ARMY RESEARCH LABORATORY

Bradley Fire Support Vehicle (BFIST) Demonstrator Task List

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ARL-TN-76 AUGUST 1996

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REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. AGENCY USE ONLY *(Leave blank)*	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
	August 1996	Final

4. TITLE AND SUBTITLE

Bradley Fire Support Vehicle (BFIST) Demonstrator Task List

5. FUNDING NUMBERS

PR: 1L162716AH70
PE: 6.27.16

6. AUTHOR(S)

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7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)

U.S. Army Research Laboratory
Human Research & Engineering Directorate
ATTN AMSRL HR MF
Fort Sill, OK 73503-5600

8. PERFORMING ORGANIZATION REPORT NUMBER

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)

U.S. Army Research Laboratory
Human Research & Engineering Directorate
Aberdeen Proving Ground, MD 21005-5425

10. SPONSORING/MONITORING AGENCY REPORT NUMBER

ARL-TN-76

11. SUPPLEMENTARY NOTES

12a. DISTRIBUTION/AVAILABILITY STATEMENT

Approved for public release; distribution is unlimited.

12b. DISTRIBUTION CODE

13. ABSTRACT *(Maximum 200 words)*

The Department of the Army is acquiring the Bradley fire support vehicle (BFIST) to replace the M981 fire support team vehicle (FISTV). This is the first of two reports that address BFIST demonstrator manpower and personnel integration (MANPRINT) issues. It presents an operator task list for the BFIST demonstrator, along with a description of the methodology used to develop the task list. This task list provides the United States Army Field Artillery School (USAFAS) with a detailed description of the missions, mission segments, functions, and tasks required for operation of the BFIST demonstrator. The task list is also the basis for a series of human performance simulation models developed in the next report.

14. SUBJECT TERMS

BFIST demonstrator	fire support vehicle	operator tasks
fire support	HARDMAN III	task list

15. NUMBER OF PAGES
55

16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
Unclassified	Unclassified	Unclassified	

AMS Code 622716.H7000111 Technical Note ARL-TN-76

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FOREWORD

The Department of the Army is acquiring the Bradley fire support vehicle (BFIST) to replace the M981 fire support team vehicle (FISTV) currently in use. The BFIST acquisition has recently proceeded through Milestone Decision II, April 1995.

The following BFIST demonstrator crew task list incorporates the design projections that were available during the first and second quarter of fiscal year (FY) 1994. The BFIST demonstrator crew task list presented in this report was based on

1. The tasks performed by the current M981 FISTV crew,

2. Operations and lessons learned of the BFIST demonstrator as it participated in on-site tests and demonstrations at Fort Sill, Oklahoma, 1 September to 10 December 1993, and the 94-07 rotation at the National Training Center, and

3. Design enhancements as projected by subject matter experts (SMEs) at the U.S. Army Field Artillery School (USAFAS) Fire Support and Combined Arms Operations Department and the USAFAS Directorate of Combat Developments during the last quarter FY 93 and first two quarters of FY 94.

This is the first of two reports. Presented in the other report are the results from human performance simulation modeling that address manpower and personnel issues pertaining to the BFIST acquisition. The task list presented in this report is the basis for the human performance simulation models.

CONTENTS

BRADLEY FIRE SUPPORT VEHICLE (BFIST) DEMONSTRATOR TASK LIST

INTRODUCTION

The Department of Army is acquiring a new fire support vehicle, which is intended to overcome several limitations of the predecessor system, the M981 fire support team vehicle (FISTV). Specific shortcomings of the FISTV that will be addressed by the new acquisition include (a) inadequate self-protection; (b) an easily recognizable profile; (c) a lack of automated displays for situational awareness and target location; and (d) unreliable subsystems such as the north-seeking gyrocompass (NSG) and the carrier engine. The Bradley fire support vehicle (BFIST) (the new acquisition) will be designed to correct the limitations of the M981 FISTV through moderate system upgrades and incorporation of existing technologies.

System developers rely on modeling and simulation to support design decisions early in the acquisition of a new system. Impact estimates with respect to the manpower, personnel, and training domains of manpower and personnel integration (MANPRINT) are required for new systems. To develop such estimates, the U.S. Army Research Laboratory (ARL) has developed the hardware versus manpower (HARDMAN) III set of interrelated human performance computer simulation modeling tools. HARDMAN III is particularly suited for the prediction of mission time, mission aborts, human reliability, and human workload associated with task performance.

The first step in developing any simulation model is preparing a task list. An analysis was performed using the available data and documentation and conducting subject matter expert (SME) interviews. As a result of this analysis, a task list was developed and refined for use in generating the HARDMAN III models. The models, in turn, will provide a technical basis for answering the following research questions:

1. What is the optimum crew structure for conducting fire support team (FIST) and combat observation lasing team (COLT) missions in the BFIST demonstrator?

2. What impact will crew configuration and task allocation have on crew workload and performance?

3. How will personnel characteristics such as aptitude affect crew performance?

The purpose of this report is to present the BFIST demonstrator task list (see Appendix A) and the methodology used to develop it.

METHODOLOGY FOR PREPARING THE TASK LIST

Framework for the Analysis

The technical approach to preparing the BFIST demonstrator task list involved a top-down analysis of BFIST missions, mission segments, functions, and tasks. Missions, mission segments, functions, and tasks data were defined, based on a thorough consideration of several relevant sources including

- The BFIST requirements documents,
- AirLand operations concepts applicable to the fire support mission,
- Fire support tactics, techniques, and procedures, and
- Briefings and interviews with SMEs from the United States Army Field Artillery School (USAFAS)

The sequence of tasks identified through this formal decomposition shows the flow of tasks required to complete a given function. This effort results in a four-level task list format, as follows:

Level One (1) - Missions,
Level Two (2) - Mission segments,
Level Three (3) - Functions, and
Level Four (4) - Tasks.

Using a Controlled Vocabulary

Many different techniques have been used to acquire, record, report, and format task descriptions. However, in most instances, such efforts have been weakened by the lack of a standard vocabulary in the task descriptions. Without a standard set of words and terms, different analysts may use different terms to describe the same task. To minimize this variability, Lowry and Wilkinson (1993) developed a verb taxonomy representing a controlled vocabulary based on the Berliner taxonomy (Berliner, Angel, & Shearer, 1964). The same controlled vocabulary was used to prepare BFIST demonstrator task descriptions for the present study.

