in the accompanying table along with standard language course length. There were no Category II languages being studied by students involved in the research.

Student Languages	Language Category	Minimum DLAB Score	Standard Course Length
Spanish	I	85	25 weeks
Persian Farsi, Russian, Serbian-Croatian	III	95	47 weeks
Arabic, Korean, Mandarin Chinese	IV	100	63 weeks

The data showed that students with the highest DLAB scores were more likely to be successful in their training for each category of language difficulty. Further, for a given DLAB score (group), students were more likely to be successful in

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learning the less difficult languages. The percentage of successful students for each DLAB grouping and language category is shown in the next table.

DLAB Score Grouping	Language Category I	Language Category III	Language Category IV
117 or Higher	100%	75	68
99 to 116	69	69	43
98 or Less	76	50	--

Note. The number of students in the study who were learning languages in Category I = 34, in Category III = 97, and in Category IV = 56.

It appears that both natural aptitude and some language learning experience together are useful predictors of learning success. For example, those students with no prior language training had only a 50% success rate while those students with prior language training had a 71% success rate. Of those students with DLAB scores of 117 or higher, 97% also had prior foreign language training of some kind. These findings suggest that additional efforts at the start of training to insure students are using good language learning techniques might be fruitful.

For the whole group of students, the scientists found that there appeared to be no difference in rate of learning success for these students due to sex of student, rank, marital status, having dependents, having some college education, or considering making a career in the military (reenlistment intent).

Attrition Patterns

Data were obtained from DLIFLC records on student attrition. For males, 44% of attrition was due to academic reasons, and 25% was due to medical causes. For female students, 32% of attrition was due to academic reasons, and 45% was due to medical causes. Looked at another way, 68% of those leaving for academic reasons were male students; 77% of those leaving for medical reasons were female. These attrition patterns, in general, are similar to patterns of previous recent years at DLI.



Locals Interrogated in Afghanistan

Motivation

Most students reported that they were highly motivated to work hard and to do their best to learn their assigned foreign language, at the start and throughout their language training. Students in the interview groups wrote down the top 5 factors that helped increase their levels of effort and enthusiasm for learning their foreign language. A condensed version of their responses is presented in the table below.

Top Motivator Cited By 44 DLT Students

Joy of Learning Factors	Cites
Desire to Learn Language & Culture	27
Joy of Learning, Generally	14
Spiral of Positive Learning Experiences	10
DLI Learning Environment & Culture	5
People Factors	
Good, Enthusiastic Teachers & Military Instructors	25
Supportive Family and Friends	13
Supportive Peers to Learn Together With	8
Personal Psychology Factors	
Pride in Doing Well, Competitiveness	22
Desire to Move On, Graduate from DLI	21
Fear of Failure, Punishment	9
Sense of Duty, Following Orders	8
Career and Job Factors	
Future Military or Civilian Job Opportunities	20
Pay and Bonuses—Present and Future	9
Good Future Assignments	5

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The students also listed the main factors that decreased their level of effort and enthusiasm for learning their language, i.e., what de-motivated them. These factors were poor or inefficient teaching, boredom and burnout, and the time and energy demands of other military duties or commitments. Questionnaire data from all students showed that the students perceived classroom activity and instruction to be less satisfying over time. This pattern indicates the de-motivating impact of stress, burnout, and boredom from the difficult and intense language learning programs. Nonetheless most students reported that they were happy to be at DLIFLC and learning their language.

Impact

General results from the initial study were reported in a workshop on language student attrition at DLIFLC, Presidio of Monterey. Workshop participants included many DLIFLC deans and other faculty members, military service representatives, student representatives, and individuals from various interested government agencies. The workshop was used to examine the level of language student attrition, analyze its causes and patterns, and recommend ways to improve linguist training and reduce attrition. The workshop presentations and recommendations have been gathered into a proceedings report

to facilitate the formation of DLIFLC groups to translate the results into actions, programs, and changes to policies.

Follow-Up

The initial study obtained student views on their language training from the limited base of experience they had while at DLIFLC. To gather their views from a wider base of experience, many of the students in the study that graduated from DLIFLC are being followed in a second, ongoing study that tracks them through Advanced Individual Training (AIT) to their units of assignment. This follow-up tracking will allow ARI scientists to see how the students view things after they have the experience of completing their initial specialty training and are working in their unit assignments. This second study will look at how to improve linguist training from its start on through to a linguist's early unit assignment. Scientists are also looking at linguist's opinions on issues of relevance to the wider Army such as long term training management, the potential for multi-skilling, and preferred learning technologies.

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Application of Story Methods to the Development of Interpersonal Skills

Background/Problem Description

Army transformation will result in more decision-making and leadership responsibilities being placed on Company grade officers in the field. The Army must prepare officers for the full spectrum of situations they will face in future operations. Case-based exercises provide a practical method for officers to acquire and practice the conceptual, interpersonal and team skills they will need.

In the past, case-based exercises included written vignettes and PowerPoint presentations. However, one drawback of such methods is that soldiers are removed from the reality and intensity of situations they actually might encounter in the field. The U. S. Army Research Institute's goal was to develop a case-based exercise that was both more involving and realistic in order to increase the likelihood that officers would transfer knowledge acquired during the exercise to real world situations.

