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Bradley Fighting Vehicle M2/M3 A3: Training and Soldier System Observations

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14. ABSTRACT *(Maximum 200 words)*:

This paper reports some training and soldier systems observations about the newly introduced M2A3 Bradley Fighting Vehicle (BFV). Some cautions and lessons learned are included as they relate to the impact of the Bradley A3 on institutional and unit training, especially in the areas of digitization and device use.

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BRADLEY FIGHTING VEHICLE M2/M3 A3: TRAINING AND SOLDIER SYSTEM OBSERVATIONS

EXECUTIVE SUMMARY

Research Requirement:

Personnel from the Directorate of Operations and Training, U. S. Army Infantry School, and from the office of the Bradley TRADOC Systems Manager, asked the U. S. Army Research Institute's (ARI) Infantry Forces Research Unit for assistance in investigation of some issues related to the newly fielded M2/M3 A3 Bradley Fighting Vehicle (BFV). The primary focus was on questions related to training and training devices.

Procedure:

The author monitored and observed events in progress and gained first hand experience with the system, and familiarity with new or improved features. The author administered surveys, and conducted structured interviews with Bradley subject matter experts. Further information was obtained through observations of New Equipment Training (NET) at Fort Hood. Additional data came through evaluations of the instruction and materials associated with two new training devices, the Bradley Desktop Trainer (BDT) and the Bradley Advanced Training System (BATS).

Findings:

The original intent of this paper was to describe some aspects of the A3 fielding process but the focus shifted to a more global view of the overall impact of the A3 on institutional and unit training. There is considerable similarity between the M2/M3 A3 Bradley vehicle and its predecessor vehicles. That fact will bode well for acceptance and for issues related to training. However, the areas of difference, especially as they concern digitization, may be more of a problem than is apparent. The A3 is not just an upgraded version of the old system.

Utilization of Findings:

The Bradley A3 soldiers and trainers would benefit from an information briefing, for the vehicle and its major devices, to set the expectations for the new system, and to maximize unit acceptance. Short-term training impacts must be addressed, as well as the need to build and maintain a pool of specially trained A3 personnel. Successful training must capitalize on all available lessons learned.

BRADLEY FIGHTING VEHICLE M2/M3 A3: TRAINING AND SOLDIER SYSTEM OBSERVATIONS

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Bradley Fighting Vehicle M2/M3 A3: Training and Soldier System Observations

Introduction

The M2/M3 A3 Bradley Fighting Vehicle (BFV) represents the newest version of the fighting vehicle, and the latest in a series of Bradleys. The A3 Bradley, like its predecessors, has both Infantry (M2 A3) (IFV) and Cavalry (M3 A3) (CFV) models. The primary differences between them are related to their missions. This impacts on the number of personnel, and the basic load of ammunition. Unless otherwise noted, however, the term A3 will refer primarily to the Infantry model, although many observations will be applicable to the Cavalry vehicle as well.

The first Bradley, fielded in late 1982 and variously called the A0 or the vanilla Bradley, represented a huge change from the M113 armored personnel carrier. The BFV, like the M113, was designed to carry personnel, but differed markedly from the M113 in its ability to defeat armored and unarmored vehicles with its 25 mm Bushmaster cannon, and defeat personnel targets and unarmored targets using the 7.62 coaxially mounted machinegun. It also became a tank killer with the Tube-launched Optically-tracked, Wire-guided (TOW) missile. The original Bradley was also noteworthy for the difficulties encountered in the effort to get it accepted. As each version has been introduced, some have derided the vehicle, maintaining that it is not needed, or simply finding fault with it. The Bradley has lasted, however. The primary shortfall at this point may be a failure to learn from the lessons from the past.

The original BFV was improved, in the 1986 A1 variant: the TOW II, the gas particulate filter unit, etc. The next version was the 1988 A2 that went to battle in Operation Desert Storm (ODS). Most equipment and performance deficiencies identified or confirmed during Desert Storm were subsequently remedied in the improved A2, the M2 A2 ODS variant, more commonly referred to as the ODS. The ODS improvements brought the Bradley more in line with the Abrams Main Battle Tank, and addressed some of the deficiencies which had been identified in the Bradley from the very beginning. The success of the Bradley during Desert Storm brought the vehicle renewed prominence, and public praise for its performance. Now barely 10 years after the war, a new Bradley is being introduced. Unlike the previous versions, the M2/M3 A3 vehicle is radically different from those that preceded it.

ARI's History with the Bradley

Throughout the lifetime of the Bradley, the U. S. Army Research Institute (ARI), specifically the Infantry Forces Research Unit at Fort Benning, GA, has been an active observer of and a key player in most aspects of the system development process. ARI, and especially this author, was instrumental in early assessments of personnel, equipment, load plans and gunnery, and has in every instance been a participant in evaluations of Bradley training, and training devices (e.g., Salter, 1984a, and 1984b; Salter, Rollier & Morey, 1985; Rollier, Salter, Morey & Roberson, 1987; Rollier, Salter, Perkins, Bayer, Strasel, Lockhart, Kramer, & Hilligoss, 1988). The author was involved

during the development of the Bradley's primary and preliminary gunnery training device, the Bradley Conduct of Fire Trainer (COFT), which was modeled after the tank's COFT gunnery trainer. The author identified training and instructor issues, and assisted in development of the initial Bradley COFT Senior Instructor/Operator Course (e.g., Salter, 1987; 1988; 1989a; 1989b; 1990).

The presence of an Infantry team in the rear troop compartment of the Bradley forced the acknowledgement that the Bradley is more than a gunnery platform. ARI personnel participated in the dialog over the BFV's true role. Despite the focus on gunnery and gunnery devices, the primary purpose of the Bradley is to get the troops to the decisive point on the battlefield, supporting them with accurate weapons fire. Once again ARI is present at the introduction of a new vehicle – and again the focus has been primarily – and possibly justifiably – on facets of gunnery.

Purpose of this Report

The intent of this paper is to describe some portions of the A3 fielding process which are new, and some that are reminiscent of earlier events. At the very least this report may provide a summary of key lessons learned. An original objective was to augment the results of earlier research (Salter & Black, 1998; Ford, Campbell & Cobb, 1998; Campbell, Ford, Shaler, & Cobb, 1998) to assess the impact of digitization on Bradley training and training devices. More recently, however, the focus has shifted to a more global view of the effectiveness of preliminary A3 training programs and devices, and the overall impact of the system on institutional and unit training.