Data Collection Approach

The approach to data collection for the preparation of the BFIST demonstrator task list is divided into three phases: tabletop analysis, on-site reviews, and data entry. The steps performed for each phase are presented in Figure 1. A detailed description of each of the three phases of the data collection process is given next.

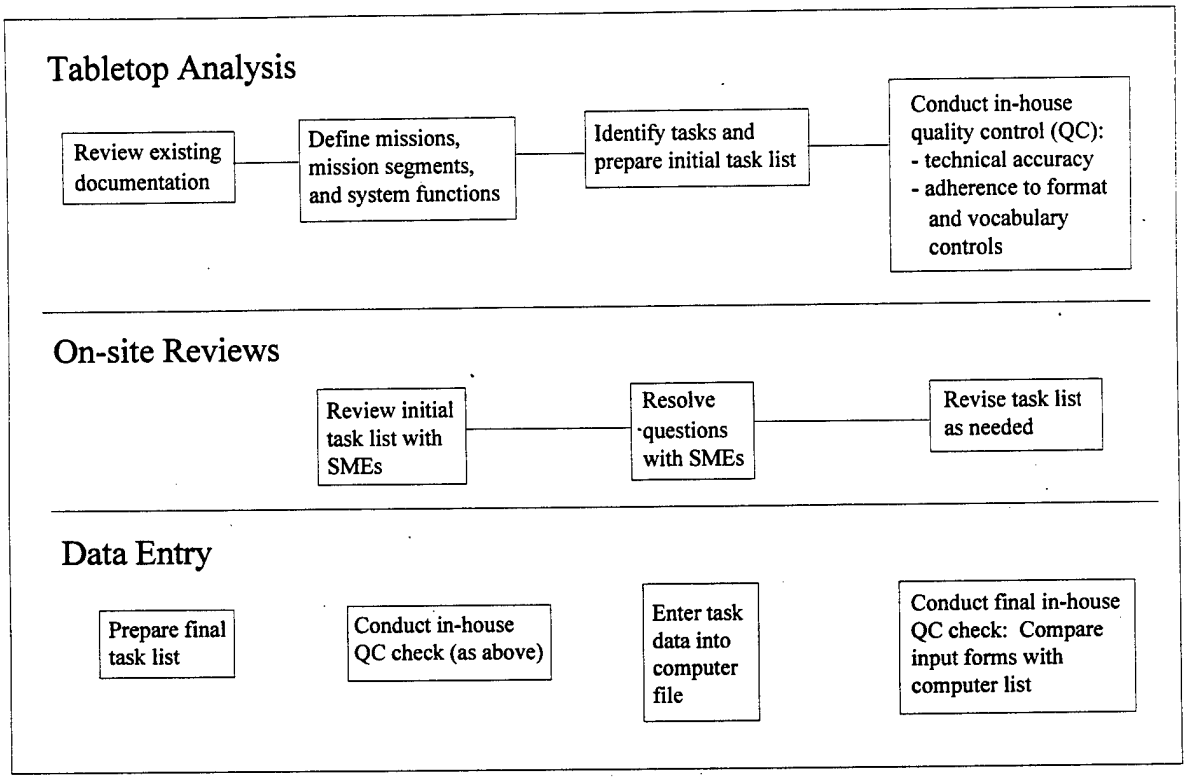

Figure 1. Systematic approach to the preparation of the BFIST demonstrator task list.

Tabletop Analysis

The first step in the tabletop analysis was to obtain and review available documentation for information relevant to the BFIST system and task performance. The available documentation was composed of two types of information: (a) the BFIST operational requirements and (b) background. The BFIST requirements and additional background information were extracted from the documentation shown in the bibliography of this report.

The second step in the tabletop analysis was to use the available documentation to define initial BFIST missions, mission segments, and functions that are inclusive of BFIST

operations. Consideration was given to the BFIST operational requirements documentation, fire support in AirLand battle operations, and prior task lists in identifying suitable mission and function data.

The third step in the tabletop analysis was the identification of the initial tasks associated with the functions listed in the mission-mission segment-function-task outline. The tasks (Level 4) were listed under associated functions. This activity resulted in the draft version of the BFIST demonstrator task list.

The final step in the tabletop analysis was to conduct the first quality control (QC) check of the draft version of the task list. A variety of QC checks were performed at each step in the analysis. These efforts included examination of the completeness and accuracy of

- available documentation,
- information pertaining to BFIST operation and maintenance, and
- task identification and description.

On-site Reviews

Phase 2, the on-site reviews, provided a forum for assessing the technical adequacy and accuracy of the task list (including its format and structure). Figure 1 identifies the steps included in the on-site reviews. The first activity involved individual reviews by SMEs at the USAFAS. Then a SME working group session was conducted at Ft. Sill as well as follow-up interviews. Finally, an informal review session was conducted to obtain specific feedback from SMEs about the accuracy and adequacy of the task list.

Data Entry

Phase 3, data entry, involved final revisions, quality checks, and final preparation of the BFIST demonstrator task list. The steps involved in final preparation are shown in Figure 1. Preparation of the final version of the BFIST demonstrator task list incorporates all comments received from SMEs. Final revisions and QC checks (applying the same QC criteria as applied during the tabletop analysis) were conducted to bring the task list into compliance with USAFAS direction received during the review session.

Selection of Missions, Mission Segments, and Functions

Documents listed in the bibliography were perused to identify missions, mission segments, and functions. Table 1 lists the missions and mission segments identified in the final version of the BFIST demonstrator task list. The list of the BFIST functions is too lengthy to represent in this table (see Appendix A for the complete list).

Table 1

BFIST (FIST and COLT) Missions and Mission Segments

Missions	FISTV mission segments
Operate system	Receive fragmentary order (FRAGO) Prepare for operations Prepare for movement Drive-navigate the BFIST Conduct recovery operations Direct a deliberate position occupation Move from a prepared position Perform a hasty occupation
Conduct fire support	Receive planning guidance Advise company commander Plan fire support Coordinate - brief - rehearse fire plan Perform quick (hasty) fire planning Controls - coordinates fires
Engage targets	Direct field artillery fires Direct other supporting fires Conduct Copperhead missions
Ensure survivability	Conduct smoke operations Conduct nuclear, biological, and chemical (NBC) defensive operations Treat-evacuate injured Perform after preventive maintenance checks and services (PMCS)

Task Description

As mentioned earlier, a controlled vocabulary was used to prepare task statements for the BFIST demonstrator task list. The grammar defines the structure, format, and content of the task statement. The result is a task statement sentence. As with standard English sentences, the task statement sentence includes various parts of speech, including as a minimum (a) subject, (b)

(action) verb, and (c) object (of the action). Additional parts of speech may include object modifiers and subordinate clauses that, for example, clarify the action described by the task statement. The task statement sentence may therefore be read as a standard English sentence.