In conjunction with the Institute for Creative Technologies (ICT), ARI has combined the lessons of previous case-based exercises with the power of Hollywood filmmaking and artificial intelligence. The resulting leader development tool is known as TLAC-XL (Think Like a Commander—Excellence in Leadership). TLAC-XL consists of two parts: a short film that details a military operation and a computer interactive portion that encourages soldiers to think about key leadership issues embedded in the film.

After watching the film, a computer-generated mentor guides the soldier through the lessons imbedded in the film. The lessons are communicated in two ways. First, the mentor asks the soldier questions about key aspects of the situation (e.g., mission, enemy, timing) and prompts the soldier to type a response into the computer.

Second, the soldier asks each character questions about what happened in the film. Each character represents a different teaching point (e.g., command influence, cultural awareness, clarity of mission), and the mentor questions the soldier about the teaching point at the end of each interaction with a character. The mentor and characters provide both spoken and written responses to the soldier.

Research Approach

In the evaluation phase of the project, Company grade officers will view either the filmed vignette or a PowerPoint presentation with comparable content. Participants will be tested to see if the film was more involving and better at evoking emotion than traditional case-based exercises. The impact of media-type on learning also will be assessed. In addition to examining the first half of the TLAC-XL lesson, the effectiveness of the computer-interactive portion versus PowerPoint-facilitated discussion will be examined. The PowerPoint presentation will be similar to the computer-interactive portion in that participants will have the opportunity to listen to the



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pre-recorded character responses available in the computer-interactive portion. The PowerPoint presentation also will pose the same questions as the computer-generated mentor; however, the PowerPoint presentation will not provide feedback about the correctness of participant responses nor will it show footage of the characters speaking. After completing either the PowerPoint presentation or computer interactive portion, the two groups will be compared to assess whether the intended emotional impact of the new vignette enhanced or inhibited memorization of relevant incidents and in terms of whether character's motives and moods are better understood using the new approach.

A separate group of participants will be tested for immediate and long-term retention of facts presented and of attitudes and inferred motives of the characters playing roles in the vignette. Finally, focus groups composed of field grade officers [Majors, Lieutenant Colonels and Colonels] will address leader training for junior officers, in light of the capabilities that this method might provide after further development.

Payoff

The new approach was designed to address deficiencies in existing case-based methods. The experimental assessment will show whether the deficiencies were ameliorated. The enhanced case-based leadership exercises will be evaluated to provide direction for future leader development research. The memory tests will address two kinds of influence that emotional content has been claimed to have on cognition: (i) distortion of facts during encoding and (ii) greatly increased long term retention.

A successful outcome will enable units to train a wider variety of leadership and decision skills under more realistic and challenging conditions—specifically, the acquisition and practice of interpersonal and team skills, wherein one must develop judgment of another's motives and anticipate emotional reactions to leader decisions.

Support

The concept of story-based or case-based teaching has long been a central theme within Army Leader Development. The original TLAC was developed in close coordination with the School for Command Preparation (SCP) at Fort Leavenworth and the TLAC-XL was developed with extensive assistance from the Center for Army Leadership at Fort Leavenworth. Both of these organizations remain enthusiastic about the potential of the application of new technologies and approaches to old teaching methods, and we will continue to work closely with them as we continue this research program.

The qualitative comments and statistical results from the evaluation phase of the first generation of TLAC-XL will be used to develop and refine additional scenarios relevant to leader effectiveness and team performance. The end result of the various generations of TLAC-XL is a fully functioning product by 2007.

For additional information, please contact Dr. Michelle Zbylut or Dr. Larry Laffitte, ARI—Leader Development Research Unit, LDRU@ari.army.mil.

Internet and PC Access and PC Capabilities

Background

Almost every soldier has access to the Internet either at the unit or at home. As a result, Army personnel officials at the U.S. Total Army Personnel Command (PERSCOM) are taking advantage of technology to allow soldiers to actively participate in the management of their careers.

Officer

Officers' careers are managed by PERSCOM's Officer Personnel Management Directorate (OPMD) through the Internet, with files routinely being downloaded or uploaded. Army Officers receive much of their career management information via websites maintained by PERSCOM and other official agencies. More importantly, officers manage their own careers by giving input (preferences) and feedback to their DA PERSCOM Assignment Managers. Key information such as assignment preferences, command preferences, and Functional Area and Career Field Designation preferences are all submitted through Internet applications. Additionally, in preparation for promotion boards, officers can use the Internet to view their personal career information such as their Official Military Personnel File (OMPF), their Officer Record Brief (ORB), and their Official DA Photo. As needed, updates are submitted directly to their personnel managers.

Enlisted

Increasingly, enlisted personnel management transactions are being processed through the Internet. In October 2002, the Enlisted Personnel Management Directorate (EPMD) at PERSCOM introduced a web-based assignment preference program called the Assignment Satisfaction Key (ASK). Through the Army Knowledge Online (AKO) portal, active duty soldiers can indicate to the ASK site their personal contact information and assignment preferences (either by location or position preference), including volunteering for assignment locations. Through a listing of realistic assignment location options, Assignment Managers are able to effectively match preferences while maintaining Army readiness requirements. Through this program, soldiers directly contribute to the overall assignment decision process and are active players in the management of their careers.