The first section will describe some of the author's first hand experiences with the A3 and associated training devices. This is followed by a brief description of the Bradley, and details about some new aspects of the A3. The next section will discuss A3 training and training devices. The final section will present some issues, concerns, and cautions, generally characterized as "lessons learned."

Method

This paper compiles information from multiple sources, gathered in varying formats. The author, an ARI research psychologist, has been an interested observer of the arrival of the M2 A3. Loosely following procedures of training impact analysis (as documented in Evans and Dyer, 2000) and those detailed in Elliott, Sanders and Quinkert's 1996 report on lessons learned from the introduction of the M1 A2, the author spent considerable time observing Bradley training. This process was characterized by a systematic but loosely structured study of the way the new material was presented, and the way the soldiers reacted to it. This provided valuable insight, as well as training for the author who became an active observer of the training provided, and, in the process, received personal hands-on experience. This helped the author to identify strengths and shortfalls in the training, the program of instruction (POI), the training materials and devices and frequently, in the equipment itself.

Detailed familiarization with the A3 began with an individual tour of the system, with a Fort Benning subject matter expert (SME) demonstrating new or improved features. Later, the author was able to use the new fire control system, firing the 25 mm gun during an A3 exhibition at Fort Benning. Exposure to the digitization capability and changes to the BC's role came through observations of preliminary soldier training on a prototype A3 training device at the United Defense (UD) prime contractor's Orlando engineering facility. This was followed by further observations at their facility, at Fort Benning, and at Fort Hood, TX, as A3 training began.

Most observations were collected first hand. Others were based on reports and surveys from U.S. Army Infantry School/Center (USAIS/C) instructors and SMEs, and from conversations at Fort Hood, where the first vehicles are being introduced. Further information was obtained through observations of the initial training conducted by the UD contractor for the Fort Benning-based New Equipment Training (NET) Team (NETT). Observations at Fort Hood included some of the training classes provided for the NET team, and also some given by the NET team. The author attended NET team classes where soldiers from Fort Hood's 2-8 Infantry Battalion learned about the A3, including some during which they used prototype training devices. The author also observed on-vehicle training conducted by the NETT for that same group of soldiers. There were also conversations with soldiers during their breaks, and with the technical support personnel (FSRs or Field Service Representatives) from the UD contractor's Fort Benning and Fort Hood teams.

Additional observations came during gunnery train-up. The author watched the UD contractor teach Fort Benning and Fort Knox SMEs about the Bradley Desktop Trainer (BDT) and the Bradley Advanced Training System (BATS), and then observed as the same instructor trained NET team personnel. The author also had first hand experience with the BATS Instructor/Operator (I/O) and Senior I/O (SIO) Courses. These two courses, originally developed by UD, were refined, rewritten, and expanded by a team of Fort Benning and Fort Knox SMEs, to include ARI. The author then observed as NET personnel and unit master gunners, using this material, were taught to be I/Os and SIOs, and then as they in turn trained the unit. The author also attended briefings, participated in after action reviews (AARs), interviewed NET Team personnel, and conducted surveys, group and individual interviews with them and with the Bradley Crew Evaluator (BCE) team.

In sum, the author monitored and observed events in progress, on site in real time, with the opportunity for immediate follow-on questions about the training, the training environment and the training materials. Throughout, I watched – and listened to the soldiers at Fort Benning and Fort Hood as they commented on their training, and their issues and concerns about the A3 vehicle.

The Bradley: System Description

The Bradley crew consists of a Bradley Commander (BC), Gunner, and a Driver. The Bradley, a lightly armored tracked vehicle, provides protected cross-country

mobility, vehicle mounted firepower, and communications, in rough terrain, mud, snow and sand. It has a stabilized 25 mm automatic gun, a TOW missile launcher, and a coaxially mounted 7.62 mm machine gun (the "coax"). The basic Bradley sight, the Integrated Sight Unit (ISU), provides both day and thermal capability, and permits the BC and the gunner to see the same sight picture.

Since the original M2 Bradley, improvements have been made. The A1 variant brought some upgrades to the basic BFV; the A2 incorporated major survivability enhancements. ODS upgrades were the Bradley Eyesafe Laser Rangefinder (BELRF) and the Global Positioning System (GPS). Despite these needed enhancements, the ODS proved to have deficiencies. Unlike its companion vehicle, the Abrams tank, the Bradley was not digitized, there was no hunter/killer capability (commander and gunner simultaneously using separate sights), and the dismounted element lacked situation awareness. A call arose for an improved vehicle, the A3 variant.

The M2 A3 Bradley

The M2 A3 Bradley brought major changes from its predecessors. (The A3 has many new items of equipment and numerous additional acronyms; a list is found at Appendix A.) The A3 has tactical and video displays, and built-in test capabilities. It includes BC and squad leader displays; and hull and turret processing units for fire control, command and control, digital maps and navigation. The digitized A3 can receive, store, retrieve, and display combat information through an integrated messaging and display capability. There are data links between every vehicle in the platoon, plus others in the chain of command. The A3 is interoperable with other Force XXI digitized platforms. The intercom system enables BFV personnel to communicate among themselves, interface with a full radio net and remotely located operators. It uses the Single Channel Ground Airborne Radio System (SINCGARS) with enhanced position location reporting system (EPLRS). The A3 also has an advanced target handoff and acquisition system that provides improvement to fire control.

A brief description of portions of the new equipment found on the A3 vehicle is provided next, to illustrate some of the differences between the A3 and earlier versions of the Bradley, and to show the impact of digitization. Some aspects of the digital attributes are described in great detail, primarily to show the relative complexity of the A3, as compared to prior versions, and the demands on the operator.

Improved Bradley Acquisition Subsystem (IBAS). The IBAS, a second-generation forward-looking infrared (FLIR), replaces the ISU. The IBAS is used for target acquisition and other situational awareness functions. It has 12X or 4X magnification with zoom. The gunner's Target Acquisition Subsystem (TAS) has a magnified optical view of the battlefield and a day TV Video output. The IBAS works through the Commander's and Gunner's Sight Control Panels (CSCP and GSCP), and the Commander's Hand Station (CHS) and Gunner's Hand Station (GHS).