The task statement sentence used in the preparation of the BFIST demonstrator task list follows the form:

<Subject> + Action Verb + Object of action + <modifier> + <subordinate clause>.

The "<#####>" convention used above denotes a part of speech that is optional or left blank (meaning assumed) for the purposes of task description. Using this structure, a task statement is only required to contain an action verb and object of action. An example of a task statement using this structure is

Receives approval.

The meaning of this task can be refined by adding more information. For example, an object modifier may be added:

Receives approval for fire plan.

A subordinate clause can be added to further clarify the task, such as

Receives approval for fire plan from battalion fire support officer (FSO).

A subject can be added:

SGT receives approval for fire plan from battalion FSO.

All tasks contained in the task list followed this grammatical structure. Each of the parts of speech in the task statement sentence, as well as the role and use of each part of speech is discussed next.

Subject

For the purposes of the BFIST demonstrator task list, the performer (subject) of the task is not identified. The assignment of task performer is a result of an allocation of the task to individual BFIST crew members, which will be performed in the crew configuration portion of the BFIST HARDMAN III analyses.

Action Verb

The action verb is a descriptor of task behavior. It describes the crew member's behavior. A standard verb vocabulary has been established for standardizing the descriptions of actions performed in a BFIST. The modified classifications, known now as the verb taxonomy, are shown in Tables 2 through 6. The action verbs (identified as specific behaviors in the Tables 2 through 5 or as maintenance tasks in Table 6 are grouped into processes. The five processes include

- Perceptual in Table 2,
- Cognitive in Table 3,
- Motor in Table 4,
- Communications in Table 5, and
- Maintenance in Table 6.

Four of these processes are subdivided into activities or maintenance type. The first column in Tables 2, 3, 4, and 6 identifies these activities or maintenance type. For example, perceptual processes include two activities: (a) searching for and receiving information, and (b) identifying objects, actions, and events. Specific behaviors (action verbs) associated with these perceptual processes are assigned to one of these two activities. The second column (first column in Table 5 identifies the specific action verb (either a behavior or maintenance task) associated with each activity, maintenance type, or process. The third column (second column in Table 5 defines the action verb. In some cases, more than one definition is necessary.

Some action verbs apply only during special circumstances. For example, definitions of action verbs that are followed by "*[Computer]*" are interpreted as behaviors that occur only in the presence of a human-computer interface. Other special situations apply to action verbs assigned to the communications process. Definitions of action verbs that are followed by "*[Voice, FM Radio, FM Digital]*" are interpreted as behaviors that occur only in the presence of digital or voice communications media.

Object of Action

The object of the action described in the task statement is the component, parameter, or other condition to which the task behavior is directed. Identification of the object of action will generally have two parts:

(1) Identification of the specific component, parameter, and state of the parameter, and

(2) Identification of the related system (subsystems) of which it is a part.

Table 2

Verb Taxonomy for Perceptual Behaviors

Activities	Specific behaviors	Definitions
Searching for and receiving information	Detects	(a) Become aware of the presence or absence of a physical stimulus. (b) Recognize the occurrence of a specific condition. (c) Discover or notice an occurrence (usually unsolicited).
	Inspects	Examine carefully, or to view closely with critical appraisal.
	Listens	(a) Pay attention for the purpose of hearing. (b) Wait attentively for a specific sound.
	Monitors	Keep track of overtime.
	Observes	Attend visually to the presence or current status of an object, indication, or event.
	Reads	Examine visually, information that is presented symbolically.
	Receives	Read or hear a communication.
	Scans	(a) Quickly examine displays or other information sources to obtain a general impression. [*Computer*] (b) Non-directed viewing of many classes of objects. (c) Glance over quickly, usually looking for overall patterns or anomalous occurrences (not details).
Identifying objects, actions, and events	Discriminates	Roughly classify or differentiate an entity in terms of a gross level grouping or set membership-frequently on the basis of a limited number of attributes.
	Identifies	Recognize the nature of an object or indication according to implicit or predetermined characteristics.
	Locates	Seek and determine the site or place of an object.
	Localizes	Roughly determine the location of an object or stimulus (usually in a 360^{o} radius).
	Searches	(a) Directed viewing for a specific class of objects. (b) Purposeful exploration or looking for specific item(s).

Table 3

Verb Taxonomy for Cognitive Behaviors

Activities	Specific behaviors	Definitions
Information processing	Associates	Connect one object or class of objects with another object or class of objects on the basis of heuristics. [*Computer*]
	Interpolates	(a) Determine or estimate intermediate values from two given values. [*Computer*] (b) Assign an approximate value to an interim point based upon knowledge of values of two or more bracketing reference points. [*Computer*]
	Itemizes	List or specify the various components of a grouping.
	Remembers	Retain information (short-term memory) or to recall information (long-term memory) for consideration.
	Tabulates	Tally or enumerate the frequencies or values of the members of an itemized list or table.
	Translates	Convert or change from one form or representational system to another according to some consistent "mapping" scheme.
	Verifies	Confirm or prove the truth of an assumption, condition, or state.
	Visualizes	Construct a mental picture of a situation.
Problem solving and decision making	Analyzes	(a) Separate material or abstract entity into constituent parts. (b) Synthesize. (c) Examine critically.
	Calculates	(a) Determine by mathematical processes. (b) Reckon, mentally compute, or computationally determine.
	Chooses	Select after consideration of alternatives.
	Compares	(a) Examine the characteristics or qualities of two or more objects or concepts for the purpose of discovering similarities or differences. (b) Consider two or more entities in parallel so as to note relative similarities and differences.
	Coordinates	Harmonize in a common effort to settle or arrange.
	Decides	Come to a conclusion based on available information.
	Determines	Induce or deduce a conclusion or decision.
	Diagnoses	Recognize or determine the nature or cause of a condition by consideration of signs and symptoms or by the execution of appropriate tests.
	Estimates	(a) Calculate, interpolate, or extrapolate value(s) within some tolerance. (b) Mentally gauge, judge, or approximate, often on the basis of incomplete data.
	Organizes	Correlate, order, or prioritize objects (or classes of objects)
	Plans	Project or arrange a scheme for accomplishing an activity.