Personnel Database

In addition, The Adjutant General Directorate (TAG) will soon field eMILPO, the next generation of the Army's personnel database. When established, eMILPO will be accessible 24/7 by all echelons of field users. TAG's eMILPO will be the system supporting OPMD and EPMD through these four primary personnel functional areas: personnel accounting, personnel services, promotions, and reassignments. eMILPO provides an interface with the Enlisted Records and Evaluation Center (EREC) where an initiative to provide individual soldiers with a single page Soldier Career Snapshot (SCS) is near completion. The SCS gives soldiers access to Enlisted Records information pertinent to career development and promotion consideration.

Source

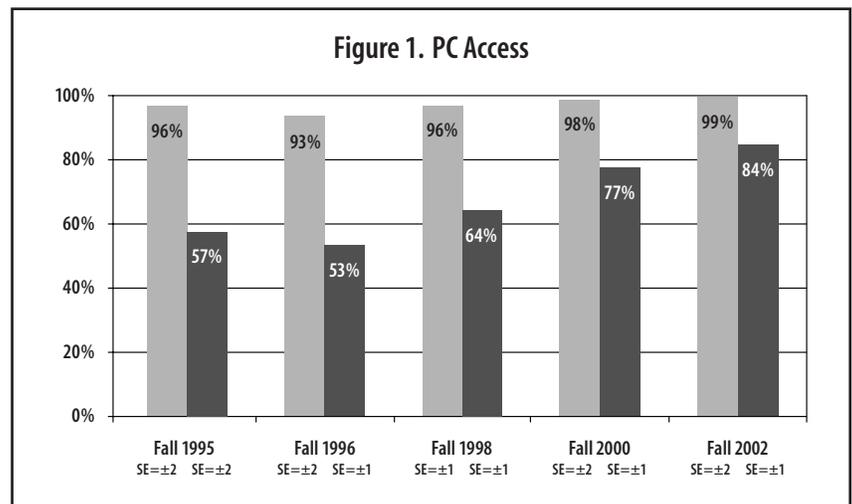
The Army Personnel Survey Office at the U.S. Army Research Institute for the Behavioral and Social Sciences conducts the Sample Survey of Military Personnel (SSMP) semi-annually in the spring and fall on behalf of the Army Deputy Chief of Staff, G-1.

Key Findings

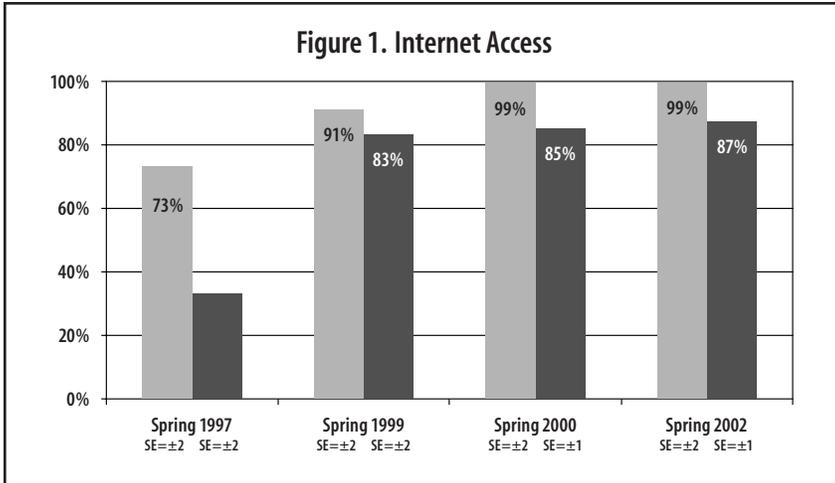
Results from the SSMP are reported below, indicating trends since 1997 for Internet access and since 1995 for PC access. A summary of PC and peripheral capabilities is at Figure 1.

Increasing Personnel Management through Internet

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Internet and PC Access and PC Capabilities



Army Internet Access Since 1997

Since the spring of 1997 there has been a steady increase in Internet use for both officers and enlisted personnel (Table 1).

In fall 2002, almost all (99.1%) of Active component officers and slightly less than nine-tenths (87.4%) of Active component enlisted personnel reported they connect to the Internet. In spring 1997, slightly less than three-fourths (73.0%) of officers and one-third (33.3%) of enlisted personnel reported they connect to the Internet (Table 1).

Among officer rank groups, the increases from spring 1997 to fall 2002 were: field grade officers from 83.1% to 99.7%, company grade officers from 69.3% to 98.8%, and warrant officers from 63.6% to 98.4% (Table 1).

Among enlisted rank groups, the increases from spring 1997 to fall 2002 were: senior NCOs from 49.6% to 98.5%, junior NCOs from 39.2% to 93.6%, and junior enlisted soldiers from 23.9% to 80.4% (Table 1).

Army PC Access Since 1995

In fall 2002, almost all (98.7%) of Active component officers and slightly more than four-fifths (84.1%) of Active component enlisted personnel reported they have access to a PC either at home, at work, in a classroom, or some other accessible location. In fall 1995, more than nine-tenths (95.8%) of officers and slightly less than six-tenths (57.4%) of enlisted personnel reported they have access to a PC either at

home, at work, in a classroom, or some other accessible location. There was a slight decrease in reported PC use in fall 1996 (93.2% for officers and 52.6% for enlisted personnel) compared to fall 1995 followed by a steady increase from fall 1996 to fall 2002 (Table 2).