Commander's Independent Viewer (CIV). The CIV subsystem is the BC's primary sight. It provides the BC with an independent external view of the battlefield and allows the BC to search for targets regardless of the gunner's field of view. He can identify and acquire a target, slew the turret, and hand off the threat to the gunner for engagement, providing a hunter-killer capability. The Remote Biocular Display (RBD) provides biocular display and thermal imagery; the Auxiliary (AUX) or backup sight permits daylight firing of the 25 mm when the IBAS and CIV sights are not operational.

Digital Capabilities. The A3 is equipped with a digital computer. The Commander's Tactical Display (CTD) flat panel display provides situational awareness through an 8.5 by 6.5 inch screen at the BC's location. The BC can adjust brightness, contrast, color, and polarity. Maps provide terrain data and display tactical and situational data. The CTD provides access to digital command and control capabilities: system management, tactical, communications, diagnostic, logistics and maintenance. There are Cursor Select, Direction, and Enter Keys as well as Map and Navigation Control Keys. The Commander's Data Entry Tool (CDET) is a hardened keyboard device that provides the capability to input text to the CTD.

The Tactical Screen has programs for Setup, Operations, Combat, SPOT Reports, Logistics and Messaging functions. The Start-up screen performs a self-test and password login; the software will be password protected. The BC navigates through the embedded system software from the Tactical menu screen to a desired program. Eight Screen Navigation Soft Keys change with each screen and are selected with a cursor. Screen Navigation Hard Keys are accessed by a touch-pad.

The Operations Program has message formats, an Operations Order with Annexes, Map and Overlay screens. Each has a pull down menu and free text areas to fill in using the CDET. Stored formats include NBC-1 and Situation Reports (SITREPs). Both have pull-down screens and a fill in the blank (free text) menu. The SITREP combines pull down and select menus plus free text fields. It includes vehicle and soldier readiness information and status. Messages are received and stored, with level of priority indicated. Defaults are set for distance traveled or time, weapons firings and time of engagement, as well as duty position (e.g., platoon leader, platoon sergeant, platoon leader's wingman), vehicle type and identification. An address book contains defaults for primary addressees and copies furnished, save, edit and delete functions.

The Status Bar allows the cursor to select from several display areas. They include a Highest Precedence (Alert) Message indicator, a F/I/P/R (flash, immediate, priority, routine) Message Indicator (the "FIPR queue"), a Malfunction Indicator, and Own Vehicle Position Indicator. Date-Time-Group data are maintained automatically from the Global Positioning System (GPS)/Inertial Navigation Position Navigation System (PNS). The precision lightweight global receiver (PLGR) provides GPS data to the PNS and an inertial navigation unit (INU) provides GPS backup. There are advisory messages for systems/weapons status and information on boresight, power management, diagnostics, and software. There is a Silent Watch mode, a low power

and signature system status that provides surveillance capability by switching off the engine and turret drive, maintaining radio listening silence.

In another departure from predecessor vehicles, the A3 provides a Squad Leader's Display (SLD), a flat panel screen located in the troop compartment just outside the turret shield door. It provides images from the CTD, IBAS, or CIV and is intended to provide increased situation awareness for troop compartment personnel.

Training

As can be determined from the system description of the A3 Bradley, although there are many similarities to predecessor vehicles, there are many hardware and accompanying procedural changes incorporated in the system. There are also a considerable number of computer skills (e.g., messaging, menus, screen navigation) that must be demonstrated by BCs who wish to take full advantage of the digitization capability. The A3 will create a considerable impact on Bradley training.

The Bradley M2 A3 Task List

The task list for the M2 A3 Bradley is comprised of 85 tasks. (The USAIS list, dated October 1999 and subject to change, is shown at Appendix B.) Of these tasks, only 30 (35%) are unchanged from earlier vehicles. Eighteen (21%) are predecessor tasks that must be in some way modified for the A3. Additionally, there are 37 new or proposed tasks (44%).

Existing tasks which need no modification include weapon-related tasks, e.g., maintain, load, unload and engage targets with the 25 mm gun, the TOW Launcher, remove a misfired missile from the launcher, etc. Other unchanged tasks include preparation of range cards and sector sketches; and preparation and operation of the SINCGARS. Existing tasks which must be modified include such tasks as loading and unloading the 25 mm ammunition cans; boresight and zero, correct malfunctions and perform function checks on the turret weapons; etc.

Other tasks are new, though they sound like familiar predecessor tasks. For example, Boresight and Zero the 25 mm Automatic Gun, is a recognizable task names, but distinctly different in the A3. Other tasks appear new and less familiar: Transmit Digital Messages; Operate and Maintain the PLGR. Navigate on a Predetermined Route does not appear to be a new task, except when coupled with Manipulate the (Driver's) Waypoint Entry Screen and Operate the Navigation Setup Screen.

Besides the existing tasks, and those to be modified, there are additional tasks. Some have no comparable predecessor tasks; others are totally new to the Bradley. Some require both keyboard and computer skills, expertise previously not required. These tasks include, for example, global tasks such as operate the IBAS, operate the CTD, and operate the CIV. There are other tasks such as operate auto-tracking; manipulate status bar and soft keys; adjust the sustainment and diagnostics screen;

modify environmental parameters screen; operate the Squad Leader's Tactical Display. (The documentation for the new tasks is not yet final but the preliminary (1999) task list at Appendix B shows many changes based on incorporation of A3 specific tasks.)

New Equipment Training Team

The New Equipment Training (NET) Team is made up of military and military-supervised contract personnel assigned to Fort Benning. The traditional military ("green suits") NET Team has been supplemented by a team of instructors ("blue shirts"), under contract to UD and comprised of former Bradley soldiers. The two groups work as one team, sharing responsibilities. Their NET mission is to provide new equipment training on all BFV unique individual, crew, and collective tasks. This includes familiarization on new components, diagnostics and communications, messaging, optics, navigation, and fire control, and is followed by maintenance, gunnery, doctrine and tactics. According to the Material Fielding Plan, sustainment training will be conducted by unit cadre who have been trained during NET, using training materials left by the NET team (Project Manager, Bradley Fighting Vehicle Systems (PM BFVS), January 2000). (See also the draft System Training Plan, USAIS/C, 2000.)

Institutional Training

Currently, ODS vehicle training is the Army baseline. Enlisted soldiers learn vehicle operation, maintenance, and how to drive. Sergeants and entry-level officers learn turret operations and gunnery skills in the seven-week Bradley Leaders Course (BLC) at Fort Benning. Maintenance personnel are trained separately. The Master Gunner (MG) 13-week course gives extensive training on operation and maintenance of all weapon systems. MGs are gunnery and training device experts who advise commanders on unit training status, and help build training calendars. They are certified I/Os and SIOs for gunnery devices. Each BFV course will be impacted on, differently, by introduction of the A3.