Table 4

Verb Taxonomy for Motor Behaviors

Activities	Specific behaviors	Definitions
Simple or discrete	Activates	Perform a control action, causing a device to become active. [*Computer*]
	Attaches	Affix an object to a larger object by tying or gluing.
	Closes	(a) Shut an entrance or opening. (b) Terminate a computer program or application. [*Computer*]
	Connects	Bind or fasten two objects together.
	Deactivates	Perform a control action, causing a device to become inactive. [*Computer*]
	Disconnects	Detach or unfasten two objects.
	Enters	Place a value or text string into a computer by means of an input or control device. [*Computer*]
	Moves	Change the location of an object or person.
	Opens	Unfasten affording unobstructed passage.
	Presses	Apply a steady weight or force to an object. [*usually Computer*]
	Pushes or pulls	Exert force away from or toward the soldier's body. [*usually Computer*]
	Selects	(a) Choose an object from a set of alternatives. (b) Choose an entity (e.g., a position or an object) by "pointing" to it. [*Computer*]
	Sets	Place an instrument in a specific setting or reading in order to achieve a specific state or mode.
	Starts	Begin an activity or movement.
	Steers	Guide the course of a vehicle.
	Stops	Terminate the movement of a vehicle.
Complex or continuous	Adjusts	Operate a continuous control.
	Aligns	Arrange objects into a straight line.
	Annotates	(a) Enter a text string. [*Computer*] (b) To note or write down textual material.
	Applies	Put into action for a purpose
	Dons	Put on clothing, especially mission-oriented protective posture (MOPP).
	Installs	Put into an appointed place or position.
	Orients	Adjust or transform an object in relation to its centroid. [*Computer*]
	Positions	(a) Operate a control that has discrete states. (b) Indicate a 1-, 2-, or 3-dimensional coordinate. [*Computer*]
	Regulates	Adjust to some standard (e.g., amount, degree, rate).
	Removes	Take out of an appointed place or position.
	Synchronizes	Cause to operate at the same rate and exactly together.
	Tracks	Visually pursue the movement of an object. [*usually Computer*]
	Types	Operate a keyboard. [*Computer*]

Table 5

Verb Taxonomy for Communications Behaviors

Specific behaviors	Definitions
Advises	Give information notifying others of a recommended course of action. [*Voice, FM Radio, FM Digital*]
Answers	Respond to a request for information. [*Voice, FM Radio, FM Digital*]
Communicates	Relay knowledge or information to others. [*Voice, FM Radio, FM Digital*]
Directs	(a) Ask for action. [*Voice, FM Radio, FM Digital*] (b) Provide explicit authoritative instructions. [*Voice, FM Radio, FM Digital*]
Indicates	Verbally direct the attention of others in a general way. [*Voice, FM Radio*]
Informs	(a) Impart information. [*Voice, FM Radio, FM Digital*] (b) Pass on or relay new knowledge or data. [*Voice, FM Radio, FM Digital*]
Instructs	Teach, educate, or provide remedial data. [*Voice, FM Radio, FM Digital*]
Requests	Ask for information. [*Voice, FM Radio, FM Digital*]
Receives	(a) Be given written or verbal information. [*Voice, FM Radio, FM Digital*] (b) Set, obtain, or acquire an incoming message. [*Voice, FM Radio, FM Digital*]
Records	Document something, as in writing.
Transmits	Send or forward information to a receiver (human or machine). [*Voice, FM Radio, FM Digital*]

Table 6

Verb Taxonomy for Maintenance Tasks

Maintenance type	Maintenance tasks	Definitions
Preventive maintenance	Performs PMCS	Performing prescribed preventive maintenance, checks, and services in an attempt to retain an item or component in a specified condition by providing systematic inspection, detection, and prevention of incipient failures.
Corrective maintenance	Adjusts and repairs	The process of returning an item or component to a specified condition through one or more of the following actions: recalibrate, retune, and fault correction.
	Boresights	Align multiple vision devices or vision devices with weapon systems to aim at a point using either a collimator or a distance aiming point.
	Inspects	Examining objects critically for deviations or unacceptable conditions.
	Removes and replaces	Taking a unit or component from a system and the reverse.
	Tests and checks	Determining whether a system is functioning within prescribed limits.
	Trouble shoots	Isolating to the line-replaceable unit level the cause of a fault through a systematic, analytical process.

The object of the action is identified by a combination of entries in the task statement: component, parameter, state, or the result of a cognitive activity. Sufficient information to properly identify the object of the action is desirable. The component is the equipment or device within the system upon which the operator acts or perceives. A parameter is a system or component variable that the operator affects or perceives. The state reflects the condition of the component or parameter upon completion of the task. A result of a cognitive activity may include conclusions regarding decisions made by an operator. This part of speech is always required in task statements prepared for the BFIST demonstrator task list.

Object Modifiers

Object modifiers serve to refine or qualify some aspect of the object of action being described in a task. Three types of object modifiers are in line with the three types of objects of action: component modifiers, parameter modifiers, and state modifiers. For example, a component modifier may be needed to distinguish between similar components within a subsystem. A component modifier is a one- or two-word description of the component's function or location in the system. This part of speech is used at the option of the task analyst.

Subordinate Clauses

A description of the purpose of a task is to clarify the intent of the action described in the task statement. While not always necessary, it can be used to provide greater detail than might otherwise be contained in the task statement. Subordinate clauses (e.g., in order to...) are used to present the purpose of a task. This part-of-speech is also used at the option of the task analyst.

SUMMARY AND CONCLUSION

This report described the objectives, technical approach, and methodology in the development of the BFIST demonstrator task list. The BFIST demonstrator task list serves two purposes. First, it provides the USAFAS with a detailed description of the missions, mission segments, functions, and tasks required for the BFIST operations, maintenance, and direct support. The USAFAS can use the task list as an additional statement of performance requirements for the BFIST development. Second, the task list will serve as a basis for the HARDMAN III analyses of BFIST MANPRINT issues. Figure 2 illustrates the role of HARDMAN III in the BFIST acquisition process.