Among officer rank groups, the increases from fall 1995 to fall 2002 were: field grade officers from 97.0% to 99.2%, company grade officers from 95.1% to 98.6%, and warrant officers from 95.8% to 97.9% (Table 2).

Among enlisted rank groups, the increases from fall 1995 to fall 2002 were: senior NCOs from 83.3% to 97.7%, junior NCOs from 67.7% to 92.8%, and junior enlisted soldiers from 43.2% to 74.8% (Table 2).

Fall 2002 Findings

Almost all (99.1%) of Active component officers and slightly less than nine-tenths (87.4%) of Active component enlisted personnel reported they connect to the Internet. (A PC is not needed for access to the Internet.) Since the fall of 2000, the percentage of soldiers with Internet access increased from 98.7% for officers and from 84.6% for enlisted personnel.

Table 1. Access to the Internet

Officers	Field Grade	Company Grade	Warrant Officers	Total Officers
Fall 2002 (SE ±3, ±3, ±4, ±2)	99.7%	98.8%	98.4%	99.1%
Fall 2000 (SE ±2, ±2, ±4, ±2)	99.6%	98.0%	99.2%	98.7%
Spring 1999 (SE ±2, ±2, ±4, ±2)	92.7%	89.6%	91.4%	91.0%
Spring 1997 (SE ±2, ±2, ±4, ±2)	83.1%	69.3%	63.6%	73.0%

Enlisted Personnel	Senior NCOs	Junior NCOs	Junior Enlisted	Total Enlisted Personnel
Fall 2002 (SE ±2, ±3, 2, ±1)	98.5%	93.6%	80.4%	87.4%
Fall 2000 (SE ±2, ±3, ±2, ±1)	96.4%	90.4%	77.7%	84.6%
Spring 1999 (SE ±3, ±3, ±3, ±2)	83.7%	84.5%	82.3%	83.4%
Spring 1997 (SE ±3, ±3, ±2, ±2)	49.6%	39.2%	23.9%	33.3%

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Internet and PC Access and PC Capabilities

Table 2. Access to a PC

Officers	Field Grade	Company Grade	Warrant Officers	Total Officers
Fall 2002 (SE ±3, ±3, ±4, ±2)	99.2%	98.6%	97.9%	98.7%
Fall 2000 (SE ±2, ±2, ±4, ±2)	99.1%	97.9%	98.1%	98.4%
Fall 1998 (SE ±2, ±2, ±4, ±1)	98.3%	94.4%	96.4%	96.0%
Fall 1996 (SE ±3, ±2, ±4, ±2)	96.7%	92.0%	89.4%	93.2%
Fall 1995 (SE ±2, ±3, ±4, ±2)	97.0%	95.1%	95.8%	95.8%

Enlisted Personnel	Senior NCOs	Junior NCOs	Junior Enlisted	Total Enlisted Personnel
Fall 2002 (SE ±2, ±3, 2, ±1)	97.7%	92.8%	74.8%	84.1%
Fall 2000 (SE ±2, ±3, ±2, ±1)	95.4%	88.3%	64.1%	76.7%
Fall 1998 (SE ±2, ±3, ±2, ±1)	91.4%	79.1%	45.7%	63.6%
Fall 1996 (SE ±3, ±3, ±2, ±1)	81.4%	61.1%	38.2%	52.6%
Fall 1995 (SE ±3, ±3, ±3, ±2)	83.3%	67.7%	43.2%	57.4%

Internet Connection Daily

Of those soldiers who connect to the Internet, nearly nine-tenths (85.7%) of officers and three-fifths (59.7%) of enlisted personnel reported they connect to the Internet daily or almost daily. Very few officers (1.1%) and one-tenth (11.3%) of enlisted personnel reported they connect to the Internet less than once a week.

Slightly less than one-tenth (9.0%) of officers and slightly more than one-tenth (12.5%) of enlisted personnel reported they have their own, personal web site. Almost all (98.7%) of Active component officers and five-sixths (84.1%) of Active component enlisted personnel reported they have access to a personal computer (PC). Since the fall of 2000, the percentage of soldiers with access to a PC increased from 98.4% for officers and from 76.7% for enlisted personnel.

Of those officers who have access to a PC, nine-tenths (90.3%) reported they have access at home or in their quarters and nine-tenths (89.9%)

reported they have access at work. Of those enlisted personnel who have access to a PC, three-fourths (73.4%) reported they have access at home or in their quarters and slightly more than three-fifths (63.2%) reported they have access at work.

Of those who have access to a PC at home or in their quarters, almost all (94.9%) of officers and slightly less than nine-tenths (88.0%) of enlisted personnel report that they, themselves, use the PC. Nine-tenths (90.5%) of these officers' spouses and three-fourths (75.9%) of these enlisted personnel's spouses also use the PC. Seven-tenths (70.4%) of these officers' child(ren) and one-half (49.3%) of these enlisted personnel's child(ren) also use the PC.

PCs at home for both officers and enlisted personnel tended to be more advanced than PCs at work in terms of processor speed, hard drive capacity, RAM, CD and DVD capability, modem, text/image scanner, and sound card with speakers. Officers were more likely to have a high-speed Internet connection and both officers and enlisted personnel were more likely to have Windows NT at work than at home.