Training Devices

The A3 vehicle will have several legacy (existing) training devices available. The PGS (Precision Gunnery System), a laser system is appended to the BFV. The Thru-sight Video (TSV), records the gunner's sight picture and crew audio for use in AARs. The Multiple Integrated Laser Engagement System (MILES) 2000 tactical engagement system is not yet ready for the A3. The Close Combat Tactical Trainer (CCTT) will be used for tactical training, and the Conduct of Fire Trainer (COFT) gunnery trainer will be replaced by the BATS; it may, in the future, interface with the CCTT. The A3 may also have the BDT. Both BATS and BDT, developed by UD, are entirely new for the A3.

Bradley Desktop Trainer (BDT). The BDT is a part-task trainer designed to familiarize BCs with the A3's turret components. It mimics the BC station and provides hands-on training. It has a touch screen monitor, the CTD, and CDET. It provides a BC practice or to help a gunner transition to BC. It can be used in briefings, or individual

familiarization, as in the case of a pre-command course. The BC learns to manipulate the display, maps, and controls, and to use the messaging capability. In its initial configuration, four BDTs are linked together under the control of one I/O.

Bradley Advanced Training System (BATS). The BATS, like the predecessor COFT, is a major system-training device. It is a precision gunnery trainer for individual crews. It replicates the A3 turret, using the CCTT terrain database and image generator. BATS will replace the COFT for all A3 units. Like the COFT, BATS has an I/O Station, with observation and AARs at remote monitors. A future BATS may be interoperable with CCTT, with a driver station and troop compartment. BATS provides much more than the COFT. In the gunnery and combat modes, BATS presents simulated targets and ranges, with ammunition and scoring in accord with the standards in the Bradley Gunnery Manual, FM 23-1 (Department of the Army, 1996; draft, 2000).

BATS has five Training Matrices. The Special Purpose Matrix offers orientation, familiarization and practice exercises to assist in target acquisition and engagement. In the Preliminary Training Exercise Matrix, engagements increase in difficulty. The Crew Gunnery Matrix incorporates malfunctions and vehicle performance degradations, with BC and AUX sight exercises. The Crew Matrix's Minimum Proficiency Level (MPL), originally the BCPC (Bradley Crew Proficiency Exercise), mirrors FM23-1, and is the gate to live fire. Advanced Training Matrix Exercises are increasingly difficult, with malfunctions, and targets that vary in speed, turret orientation, direction and evasiveness. Sustainment Training Matrix exercises are based on crew performance.

As with the COFT, a BATS I/O trains and sustains crew proficiency. The I/O has an on screen pre-brief, and a computer generated post-brief. The BATS offers flexibility in mixes of ammunition and targetry, light and weather conditions. The SIO must tailor the unit's gunnery training to its own live-fire target worksheets, and unit METL (mission essential task list) and threat. Crew records (paper and disc) are maintained and managed by the SIO. The BATS takes a crew from pre-gunnery through simulated gunnery Tables V through VIII, and into Platoon Gunnery. A very recent enhancement to the BATS concept is the prototype Virtual Range (VR), which embeds the BATS software into the actual vehicle rather than in a standalone trainer.

Results: Potential Lessons Learned

Throughout the period during which the author has been observing activities related to the A3 Bradley, several things have become apparent. First, the A3 is a radical departure from the previous vehicles, probably more radical a departure even than the original was from its predecessor, the M113 armored personnel carrier. The turret is considerably more technically demanding, and the requirements placed on the soldier, and on the unit master gunner, are greater than for predecessor vehicles. The equipment in the A3 is complex, and somewhat fragile, although not beyond the capability of a well-trained operator, especially one with a certain amount of computer familiarity. The problem with the A3 appears to be that not enough people are taking it

seriously, and once again, the focus has been on gunnery. The following sections describe some areas possibly in need of greater attention.

Digitization Issues

Predictably, digitization provides most of the lessons to be learned from introduction of the A3. The vehicle changes, as will the skills and performance required of the Fighting Vehicle Infantryman. Areas are described separately, but they are intertwined, and the overall and cumulative effects are as yet largely unknown. The only danger is in ignoring them.

Software. In the A3 software is essential to fire control and mission performance. It provides the operator the ability to gather, store, retrieve, and display combat situational awareness information. It permits assembly, delivery, and acknowledgement of reports, requests, and overlays. Preparation and planning for software maintenance, computer resources and support is essential, especially since future upgrades will require coordination between the Bradley, Abrams, and other tactical sectors using the FBCB2 (Force XXI Battle Command, Brigade and Below) systems. Ford, Campbell and Cobb (1998) note that digital development moves faster than the training associated with it and software changes move much faster than the documentation required to take advantage of them. This has already proven true with the A3.

Digital Skills. Digital skills are additive and will impact on needed training resources. Digitization in institutional training will add to the number of tasks to be taught, the complexity of those tasks, and will reinforce the necessity to train to and maintain high standards. This is coupled with the perishability of digital skills and knowledge. Digital skills may be taught through computer-based training support packages (e.g., Andre, Wampler, & Olney, 1997) and evaluated in a number of ways (see Alliger, Tannenbaum & Bennett, 1996; Evans & Dyer, 2000). Although future training can be based on past training, A3 training may not be easy.

Digital training may require more time than expected, and the skills will be perishable if not reinforced. Some skills, especially those involved in messaging, appear to be rather tenuous and may deteriorate over time, and decay with disuse (Salter & Black, 1998; Ford, Campbell & Cobb, 1998). Sanders, working with reporting and overlays on the M1 A2 tank, showed that "representative digital procedural skills will show significant skill decay after 30 days without sustainment training" (Sanders, 1999, p. viii). Skills must be learned and over-learned, then sustained. (See also Eckert & Phillips, 2000.) The realistic appraisal of training may prove harder than it seems, as the impact of skill decay is as yet unknown (see Campbell, Ford, Shaler, & Cobb, 1998).