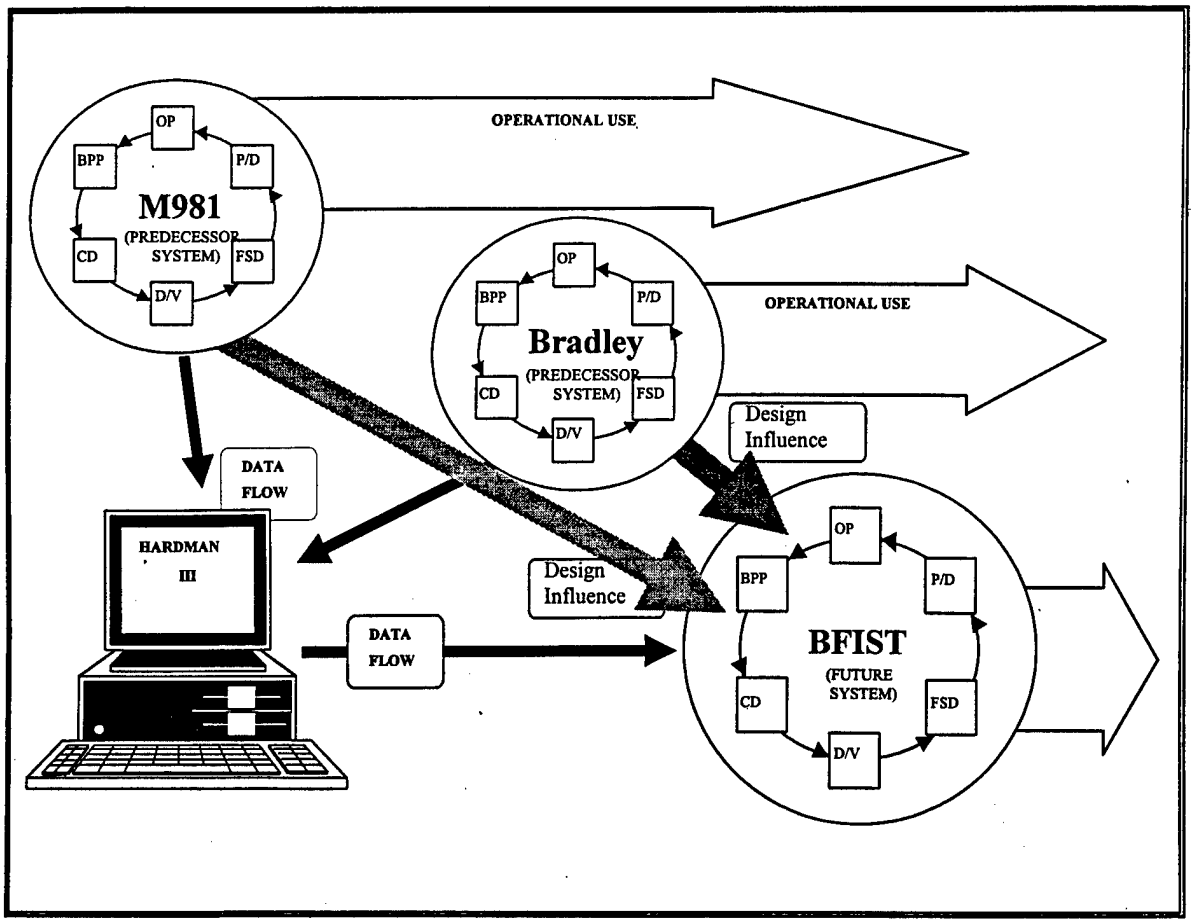

Figure 2. The role of HARDMAN III in BFIST acquisition. (The acronyms arranged in circular fashion in the three circles in the figure are (a) BPP, branch planning process, (b) CD, concept development, (c) D/V, demonstration and validation, (d) FSD, full scale development [also known as engineering and manufacturing], (e) P/D, production and deployment, and (f) OP, operation. These terms represent phases in military acquisition.)

The BFIST demonstrator task list will help address a variety of MANPRINT questions pertaining to the BFIST system. Simulations based on the BFIST demonstrator task list will be designed and executed to provide quantitative predictions of various aspects of the BFIST crew performance. Variables such as crew size, personnel, and training attributes of the BFIST crew will be manipulated to determine the optimum BFIST crew characteristics.

The BFIST demonstrator task list represents a comprehensive technical basis for subsequent MANPRINT analyses. It was developed, based on the best available source documentation and has been extensively reviewed by the USAFAS SMEs for technical accuracy and adequacy. It is understood that the task list contained in this report and analyses based on this task list may be revised as the BFIST matures.

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APPENDIX A

BFIST DEMONSTRATOR TASK LIST

BFIST DEMONSTRATOR TASK LIST

A. OPERATE SYSTEM

1. Receive FRAGO

Alert crew
- Receives warning of upcoming operation
- Determines content of directions to crew
- Instructs crew to start preparations for combat

Move to company headquarters (HQ) to receive planning guidance
- Selects fire planning or observing materials
- Moves to company HQ

2. Prepare for operations

Operate turret shield door
- Opens turret shield door
- Inspects turret shield warning light
- Moves into turret
- Closes turret shield door

Start BFIST engine
- Adjusts driver's controls, seat, lap belt, and combat vehicle crewmember (CVC) helmet
- Tests and checks driver's panel gauges and switches
- Activates (starts) engine
- Monitors driver's instrument panel gauges

Prepare the targeting system
- Installs the laser designator and rangefinder (LD/R)
- Installs the thermal night sight

Conduct the north seeking gyrocompass (NSG) confidence check
- Verifies correct vehicle coordinates are in memory
- Presses and releases NSG alignment and enter keys
- Monitors display until realignment is complete
- Presses and releases heading key

Tests and checks targeting station control display (TSCD) display with known direction

Conduct the targeting systems accuracy check
- Calculates target position
- Compares calculated position with known coordinates

Check boresight of LD/R
- Installs boresight collimator
- Inspects boresight of LD/R
- Boresights LD/R

Conduct targeting systems nightsight check and boresight alignment
- Activates nightsight
- Inspects boresight alignment of targeting system's nightsight
- Adjusts boresight alignment of targeting system's nightsight
- Removes boresight collimator