Process

Army offices and agencies submit questions on topics to be addressed by the Sample Survey of Military Personnel (SSMP). The population for the SSMP consists of all permanent party, Active component Army personnel (commissioned officers, warrant officers, and enlisted personnel [excluding all PV1 and those PV2 soldiers in Europe and Korea]). Samples of about 10% of officers and 2-3% of enlisted personnel are drawn, using the final 1 or 2 digits of soldiers' social security numbers. Since spring 1992, databases have included approximately 4,000 each for officers and enlisted personnel. Data at each rank level are weighted up to Army strength at the time each survey is conducted. The Fall 2002 SSMP was conducted from about 15 October 2002 to 4 February 2003. Completed responses were received from 3,747 officers and 4,669 enlisted personnel.

For additional information, please contact Chief, ARI—Army Personnel Survey Office, APSO@ari.army.mil.

Critical Thinking Training for Army Schoolhouse and Distance Learning

High Pay-off Skills to deal with the uncertain

The ability to critically think through a problem, rather than only apply previously learned solutions, is crucial to Army success.

Army officers are often required to operate in situations which they may not have previously encountered and for which they haven't been trained—for example, fighting terrorism, performing peace keeping operations, disarming an explosive device they have never seen before, or working closely with team members of other nationalities who have different ways of approaching problems. The ability to critically think through a problem, rather than only apply previously learned solutions and procedures, is crucial to Army success. The U.S. Army Research Institute is sponsoring research to investigate ways of training high quality critical thinking skills to better equip Army officers to deal with the novel, uncertain, and complex requirements of future Army operations.

Identifying High Payoff Critical Thinking Skills

Educators have long been interested in training critical thinking skills (CTS). The particular set of required CTS appears to vary depending on the domain in which they are to be used. Thus, the first step in developing training for Army Battle Command critical thinking skills was to decide which CTS should be trained. To identify these CTS, we first developed a model of critical thinking (see Figure 1) based on an extensive review of the psychological, educational, philosophical, military and commercial literatures dealing with critical thinking. The model was developed and validated for conceptualizing critical thinking within a Battle Command context. The literature review also identified over 100 core critical thinking skills described by theorists and researchers. We then conducted a survey of Army officers to assess their experiences related to CTS, their predispositions for critical thinking, their opinions about situations within

the Battle Command domain requiring CT, and difficulties related to CT. From the original set of CTS appearing in the literature, we identified key CT skills using two criteria: (1) how important each was to the success of battle command operations and (2) how difficult or problematic each skill was to execute. Based on this analysis and a subsequent validation, we identified eight high pay off CTS. These are listed in Table 1.

Table 1. High Pay-off Critical Thinking Skills for Army Battle Command

- Frame the Problem
- Recognize main point in a message
- Visualize plans to see if they achieve goals
- Construct a plausible story that ties all incidents together
- Recognize fallibility and bias in own opinion
- Generalize from specific instances to broader classes
- Adopt multiple perspectives in interpreting events
- Determine when to seek more information