Soldier Performance. There are also some possible soldier training-specific issues. The user and the system software must interface, and do it well. The BC's input is processed and immediately shown on many displays. There is little room for error. Leaders at every level must have the skills to understand these capabilities and to fully utilize the A3. In 1996 Elliott, Sanders and Quinkert conducted a detailed

analysis of the performance of the soldiers in the M1 A2 Abrams Focused Dispatch Advanced Warfighting Experiment, and provided a number of lessons to be learned from the insertion of a digitized system in a previously non-digitized force. Among the training-related lessons are several which apply to the Bradley. Key is a warning first to train to proficiency on combat fundamentals, then digital proficiency before attempting the integration. Too many new things introduced simultaneously causes problems. Training must be sequential (Ford, Campbell & Cobb, 1998). Building on an imperfectly learned skill is a task doomed to failure. For example, NET reports indicate that the primary problem in teaching soldiers to use the POSNAV systems is that they do not have the basic skills of the EPLRs or PLGR. Sanders (1999) also noted that despite extensive training, many soldiers he studied did not achieve the initial basic minimum standards and had to be removed from further consideration as test subjects. This is consistent with NET Team reports that some personnel had not mastered preliminary basic Bradley skills before they began NET training.

A comprehensive study of the digitized Bradley and the digitized M1 A2 tank (Ford, Campbell & Cobb, 1998) confirmed that in addition to the primary digital skills, personnel must receive training on back-up analog, or pre-digital skills. Messaging capability will be very powerful; however, soldiers must retain the ability to use traditional forms of communication. Much as manipulating the turret in manual mode is a needed skill, range estimation without a laser range finder must be retained as a skill.

Computer Skills. It is unlikely that soldiers at all levels are receiving fundamental background training. Elliot, Sanders and Quinkert's (1996) observations with the Abrams showed that the sophistication of the digital equipment and the operator's abilities are thoroughly intertwined. A recent study of the background computer skills of over 700 soldiers enrolled in various courses at Fort Benning between 1999 and 2000 showed different populations with very different skills. An assumption that all young soldiers are computer literate cannot be supported (Fober, Bredthauer, & Dyer, 2000). While lieutenants (potential platoon leaders) showed good skills with computers and messaging, the recipients of some of their messages (potential BCs and platoon sergeants) were less skilled. Typically, basic trainees and NCO Course enrollees reported that they typed more slowly, and their self-ratings of computer skill were generally lower (novices, or good with only one software program) than were those of the lieutenants sampled (Fober, Bredthauer, & Dyer, 2000). Specific computer training can overcome differences in skill levels, but the potential problem cannot be ignored.

Individual Differences. Mastery and retention of digital skills may vary widely between individuals and there may be differences between mastery of the procedures, and cognizance of the underlying conceptual skills (Dodge, Webb & Christ, 1999). Digital maps will be available, but interpretation requires background knowledge of typical battlefield operations. Messages may appear in the BC's display, but overcome by events before they can be acted upon. Simply learning how to open or send messages will be insufficient; the recipient needs an overall concept, or "the big picture."

Dodge, Webb and Christ (1999) also suggest that effects of digitization go beyond the hardware and software to the people involved. The impact on the human dimension – the attitudes and interactions of personnel must not be ignored. There is a potential overload problem. New information can increase situational awareness, but can place an increased burden on leaders. Data must be filtered and interpreted rather rapidly. Too much information may overwhelm the user and impact on decision-making (Freeman, Cohen, Serfaty, Thompson, & Bresnick, 1997). Training for the digital battlefield must take this into account. Another lesson is to "identify new, modified and unchanged tasks resulting from digitization and ensure that they are incorporated into training" (Elliott, Sanders & Quinkert, 1996, p. 92). That has been done, but with limited acknowledgement of the impact of these tasks on training.

Finally, according to the observations made by Elliot, Sanders and Quinkert (1996), one key to success in presenting new equipment is that the technologies and capabilities need to be explained to the user, prior to or simultaneously with introducing them into training. One of the often-repeated comments from the Bradley soldiers at Fort Hood was that they did not know what they were supposed to be doing, or why they were doing it. They needed (or asked for) an overview of the total package of changes in the A3, rather than the total immersion they got. Sanders (1999) also suggested that an overview be provided in addition to just training on specific tasks – to increase conceptual knowledge and provide a foundation for specific items of training.

Impact of Multiple Vehicle Variants on Training

Another concern in the introduction of the A3 Bradley is not unlike that experienced when the Bradley began to replace the M113 in selected units. Of 6720 Bradley vehicles, only approximately 1100 will ever be A3 variants. There are currently five BFV variants in various locations throughout the Army. Although some are being upgraded, the current fielding strategy will continue to reflect a mixed fleet of A2 ODS and A3s. Cavalry will have the M3 A3, but the M2 A3 will be limited to one battalion per division, except for the 3d Infantry Division at Fort Stewart, which will receive two battalion sets. (The Material Fielding Plan, PM BFVS, Jan. 2000, has full information, but is subject to change.) Reserve Component units will not be upgraded to the A3.

The resulting mixed fleet of ODS and A3 will require the Infantry School (and to some extent the Armor School) to maintain training on both systems for the foreseeable future. A large tracking effort will be required for students and for instructors. The primary professional development courses, BNCOC, which trains personnel at the BC level, ANCOC, which trains platoon sergeants, and the Officer Basic Courses, which train platoon leaders, offer BFV familiarization. The Infantry School trains all Bradley Master Gunners (Cavalry and Infantry), and provides Bradley Pre-Command Courses for designated senior leaders.

As noted earlier, the primary near term training (baseline) vehicle for institutional training will remain the A2 ODS and A3 training will be incorporated as needed or in add-ons to current courses. As A3 fielding density increases, critical tasks will be fully

integrated into POIs. NET training will continue until proponent schools are ready to conduct A3 training; however plans for integration of A3 training into these courses must begin well in advance of the first unit equipped. The Schools will also have to retain a mix of devices, in order to insure gunnery training on both the COFT and the BATS.

Training (to include initial and transition training), and professional development courses will consist of instruction using a mix of media, simulators and simulations. Institutional training will be supported by embedded and stand-alone systems. The instructional materials produced and used by the contractor and the NET teams will serve as the baseline for the new training programs and to supplement existing training and POIs. Currently, the quality of the new materials is, at best, uneven. The mixture of both old and new may be, at best, unwieldy.

The impacts on unit (sustainment) training are also unknown. Units may have a mixture of different kinds of equipment, and a mismatch of personnel trained to deal with them. Maintainers and operators will be less interchangeable than before, and more on-the-job training and cross-training, unlikely to be standardized and frequently not performed to standard, is likely to occur. Resource requirements will be different for different variants, and priorities may become an issue.