Conduct the turret systems operational check-out
- Activates the turret power switch
- Tests and checks turret traverse (slow)
- Tests and checks turret slew (fast)
- Tests and checks handgrip triggers
- Tests and checks fire interrupt circuitry and audible alarm
- Tests and checks deck clearance system
- Tests and checks turret stabilization system

Initialize the forward-looking infrared (FLIR)
- Activates the FLIR
- Inspects the FLIR sight picture

Initialize the precision lightweight global positioning system (GPS) receiver (PLGR)
- Activates the PLGR
- Tests and checks the PLGR system with built-in test equipment (BITE)

Initialize the battlefield intelligence system (BIS)
- Activates the BIS
- Tests and checks the BIS with BITE

Check and boresight the 25mm gun
- Inspects 25mm gun system for dirt or damage
- Positions and aligns (prepares) 25mm gun for boresighting
- Installs boresight adaptor and telescope for 25mm gun
- Adjusts and aligns (boresights) 25mm gun sight
- Tests and checks boresight for 25mm gun

Check and boresight the coax machine gun
- Inspects coax machine gun for dirt and damage
- Positions and aligns (prepares) coax machine gun for boresighting
- Installs boresight adaptor and telescope on machine gun (2 man)
- Adjusts and aligns (boresights) coax machine gun

Check and boresight integrated sighting unit (ISU) for turret weapons
- Inspects ISU controls, lights, and sight displays for weapons
- Adjusts and aligns (boresights) weapons nightsight to daysight
- Tests and checks nightsight and daysight boresight for weapons

Conduct FIST digital message device (DMD) diagnostics checks
- Tests and checks display and indicator lamps
- Tests and checks keyboard (keyboard test)
- Tests and checks communications interface
- Tests and checks message bell volumes

Conduct FIST DMD initial status selection
- Enters communications parameters
- Enters FIST DMD functional characteristics

Activate communications
- Receives frequencies and call signs from signal operation instructions
- Enters authentication codes and operator's key in FIST DMD
- Tests and checks intercommunications set

Enter radio nets
- Enters field artillery (FA) battalion fire direction net
- Enters maneuver battalion mortar fire direction net
- Enters battalion fire support element (FSE) net
- Enters maneuver company command net
- Activates digital communications on fire nets
- Monitors radio communications

Prepare radio for off-vehicle operations
- Removes radio from its mount in BFIST
- Installs battery box, harness, antenna, and handset to radio
- Determines frequency from signal operation instructions
- Sets frequency on radio
- Enters FA fire direction net

Prepare forward entry device (FED) for off-vehicle operations
- Removes FED from stowage in BFIST
- Installs battery for the FED
- Connects FED to radio for off-vehicle operations
- Tests and checks (operational tests) the FED
- Enters FED initialization data

Perform before PMCS on the BFIST hull
- Inspects BFIST suspension
- Inspects external fire suppression handles
- Inspects final drive hull drain plugs
- Inspects drivers hatch
- Inspects hull drain plugs
- Inspects hand brake
- Inspects internal fire extinguishers
- Inspects fire suppression switch and handles

Prepare eye-safe, hand-held laser rangefinder (LR) for operation
- Performs before-operation PMCS on the LR
- Installs the battery for the LR
- Inspects the battery for the LR
- Connects the LR to an external power source

Determine direction using an M-2 compass and map
- Calculates declination constant
- Sets declination constant on compass
- Determines direction using compass

3. Prepare for movement

Perform during PMCS on the BFIST turret
- Tests and checks turret indicator lights
- Tests and checks gun fans
- Tests and checks turret drive system
- Tests and checks turret slew and elevation or depression

Perform during PMCS on BFIST weapons
- Inspects 25mm gun from observation station by dry firing
- Inspects coax machine gun from observation station by dry firing
- Inspects 25mm gun from targeting station by dry firing
- Inspects coax machine gun from targeting station by dry firing
- Tests and checks smoke grenade system launcher

Perform during PMCS on the BFIST driver's station
- Monitors driver's instrument panel gages and lights
- Inspects driver's controls
- Inspects driver's periscope
- Inspects driver's compartment nuclear, biological, and chemical (NBC) system
- Inspects personnel heater

Perform during PMCS on other BFIST systems
- Tests and checks vehicle NBC system
- Inspects hatches and doors
- Inspects storage of high explosive (HE) and armor piercing (AP) ammunition for 25mm gun

Load turret weapons

Installs (loads) ammunition in the 25mm gun feeder
Installs (loads) HE ammunition in the 25mm gun
Installs (loads) AP ammunition in the 25mm gun
Installs (loads) coax machine gun

Test fire turret weapons

Moves turret drive system to OFF
Removes 25mm gun guard and gun cover
Moves manual SAFE handle to FIRE position
Closes gun cover and installs 25mm gun guard
Selects ammunition type (HE or AP)
Moves turret drive system to ON
Moves sight on target
Presses trigger
Selects machine gun
Presses trigger

4. Drive or navigate the BFIST

Prepare to drive

Receives order to prepare to move
Presses (sounds) horn
Closes (raises) ramp

Drive the BFIST

Adjusts or moves BFIST driver's controls
Moves and steers BFIST

Navigate vehicle by terrain association

Plans route visualizing a straight line from start point to destination
Plans route to accommodate weather, terrain and situation
Directs driver along route
Steers in response to directions

Navigate vehicle by dead reckoning

Determines azimuth to distant steering point
Directs driver to steering point
Moves to steering point

Operate BFIST on roads

Regulates speed
Steers BFIST
Scans roadway for hazards or approaching traffic
Adjusts speed and direction of travel

Operate BFIST cross-country unimpeded
- Regulates speed
- Steers BFIST
- Scans ahead for hazards or obstacles
- Scans ahead for best route
- Adjusts speed and direction

Drive BFIST over trenches
- Regulates (decreases) speed approaching trench
- Decides trench is negotiable
- Steers BFIST perpendicularly over trench
- Regulates (increases) speed after crossing trench

Drive BFIST over obstacles
- Regulates (decreases) speed approaching obstacle
- Decides obstacle is negotiable
- Steers BFIST straight on over obstacle

Drive BFIST on side slopes
- Regulates (decreases) speed approaching slope
- Decides slope is negotiable
- Steers BFIST straight up slope
- Regulates (decreases) speed at top of slope
- Steers BFIST straight down slope
- Regulates (increases) speed just before bottom of slope