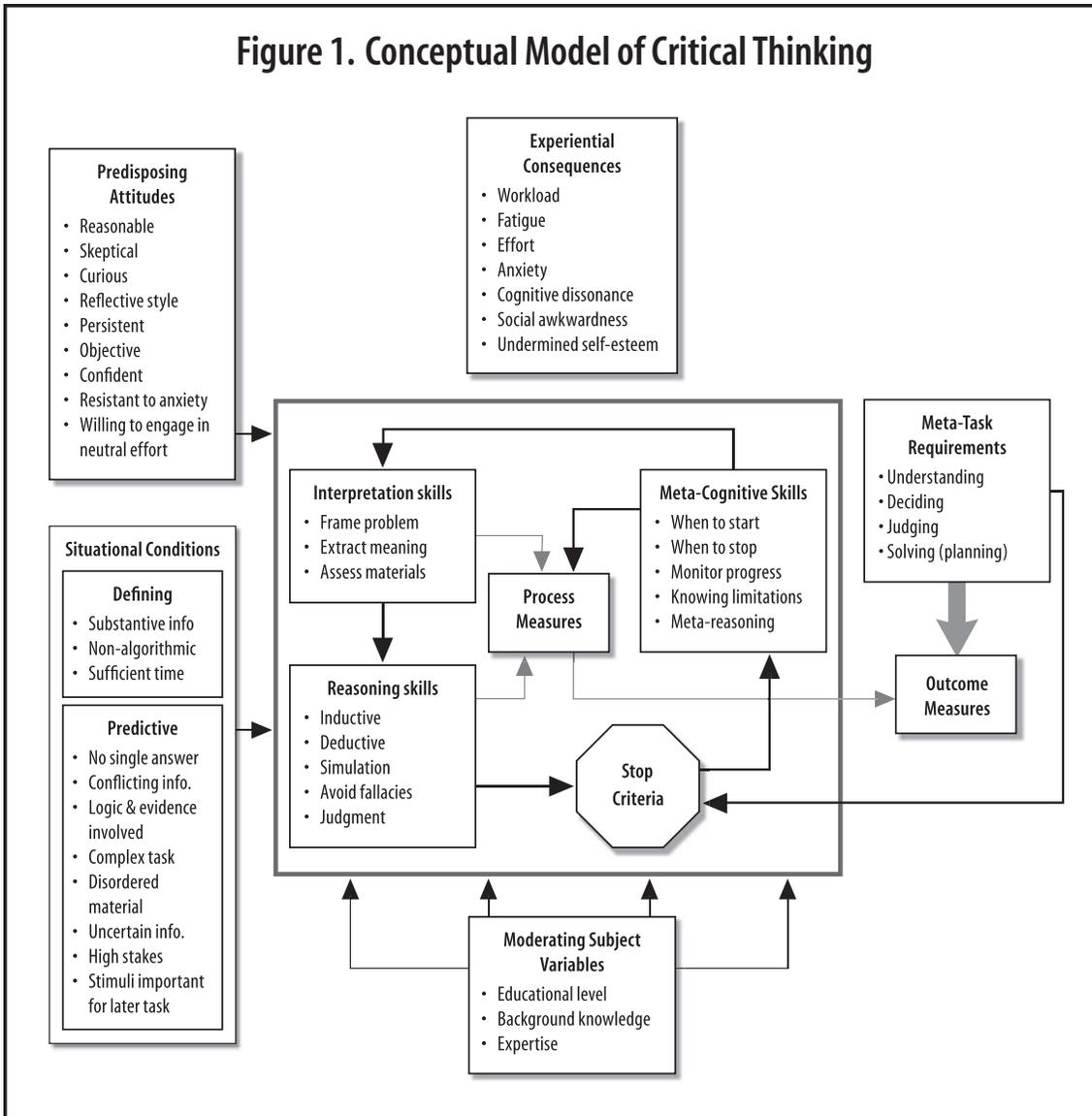
Training Approach

CTS are a set of cognitive skills that are developed over time given the appropriate educational experiences and practice. The quality of performance of CTS may reflect some raw ability, but our training approach is based on the theory that everyone can develop critical thinking skills given appropriate educational experiences and practice. As with any skill-acquisition training, students must be given an explanation of the skill and how it is used, an opportunity to practice the skill, and immediate feedback about their performance of the skill.

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Critical Thinking Training for Army Schoolhouse and Distance Learning

Figure 1. Conceptual Model of Critical Thinking



Our approach to schoolhouse implementation of CTS training seeks to integrate the skills into lesson plans in such a way that they are practiced and evaluated in the course of a seminar discussion or a practical exercise. These skills are explicitly listed in the lesson plans, but ideally they are integrated seamlessly into the conduct of regular classroom instruction. A history lesson may compel students to adopt multiple perspectives. A tactical planning exercise may compel

students to visualize plans to see if they accomplish an objective. A leadership lesson may compel students to challenge their own biases. If a student identifies the skill and wants to discuss it, that is encouraged. However, the skill will not normally be explicitly acknowledged by the instructor in the course of the instruction. The instructor also provides a model of how to execute critical thinking in his own approach to the exercises.

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Critical Thinking Training for Army Schoolhouse and Distance Learning

The emphasis is on student demonstration and instructor evaluation of the student CTS.

Our web-based training system approach (1) incorporates an explanation of CT, an explanation of the CT skill being trained, the rationale behind the skills and how it is used in the battle command environment, (2) provides exercises in which students practice elements of those skills, and (3) provides appropriate and immediate feedback on their performance.

Eight High Payoff CTS and CT Specific Training Concepts
Eight key skills were identified and validated in our interviews with Army officers.

Seek a clear statement of the problem. Sub-skills include: identifying and resolving weak spots in a message, chunking and integrating critical information, and assessing the overall representation of the problem. One key training concept for this skill is “Fuzzy Statement Training”. This involves helping students to quickly and reliably distinguish clear statements from fuzzy counterparts. Our focus is to teach students to recognize ambiguous spots in material and to produce clear statements.

Recognize main point in a message. When reviewing a mission statement or commander’s intent, it is important that an officer extract the main point right away as that provides a necessary framework for absorbing the surrounding details. “Central Thesis Training” teaches students to quickly recognize the main point in an argument or text passage. Students are trained to find the anchor point or key elements in a message.

Visualize plans to see if they achieve goals. Research shows that both psychomotor and cognitive performance is enhanced if users engage in prior cognitive or mental rehearsal. Sub-skills here include: identify the initial and desired end states, establish a mental picture of the current state, visualize each step of the plan, check intermediate and final outcomes of each step as visualized for problems, and judge adequacy of the plan to reach intermediate and end states. This skill will be trained using “Visualization Rehearsal

Training”. Techniques from the simulation world are used to help students construct more effective mental simulations which play out the flow of events, and include branches and sequels of a course of action in the battlefield.

Construct a plausible story that ties all incidents together Training this skill uses “Connect a Point Training”, the goal of which is to teach students how to construct a plausible explanation that integrates all the independent facts in a message into a coherent whole. The student learns to consider information elements as related rather than in isolation. The training focuses on uncovering relationships, exploring alternative explanations of the information and keeping an open mind to detecting patterns.

Recognize fallibility and bias in own opinion. Research shows that people have a tendency to disregard new information that is inconsistent with their previously formed hypotheses. This training makes officers aware of the potential fallacies in their own plans and the need to consider and access new information. Sub-skills include: clearly specify your own opinion/theory, specify and seek out evidence that would invalidate your opinion/theory, recognize conflict and consistency between your opinion and new information, evaluate the evidence and make a judgment of whether the evidence as a whole supports or refutes the opinion/theory. “Weak Link Training” guides students to find the “weak links” in their own thinking.

Generalize from specific instances to broader classes. This skill is trained with “Progressive Broadening Training”, which exposes students to progressively more discrepant pieces of information to promote the ability to induce a broader classification from specific instances.