Impact of Simultaneous Fielding of Device and Vehicle

The BATS, the primary gunnery trainer, is being fielded almost simultaneously with the vehicle. This is not usually a bad idea. The device is in place and soldiers can use it to prepare for live fire gunnery. Such concurrent fielding grows increasingly important in view of the high costs associated with vehicle operating tempo - ammunition, moving vehicles to ranges, etc. In this case, however, the devices use simulations of actual vehicle software; the vehicle software is still changing, during the time when the device is initially being fielded. This has placed the user community in a difficult and sometimes untenable position.

Deliberate (or unplanned) changes to software frequently cause other, unforeseen effects. With BATS, for instance, problems have been identified; many have been remedied, or will soon be. Still others - new problems - have been identified as the prototype devices have received more use. Sometimes the fixes themselves have created problems. The user community is now in the position of having assessed two prototype BATS devices that are almost but not quite like the vehicle, and almost but not quite like the final BATS production models.

Another problem of simultaneous fielding comes when the new devices are "not quite ready" when seen for the first time by the intended user group. The device must operate in a manner similar to the vehicle, in functionality and in speed of performance, but often overlooked is the fact that it must actually be available for use. When a training device is down (broken or simply inoperable for unknown reasons) during NET training or even during sustainment training, a problem arises. The issue is much greater than simply lost training time. When a new system is down, frequently that fact

is all that the user – whether NET team or the unit – remembers: the downtime. When the new device does not work, or work well, the old device (in this case the COFT) becomes "better" by default. The BATS must overcome credibility problems.

Personnel Continuity

When devices and the vehicle are fielded simultaneously, but over a period of several years, other continuity problems arise, in the contractor's development group, but to an even greater extent in the user community. With different vehicles in the inventory, there is a great likelihood that someone trained on the A3 may have his next assignment at a unit where the ODS is the primary vehicle. Not only will he lose his A3 skills from disuse, but also he may have forgotten critical information about the ODS. A more serious possibility is that the ODS trained soldier will be transferred to an A3 unit, without the prerequisite skills. How will he be trained? How will standardization be maintained? There must be a tracking process to identify soldiers specially trained on the A3. As noted earlier, differences between the ODS and the A3 will affect Leader and Master Gunner Course POIs and students. And they will impact on instructors.

Subject Matter Experts. Within the initial user community (Fort Benning, Fort Knox, and Fort Hood), the time lapse from early attempts to actual fielding has created some problems. There has been considerable personnel turnover, to include military, civilians, and the NET team. There are several areas of potential instability in addition to the somewhat predictable turnover within and between units and the turbulence that comes in the course of normal career progression moves and schools.

Turbulence has already surfaced with respect to A3 SMEs. For example, the Armor School has over the past few years provided six personnel who have become, to varying degrees, experts on the A3 Bradley. At this writing, one of the six has just been reassigned to the A3 after a two-year absence; the other five and their expertise are lost to the program. Similarly, the USAIS Bradley Proponency Office (BPO), site of most of the Army's A3 SMEs, will have had almost 100% turnover by the end of calendar year 2000; the only long-term continuity is the lone civilian and one senior NCO from the now disbanded COFT Branch. Within the training base, the 29th Infantry Regiment's total reorganization of personnel and function has further diluted expertise and precludes long-term continuity. The NET Team, both military and UD, has had major attrition.

Some of this change is a natural outcome of growth and efficiency; other aspects appear to be shortsighted or a failure to learn from experience. As an example of possibly poor planning, in February 2000, fourteen personnel were trained to be the first BATS SIOs. Of these, twelve (two NCOs and two civilians from the NETT, two NCOs from the BPO and COFT, two NCOs from Fort Knox, and four from Fort Hood), are gone. Only two NCOs from Fort Hood remain active in the program. There are no other certified BATS SIOs.

There is a lack of permanence in the entire BFV A3 training program and too much knowledge resides in too few people. Personnel from the Bradley TRADOC

Systems Manager's (TSM-B) Office with long-term experience are overburdened; much of their focus is, rightfully, long term rather than near term. It would appear that an effort to build and retain a few more A3 dedicated personnel, particularly in the training arena, would be beneficial. Fort Knox SMEs should be consulted for the lessons learned during the fielding of the M1 A1 tank.

Training Materials and Devices

From the early 1980s, Field Manual (FM) 23-1, Bradley Gunnery, has been a controversial and frequently changing document. Units in the field and the Infantry School have argued points of gunnery and scoring since the first draft manual was published in 1982 (USAIS/C, 1982). The stability finally produced by the March 1996 version has been replaced by the uncertainty of the 15 April 99 draft that incorporates material new to and specific to the A3 vehicle. This new gunnery manual, in draft form for over a year, is not yet available. The inability to provide a gunnery manual prior to vehicle fielding has wide impacts, some of which are probably still unknown.

Training materials provided by the NET Team have become relatively polished. However, the training support packages (TSPs) for the BATS and BDT, the I/O and SIO packages, are still not fully finished (United Defense, 1999a; 1999c; 2000). Instructor's Utilization Handbooks (United Defense, 1999b; 1999e; also 1999g) remain in draft form. The BDT TSPs are similarly incomplete (United Defense 1999d; 1999f). There is little time available to remedy the problem, and fewer personnel available to do it.

Plans for the new A3 devices have not been finalized – and there are considerations beyond the provision of physical space within the institutional training environment. The future of the BDT is unclear. With BDT, since four stations are linked to one I/O, the training area must be large enough so one user does not interfere with another. Students may need headphones; the I/O may need an intercom-like system so he can talk to and assist one student without disturbing others. The I/O needs to see his screen and student monitor screens, but needs to be able to walk around to watch students work. If the area is too crowded and there are too many people at any station, then too much non-training related business goes on.

Additionally, a determination must be made as to who will actually be trained on the BDT – and for what purposes. A gunner needs to know turret components and messaging, for career progression, and more importantly, when he takes the BC's position in an emergency or when the BC exits the vehicle, but may not need to link to other stations and an I/O. The BDT might be used for familiarization to ensure keyboard competence before a BC gets in the turret. Much as the COFT has been a gate to live fire for tanks and Bradleys, BDT competency might be a turret prerequisite. BDT could also be used to help soldiers understand the bigger picture – how their vehicle fits within the company operation.