Drive BFIST on snow, ice, or mud
- Regulates speed for conditions
- Steers BFIST with gradual corrections
- Removes track shoe pads (if necessary)

Prepare to ford water obstacles
- Closes open hull drain plugs
- Inspects seating of other drain plugs
- Inspects operation of bilge pump
- Activates bilge pumps

Ford water obstacle
- Chooses water obstacle entry or exit points
- Steers through (fords) water obstacle
- Performs post-fording PMCS

Prepare to swim water obstacles
- Opens BFIST hatches
- Closes open hull drain plugs
- Inspects seating of other drain plugs
- Removes upper hull drain plugs
- Inspects ramp and door for good seal
- Opens (raises) exhaust shroud
- Installs (erects) water barrier
- Activates bilge pumps

Swim water obstacle
- Chooses water obstacle entry or exit points
- Steers through (swims) water obstacle
- Removes (lowers) water barrier
- Performs post-swimming PMCS

5. Conduct recovery operations

Start BFIST with a slave cable
- Decides to start vehicle with a slave cable
- Requests assistance to start BFIST
- Deactivates (turns off) electrical switches
- Connects slave cable through driver's hatch
- Activates (starts) vehicle

Start vehicle with a combat tow
- Decides to start vehicle with a combat tow
- Directs combat tow to start BFIST
- Requests assistance to tow-start BFIST
- Attaches disabled BFIST to tow vehicle
- Positions transmission range selector to TOW and TOW START
- Positions selector to DRIVE when vehicle starts
- Removes cables or tow bar

Tow BFIST to a safe location
- Decides to tow BFIST to a safe location
- Directs combat tow to safe location
- Requests a combat tow from a second vehicle
- Connects BFIST to tow vehicle
- Monitors BFIST movement throughout combat tow
- Disconnects BFIST from tow vehicle

Recover BFIST bellied in mire
- Decides to recover BFIST bellied in mire
- Directs recovery of vehicle bellied in mire
- Attaches log to BFIST tracks using tow cables
- Moves BFIST forward slowly
- Stops BFIST
- Removes tow cables

Recover BFIST bellied on rocks or stumps
- Decides to recover BFIST bellied on rocks or stumps
- Directs recovery of BFIST bellied on rocks or stumps
- Attaches tow cables to BFIST tracks
- Moves BFIST forward slowly
- Stops BFIST
- Removes cables

Prepare BFIST for abandonment
- Decides to abandon BFIST
- Directs abandonment of BFIST
- Deactivates machine gun and 25mm cannon
- Removes radios, ammunition, and digital devices from BFIST
- Moves away from the BFIST

6. Direct a deliberate position occupation

Select and occupy an observation post
- Chooses an observation post location by map reconnaissance
- Verifies choice with a physical reconnaissance
- Chooses a route to and from the observation post
- Moves BFIST into selected position

Select and occupy a position prepared by engineers
- Chooses an observation post location by map reconnaissance
- Verifies choice with a physical reconnaissance
- Inspects ground-level observation
- Chooses a specific location for BFIST emplacement
- Selects (marks) specific location for preparation by engineers

Determine location using on-board navigation aids
- Reads position coordinates and azimuth from PLGR
- Enters position coordinates and azimuth in TSCD
- Enters an observer location message in FIST DMD
- Transmits location of observation post to fire direction center (FDC) and FSE

Determine self-location using known point(s) or burst(s)
- Chooses known point(s) or location of burst(s)
- Enter known point(s) or burst(s) in FIST DMD
- Aligns ground/vehicular laser locator designator (G/VLLD) with known point(s) or burst(s)
- Presses trigger to lase known point(s) or burst(s)
- Calculates position using FIST DMD

Re-align the NSG
- Verifies correct vehicle coordinates are in memory
- Presses and releases the NSG alignment and enter keys
- Monitors display until re-alignment is complete

Re-initialize the NSG
- Verifies correct vehicle coordinates are in memory
- Presses and releases the NSG alignment twice
- Observes NSG re-initialize display on TSCD
- Presses and releases enter key
- Monitors display until re-initialization is complete

Employ the auxiliary generator
- Sets up generator for operation
- Activates (starts) the auxiliary generator
- Adjusts meters and gages to proper readings
- Activates (applies) electrical load to generator
- Monitors activated generator

Develop observed fire aids
- Orients map to terrain
- Orients observed fire fan
- Analyzes terrain to the front
- Translates image of terrain into a terrain sketch
- Translates image of terrain into a visibility diagram

Determine cloud height using the G/VLLD
- Moves (elevates) G/VLLD to 350 mils toward target area
- Presses trigger to lase the cloud formation
- Reads range to cloud formation
- Calculates cloud height from tables
- Transmits cloud height to the FDC

Select the locations for dismounted emplacement of G/VLLD
- Determines location for BFIST without G/VLLD
- Determines location for a dismounted G/VLLD
- Moves BFIST to selected location

Dismount G/VLLD and prepare it for backpacking
- Removes LD/R from turret
- Removes LD/R backpack from its stowage position in BFIST
- Installs LD/R in its backpack
- Removes ancillary equipment transit assembly from stowage
- Removes tripod and traversing unit from stowage location

Dismount radio and prepare it for backpacking
- Removes radio from its mount in BFIST
- Installs battery box, harness, antenna, and handset to radio
- Determines frequency from signal operation instructions
- Sets frequency on radio
- Enters Field Artillery fire direction net

Dismount FED and prepare it for backpacking
- Removes FED from stowage in BFIST
- Installs battery for the FED
- Connects FED to radio for off-vehicle operations
- Tests and checks (operational tests) the FED
- Enters FED initialization data

Dismount nightsight and prepare it for carrying
- Removes nightsight field handling case from stowage location
- Removes nightsight from turret
- Installs nightsight in its field handling case
- Removes battery box, battery power conditioner and collimator

Manpack G/VLLD, FED, radio, and nightsight to new location
- Moves LD/R and ancillary equipment to new location
- Moves radio and FED to new location
- Moves nightsight and ancillary equipment

Emplace G/VLLD and support equipment in dismounted configuration
- Sets traversing unit in designated location
- Installs LD/R on traversing unit
- Attaches interface connector of traversing unit to LD/R
- Installs nightsight interface mount on tripod (night only)
- Installs nightsight on interface mount (night only)
- Installs battery on LD/R