Adopt multiple perspectives in interpreting events. The “Three Look Training” approach teaches students to examine multiple perspectives by requiring them to view a given argument from least three vantage points. The different perspec-

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Critical Thinking Training for Army Schoolhouse and Distance Learning

tives might include the enemy point of view, the end of the engagement, and key decision points. This training will help the student look for inconsistencies in the original plan that might be found by examining these other perspectives. The goal is to encourage students to “get out of the box” by examining the spatial and information aspects of the battlefield from other points of view.

Determine when to seek more information This skill is trained using “You be the judge” training. This training approach trains students to decide when to seek more information based on its cost and value. It teaches students when to stop information seeking and analysis and make a decision based on the data available. Students will be more aware that information and analyses have both value and costs.

Schoolhouse implementation

The critical thinking model, incorporating the eight critical thinking skills described above, has been integrated into the Command and General Staff College’s (CGSC) Intermediate Level Education (ILE) and Advanced Officers’ Warfighting Course (AOWC) curriculum. In ILE, the CT model and eight CTS are taught in five core course instruction blocks: Foundations, Leadership, Strategic Studies, Operational Studies and Tactical Studies. They are integrated into 16 course modules and 63 course lesson plans. In AOWC, the model and CTS are taught in 6 blocks of instruction, including Operational Warfighting, Division Operations, Brigade Operations, History, Leadership and Digits. It has been integrated into 45 lesson plans.



In the future, these CTS and the CT model could be integrated earlier into soldiers’ schoolhouse experiences. For example, they could easily be integrated into ROTC, West Point and Captain’s Career Course curricula. The earlier critical thinking skills are acquired, the more opportunity for practice and feedback exists throughout the soldier’s career. CTS would then be applied automatically and seamlessly when needed.

Web-based CT modules for distance learning

Training modules for the first two CTS, Frame the Problem and Recognize the Main Point in a Message, have been implemented on the web. This self-paced training is implemented in a layered



architecture on an open source web site. The remaining six CTS have been analyzed into their training elements and are tentatively scheduled to be developed by 2005. We are currently evaluating the two web based modules within Reserve Units. These web-based modules would be convenient and useful for officers’ self-development programs, Reserve Unit training, and ILE and AOWC distance learning programs.

For additional information, please contact Dr. Sharon Riedel, ARI—Fort Leavenworth Research Unit, LDRU@ari.army.mil

Basic Officer Leader Course (BOLC)

*Common military foundation
for new lieutenants*

The Basic Officer Leader Course (BOLC) is a three-phased program designed to develop confident and competent small unit leaders. A key change to the Officer Education System, BOLC enables new lieutenants to train together, branch and gender immaterial. The program will present a tough, standardized, small unit leadership experience that flows progressively from pre-commissioning (BOLC Phase I) to the common leadership experience (BOLC Phase II), and then to the more traditional branch specific technical/tactical training (BOLC Phase III).

In October 2000, the U. S. Army Research Institute (ARI) began a longitudinal study of BOLC II, sponsored by the Office of the Deputy Chief of Staff for Operations and Training, Training and Doctrine Command. The primary objective of the study was to provide an independent evaluation of the initial iterations of BOLC II. The ARI Team accomplished this through daily observations of BOLC training, surveys both during and after the Pilot courses, and through interviews.

What is BOLC?

All new lieutenants, regardless of commissioning source (BOLC I), attend a common-core, six-week course, BOLC II. BOLC II teaches leadership, promotes Army values and officership utilizing a standardized “hands-on”, field-oriented program of instruction (POI). Graduates move to their respective schools for follow-on branch-specific training, BOLC III to learn technical and tactical skills.

BOLC II provides a common military foundation for new lieutenants. It is based on FM 22-100 Army Leadership (DA, 1999) with the goal of producing leaders who are prepared to lead small units upon arrival at their first assignment. Basic leadership and some common core tasks are conducted primarily in a field environment. All focus on small unit leadership, with an emphasis on performance counseling, while instilling the Warrior Ethos and promoting physical fitness.

BOLC Phase II Pilot Programs at Fort Benning

BOLC Pilot 1 (January 21 through March 9, 2001) included 123 Infantry lieutenants, commissioned through Officer Candidate School, Reserve Officer Training Corps, the United States Military Academy, and other sources. After the seven-week BOLC program, lieutenants moved into their Infantry OBC Class. This was the pilot for course content.

BOLC Pilot 2 refined the POI, and provided an opportunity to evaluate the first effort at branch immaterial and gender integrated training. Four women were added to the Fort Benning BOLC cadre. The 138 lieutenants in Pilot 2 (February 25 through April 12, 2001) included 38 non-Infantry lieutenants (13 females and 25 males); other branches included Engineer, Finance, Military Intelligence, Ordnance, Quartermaster, Signal, and Transportation. Following BOLC, all personnel attended their branch-specific OBCs.

The third BOLC Pilot (October 13 to December 18, 2001) had 173 students, and was truly branch and gender integrated. Seventeen branches were represented, as well as all commissioning sources. About 20% of the students were women. The Infantry, heretofore in the majority, comprised only 10%. Similarly, Pilot 4 (January 13 to March 5, 2002), had multiple branch and commissioning source representation with 158 students; only 33% were Infantry. At the conclusion of Pilot 3 some lieutenants went to their respective BOLC III courses; others waited until the end of Pilot 4 to join OBCs.