The BATS also has areas in need of resolution. It uses the CCTT database, with known defects. Some problems are of little importance in the CCTT, but make a

difference in a precision gunnery trainer. For example, technical (stabilization) issues and training (computer progression and sustainment exercise generation problems) issues cause gunnery problems. (Troop targets that appear in sections may cause the gunner to fire only on a few instead of all, thereby failing the engagement.) This sort of problem is very difficult to explain to a unit. The I/O and the device lose credibility.

The BATS also needs a standardized introduction to provide consistent and thorough information to personnel preparing to use it – once again, the "big picture." The briefing must explain the matrix and describe the reasoning behind the special purpose exercises. Units familiar with the COFT will not appreciate enhancements offered by the BATS without an explanation. Additionally, BATS is good for crew coordination and skill retention but some determination must be made as to the number (ideal and maximum) number of hours a crew should be in the trainer, at one sitting, and in order to achieve a passage to live fire. The BATS, unlike the COFT, has no reticle aim group; crew proficiency is measured by success in the BCPC-like exercise that serves as the gate to live fire. Continued efforts to designate a reticle aim group as a gate to live fire indicate an incomplete understanding of the differences between COFT and BATS.

BATS provides on screen AAR information at the IOS (I/O Station) and a remote monitor for formal AARs, but an exercise playback capability may be needed. BATS can be used as a remedial or sustainment device. To gain the true worth of the BATS, the unit and the I/Os alike must be specially trained. The BATS, even more than the COFT, requires a very skilled operator, and some effort needs to be made to determine how long an I/O can work at the IOS before he loses effectiveness. The attempt to embed BATS in the vehicle, the Virtual Range, is more of a concept than a training device; it will have to undergo the same scrutiny as the other A3 devices.

Conclusions

In general, with the A3, there is enough similarity to the predecessor vehicle that there may already be a tendency to be complacent, or presume that if things don't work the first time, the old ways from the old vehicle are a good and sufficient fall back. If a soldier cannot make the A3 work the way he wants it to, he may revert to old habits. The old procedures will not always work, as the A3 is not just an upgraded version of the ODS. Reversion to ODS capabilities will not only fail to take advantage of the A3's enhancements, but will also render the A3 at a disadvantage when with its combined arms battlefield companions. BFV personnel in the institution or in units, and all of their leaders need to have the new system explained to them in advance, before it arrives. Soldiers and trainers would benefit from a standardized information briefing to set the deservedly high expectations for the new system, and maximize both unit acceptance and effectiveness of the provided training. A briefing reinforced by a more nearly stabilized group of trainers, will ensure successful fielding. The Bradley A3 need not be a mystery and successful training must capitalize on all available lessons learned.

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Appendix A
List of Acronyms

AAR	After Action Review
ANCOC	Advance Noncommissioned Officers Course
AP	Armor-Piercing
ARI	Army Research Institute
AUX	Auxiliary (Sight)
BATS	Bradley Advanced Training System
BC	Bradley Commander
BCE	Bradley Crew Evaluator
BCPC	Bradley Crew Proficiency Exercise
BDT	Bradley Desktop Trainer
BELRF	Bradley Eye Safe Laser Rangefinder
BLC	Bradley Leaders Course
BNCOC	Basic Noncommissioned Officers Course
BFV	Bradley Fighting Vehicle
BFVS	Bradley Fighting Vehicle Systems
C2	Command and Control
CCTT	Close Combat Tactical Trainer
CDET	Commander's Data Entry Tool
CFV	Cavalry Fighting Vehicle
CIV	Commander's Independent Viewer
CHS	Commander's Hand Station
COFT	Conduct of Fire Trainer
CSCP	Commander's Sight Control Panel
CTD	Commander's Tactical Display
EBC	Embedded Battle Command
EPLRS	Enhanced Position Location Reporting System
FBCB2	Force XXI Battle Command Brigade and Below
FC	Fire Control
FH	Frequency Hopping
FIPR	Flash, Immediate, Priority, Routine
FLIR	Forward Looking Infra Red
FM	Field Manual
FPD	Flat Panel Display
FSR	Field Service Representative
GHS	Gunner Hand Station
GPS	Global Positioning System
GSCP	Gunner's Sight Control Panel
HE	High-Explosive
HEIT	High Explosive Incendiary Tracer
IBAS	Improved Bradley Acquisition System
IFV	Infantry Fighting Vehicle
I/O	Instructor/Operator

IOS	Instructor/Operator Station
ISU	Integrated Sight Unit
METL	Mission Essential Task List
MILES	Multiple Integrated Laser Engagement System
MMU	Mass Memory Unit
MOS	Military Occupational Specialty
MPL	Minimum Proficiency Level
MRE	Meals, Ready to Eat
NCO	Noncommissioned Officer
NET	New Equipment Training
NETT	New Equipment Training Team
ODS	Operation Desert Storm
PCMCIA	Personal Computer Memory Card International Assn.
PGS	Precision Gunnery System
PLGR	Precision Lightweight Global Positioning Receiver
PM	Program Manager
PNS	Position/Navigation Subsystem
POI	Program of Instruction
POL	Petroleum, Oil, Lubricants
POSNAV	Position Navigation
RBD	Remote Biocular Display
SALUTE	Size, Activity, Location, Unit/Uniform, Time, Equipment
SC	Single Channel
SINCGARS	Single Channel Ground Airborne Radio System
SIO	Senior Instructor/Operator
SITREP	Situation Report
SLD	Squad Leader's Display
SME	Subject Matter Expert
STAB	Stabilization
TAS	Target Acquisition Subsystem
TOW	Tube-launched, Optically-tracked, Wire-guided Missile
TPU	Turret Processing Unit; Trained-Partially Trained-Untrained
TRADOC	Training and Doctrine Command
TSM-B	TRADOC System Manager, Bradley
TSP	Training Support Package
TSV	Thru-Sight Video
UD	United Defense
UDLP	United Defense Limited Partnership
USAIS/C	United States Army Infantry School/Center
VIS	Vehicle Intercommunications System
VR	Virtual Range

Appendix B
M2A3 Bradley Task List

Numbers in front of the tasks represent the current set of numbers. The letter P after the task number indicates that it is a proposed (new) task; an asterisk indicates that an existing task must be modified. Tasks without P or an asterisk are unchanged from predecessor vehicle tasks. (Personal communications, Directorate of Training and Operations, U. S. Army Infantry School/Center, October 1999 and November, 2000.)