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Lieutenants Begin a Road March



Basic Officer Leader Course (BOLC)

Pilots 3 and 4 included broader cadre diversity. Following a 5-week train up, officers and non-commissioned officers from other branches were integrated with the Fort Benning Infantry cadre to present BOLC. During their train up, they received refresher training on tasks presented in BOLC, including confidence courses and firing ranges.

Program of Instruction

Although improvements occurred over time, all BOLC pilots followed a similar POI (see Table 1). In addition to events shown, physical training (including combatives), leadership training, and a modified 360-degree counseling program occurred each week.

Table 1. Sample BOLC Schedule of Events.

Week	Major Event(s)	Selected Additional Events
Zero	<ul style="list-style-type: none"> In-processing 	<ul style="list-style-type: none"> Combat Water Survival Test Army Physical Fitness Test
One	<ul style="list-style-type: none"> Rifle Marksmanship Individual Movement Techniques 	<ul style="list-style-type: none"> Platoon Trainer Counseling Foot March
Two	<ul style="list-style-type: none"> Land Navigation 	<ul style="list-style-type: none"> Supervise Preventive Maintenance Weapons Familiarization
Three	<ul style="list-style-type: none"> Squad Situational Training Exercise Battle Drills 	<ul style="list-style-type: none"> Foot March Counseling Hand Grenades Bayonet Course
Four	<ul style="list-style-type: none"> Patrolling 	<ul style="list-style-type: none"> Platoon Trainer Counseling Water Confidence Test
Five	<ul style="list-style-type: none"> Defense Military Operations on Urban Terrain 	<ul style="list-style-type: none"> Foot March Peer Evaluations Army Physical Fitness Test
Six	<ul style="list-style-type: none"> Leadership Graduation Out-processing 	<ul style="list-style-type: none"> Platoon Trainer Counseling Military Problem-Solving

Initial Assessment

Although it is too soon to know the overall effects of BOLC, the most apparent initial benefit was the camaraderie demonstrated despite physical and emotional challenges. The BOLC lieutenants increased their confidence and leadership skills. In

end-of-course surveys, 30 to 40% of the lieutenants reported increased self-confidence, although only a small percentage felt that they were better leaders as a result of BOLC. The ARI Team’s observations of student performance showed increases in their leadership skills, regardless of how they responded to survey questions. BOLC students rotated through squad, platoon and company leadership positions and received performance based counseling. Both cadre and students were enthusiastic about this basic leadership technique. From 50% to 75% of survey respondents said they recognized the value of role-play practice sessions and counseling. They were enthusiastic about live fire, military operations on urban terrain, and combatives. They liked physical challenges and confidence building events like obstacle courses and a live fire infiltration range.

Post Course Data Collection

ARI visited and interviewed lieutenants at their branch schools. In focus groups and interviews, the majority of the lieutenants realized, after the fact, that BOLC had helped them develop leader-



Peer Counseling

ship skills. They voiced concerns about the course as executed, but many shared stories about the positive influence BOLC had on them personally.

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Basic Officer Leader Course (BOLC)

They continue to provide additional feedback to ARI from their unit locations. Their feedback will help assess the effectiveness of the POI, the training, and the overall BOLC program.



by non-Infantry officers would improve the program. Due to time constraints, some required tasks will probably have to be trained in pre-commissioning programs, OBC or the officer's first unit.

- **Improve counseling program**

The counseling program as executed in BOLC was a good idea, but with insufficient time allocated to planning and preparation for cadre and students alike. Cadre must be trained for this critical role. Modifications can ensure that this critical aspect of BOLC is worthwhile.

- **Set course and graduation standards, and publicize the BOLC concept**

Decisions must be made about BOLC standards, and a recycle policy established. Training must be tough, and standards enforced. The entire Army training community must embrace the intent and value of BOLC, and must be both positive and enthusiastic in order for it to succeed.

What Does the Future Hold for BOLC?

The BOLC Phase II POI has already been adjusted, using a building-block approach to training. Pre-commissioning instruction is being cross-walked with the BOLC POI to eliminate redundancy, and to ensure that all critical tasks are taught sequentially. The effects on branch training will be evaluated. Cadre train up is planned. The initial entry training experience for Army officers will be BOLC, to be fully implemented in 3rd quarter FY06.

For additional information, please contact Marnie Salter, ARI—Infantry Forces Research Unit, IFRU@ari.army.mil.



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Coaching BOLC Students in Basic Rifle Marksmanship

The Bottom Line

After thorough assessment of the four BOLC pilots, the ARI Team's overall recommendations and lessons learned are as summarized below.

- **Select and prepare motivated cadre**

The BOLC program must be well planned and well executed by the best of Army leadership. Cadre must be immersed in the BOLC philosophy, with a clear understanding of the intent of BOLC, and its role in officer training. They must be selected based on their proven ability to mentor, coach, and teach, and be provided the preparation and training to ensure success.

- **Develop a POI focused on lieutenant skills**

A common perception was that BOLC and pre-commissioning overlapped. Since the POI used drills, weapons familiarization, and patrolling as a means to reinforce basic skills, lieutenants often lost sight of the larger intent of the course as they focused on the content of training events rather than on leadership responsibilities. A better balance between Infantry skills and those needed