Existing Tasks

071-024-0005	Maintain the 25-mm Automatic Gun
071-024-0007	Load the 25-mm Automatic Gun on a BFV
071-024-0008	Unload the 25-mm Automatic Gun on a BFV
071-028-0001	Maintain an M231 Firing Port Submachine Gun
071-028-0002	Perform a Function Check on a M231 Firing Port Submachine Gun
071-028-0003	Install an M231 Firing Port Submachine Gun on an M2 BFV
071-028-0004	Remove an M231 Firing Port Submachine Gun From an M2 BFV
071-028-0005	Load an M231 Firing Port Submachine Gun
071-028-0006	Unload an M231 Firing Port Submachine Gun
071-034-0005	Load the M257 Smoke Grenade Launcher on a BFV
071-034-0006	Unload the M257 Smoke Grenade Launcher on a BFV
071-056-0001	Load the TOW Launcher on the BFV
071-056-0002	Unload the TOW Launcher on the BFV
071-200-0004	Select a Water Crossing Site
071-216-0004	Maintain the Track and Suspension System on a BFV
071-311-6004	Correct Malfunctions of an M231 Firing Port Weapon on a BFV
071-311-6005	Engage Targets with an M231 Firing Port Weapon on a BFV
071-313-4007	Engage Targets with the M240C
071-314-0012	Engage Targets with the 25-mm Automatic Gun on a BFV
071-316-3006	Engage Targets with the TOW System on a BFV
071-316-3015	Remove a Misfired TOW Missile from the TOW Launcher on a BFV
071-324-2003	Prepare a Range Card for a BFV
071-324-4003	Fire the M257 Smoke Grenade Launcher on a BFV
071-326-5770	Prepare a BFV Platoon Sector Sketch
071-410-0007	Prepare an M2 BFV Section/Squad Sector Sketch
113-587-1064	Prepare SINCGARS Manpack for Operation
113-587-2070	Operate Secure SINCGARS Single Channel (SC)
113-587-2071	Operate Secure SINCGARS Frequency Hopping (FH) Net Member
171-122-1012	Perform Operator's Maintenance on an M240/M240C Machine Gun

Existing Tasks which must be Modified for M2A3

071-024-0001*	Load the 25-mm HEIT Large Ammunition Can
071-024-0002*	Load the 25-mm AP Small Ammunition Can

071-024-0003*	Unload the 25-mm HEIT Large Ammunition Can
071-024-0004*	Unload the 25-mm AP Small Ammunition Can
071-024-0006*	Perform a Function Check on the 25-mm Automatic Gun on a BFV
071-026-0001*	Load the M240C Coaxial Machine Gun
071-026-0002*	Unload the M240C Coaxial Machine Gun
071-026-0006*	Perform a Function Check on the M240C Coaxial Machine Gun
071-026-0007*	Boresight the M240C Coaxial Machine Gun on the M2A3
071-026-0009*	Install/Remove an M240C Machine Gun on an M2A3 BFV
071-056-0003*	Operate the TOW Launcher on the BFV
071-056-0063*	Perform Misfire Procedures on the TOW System on a BFV
071-056-0063*	Boresight the TOW Launcher on an M2A3 BFV
071-216-0023*	Operate the Turret of a M2A3 BFV
071-313-4004*	Correct a Malfunction on the 240C Coax Machine gun on an M2A3 BFV
071-313-4006*	Correct Malfunctions of the M240C Machine Gun on a M2A3 BFV
071-314-0011*	Perform Misfire Procedures on a 25-mm Automatic Gun on an M2A3
071-620-0003*	Operate the NBC System on a M2A3 BFV

New Tasks

071-000-0005P	Operate Auto-tracking on an M2A3 BFV [combined in all firing tasks]
071-000-0006P	Operate in Degraded Fire Control Mode
071-000-0007P	Operate the Commander's Tactical Display on an M2A3 BFV
071-000-0008P	Operate the CTD Screen Architecture Components
071-000-0009P	Operate the Commander's Sight Control Panel
071-000-0010P	Operate the IBAS on an M2A3 BFV
071-000-0011P	Operate the Gunner's Sight Control Panel on an M2A3 BFV
071-000-0012P	Operate the Commander's Independent Viewer
071-000-0013P	Manipulate the Sustainment and Diagnostics Screen on an M2A3 BFV
071-000-0014P	Manipulate Status Bar and Soft Keys
071-000-0015P	Access and Modify Fire Control Screens
071-000-0016P	Access and Modify Environmental Parameters Screens
071-024-0011P	Zero the 242 25-mm Automatic Gun on the M2A3 BFV
071-026-0003P	Zero the M240C Coaxial Machine Gun on the M2A3 BFV
071-200-0006P	Stowage for the M2A3 BFV
071-200-0007P	Operate the MRE Heater
071-200-0008P	Maintain the MRE Heater
071-200-0009P	Maintain the Driver's Viewer Enhancer
071-200-0010P	Conduct Pre-water Operations
071-200-0011P	Conduct Post-water Operations
071-216-0024P	Maintain the NBC System on the M2A3
071-314-0008P	Boresight the 25-mm Automatic Gun on a M2A3 BFV
071-329-1032P	Operate the Driver's Viewer Enhancer on an M2A3

071-329-1034P Operate the Squad Leader's Tactical Display on an M2A3
071-329-1200P Navigate the M2A3 Vehicle on a Predetermined Route
071-329-1201P Manipulate the Waypoint Entry Screen
071-329-1202P Navigate Through All Available Top Level Screens
071-329-1033P Define the Major Components of the PNS
071-329-1035P Operate the Navigation Setup Screen
071-329-1300P Operate the Driver's Compass Display
071-410-0008P Prepare a BFV for Fording
071-600-0013P Operate the Power Management Distribution System
071-810-0006P Operate Secure SINCGARS Digital Traffic Setup
071-810-0007P Transmit Digital Messages
071-820-0005P Operate C3 Display Screens
071- - P Operate the PLGR on an M2A3 BFV
071- - P Maintain the Commanders Tactical Display on an M2A3
071- - P Maintain the Commanders Independent Viewer on an M2A3
071- - P Maintain the Improved Bradley Acquisition system on an M2A3
071- - P Maintain the Squad Leaders Tactical Display on an M2A3
071- - P Employ Missile Countermeasure Device on an M2A3
071- - P Maintain Missile Countermeasure Device on an M2A3
071- - P Maintain the PLGR on an M2A3 BFV
071- - P Maintain the MMU PCMCIA card on an M2A3 BFV