Perform initial check-out of the G/VLLD
- Performs initial PMCS on G/VLLD
- Perform LD/R self tests

Check boresight of LD/R
- Positions LD/R on the target
- Inspects boresight

Conduct nightsight check and boresight alignment
- Adjusts sight for best focus
- Installs collimator on nightsight
- Inspects boresight alignment of nightsight
- Adjusts boresight alignment of nightsight
- Removes collimator on nightsight

Conduct initial orientation of G/VLLD
- Chooses a prominent point whose location is known
- Reads azimuth to a prominent point on the M2 compass
- Orients G/VLLD on same point
- Sets azimuth from M2 compass on G/VLLD
- Determines location through resection and terrain analysis
- Enters position location in FED

Determine self-location using known point(s) or burst(s)
- Chooses known point(s) or location of burst(s)
- Enters known point(s) or burst(s) in FED
- Aligns G/VLLD with known point(s) or burst(s)
- Presses trigger to lase known point(s) or burst(s)
- Calculates position using FED

Establish wire communications
- Directs establishment of wire communications
- Installs (lays) field wire from G/VLLD to BFIST
- Installs (lays) field wire from BFIST to company HQ
- Installs (lays) field wire from BFIST to forward observers (mechanized battalion)
- Receives wire laid by maneuver battalion FSE
- Installs switchboard in BFIST

Erect off-vehicle antennas
- Directs the installation of off-vehicle antennas
- Installs antenna group
- Installs line antenna

Improve position defenses
- Directs improvement of position defenses
- Directs installation of camouflage and cover
- Removes camouflage screen and supports from BFIST
- Installs (erects) camouflage screen
- Selects individual defense positions
- Installs (prepares) individual defense positions
- Monitors position defense improvements
- Informs local ground commander of position location

Select an alternate position location
- Selects alternate position location
- Chooses a route to the alternate position
- Determines coordinates of the alternate position
- Determines direction to a target from the alternate position

Engage enemy with 25mm gun
- Moves turret drive system to OFF
- Removes 25mm gun guard and gun cover
- Moves manual safe handle to FIRE position
- Closes gun cover and installs 25mm gun guard
- Selects HE or AP ammunition
- Moves turret drive system to ON
- Activates nightsight (night only)
- Searches for or locates target
- Decides to engage target
- Presses trigger

Engage enemy with coax machine gun
- Activates nightsight (night only)
- Searches for or locates target
- Decides to engage target
- Presses trigger

7. Move from a prepared position

Remove camouflage
- Decides to remove camouflage
- Directs camouflage be removed
- Removes camouflage

Strike off-vehicle antennas
- Decides to strike off-vehicle antennas
- Directs off vehicle antennas be struck
- Deactivates (strikes) line antenna
- Deactivates (strikes) antenna group
- Installs (stows) antennas in BFIST

Disestablish wire communications
- Decides to disestablish wire communications
- Directs disestablishment of wire communications
- Disconnects field wire
- Installs field wire on reel
- Installs switchboard in BFIST stowage location

Direct G/VLLD be returned to BFIST and installed in turret
- Decides to return the G/VLLD to the BFIST
- Directs G/VLLD be returned to the in BFIST

Disassemble G/VLLD for manpacking
- Disconnects LD/R battery
- Disconnects nightsight from interface mount
- Disconnects interface mount from tripod
- Installs battery, interface mount, and nightsight in cases
- Disconnects LD/R from traversing unit
- Installs LD/R, tripod, and traversing unit in backpacking configuration

Manpack G/VLLD, FED, radio, and nightsight to BFIST location
- Moves LD/R and ancillary equipment to BFIST location
- Moves radio and FED to BFIST location
- Moves nightsight and ancillary equipment

Return G/VLLD to BFIST
- Installs tripod and traversing unit in BFIST stowage location
- Installs ancillary equipment transit assembly to stowage
- Removes LD/R from its backpack
- Installs LD/R in turret
- Installs LD/R backpack in BFIST stowage location

Return radio and FED to BFIST
- Disconnects FED from radio
- Removes battery from the FED
- Installs FED in BFIST stowage location
- Removes radio battery box, harness, antenna, and handset
- Installs battery box, harness, antenna, and handset
- Installs radio in its mount in BFIST

Return nightsight to BFIST
- Removes nightsight from its field handling case
- Installs nightsight in the BFIST turret
- Installs nightsight field handling case in BFIST stowage
- Installs battery case, power conditioner, and collimator

Move to alternate position
- Decides to move to alternate position
- Directs movement to alternate position
- Moves BFIST to alternate position location
- Enters pre-determined position coordinates and azimuth in TSCD
- Enters observer location message on FIST DMD
- Transmits message to FDC and battalion fire support officer (FSO)

8. Perform a hasty occupation

Select and occupy a position for a hasty occupation
- Decides to conduct a hasty occupation
- Chooses a hasty occupation location by map reconnaissance
- Selects an observation post
- Moves BFIST to selected location

Determine location using on-board navigation aids
- Reads position coordinates and azimuth from PLGR
- Enters position coordinates and azimuth in TSCD
- Enters an observer location message in FIST DMD
- Transmits location of observation post to FDC and battalion FSO

Conduct initial orientation of G/VLLD
- Chooses a prominent point whose location is known
- Reads azimuth to a prominent point on the M2 compass
- Orients G/VLLD on same point
- Sets azimuth from M2 compass on G/VLLD
- Determines location through resection and terrain analysis
- Enters position location in TSCD

Continue forward movement (bound forward)
- Decides to move forward in support of ground operation
- Directs preparations for movement
- Determines route from position
- Directs movement along chosen route
- Steers (drives) along chosen route

B. CONDUCT FIRE SUPPORT

1. Receive planning guidance

Receive battalion order
- Moves from BFIST to company HQ
- Moves to battalion tactical operations center (TOC) with company commander
- Receives battalion order with company commander
- Receives battalion fire support plan and guidance from battalion FSO
- Moves to company HQ with company commander

Receive planning direction and guidance from company commander
- Receives mission and scheme of maneuver
- Receives enemy information and likely avenues of approach
- Receives ground control measures
- Receives priorities for fires supporting platoons
- Receives guidance for planning and scheduling fires

2. Advise company commander

Determine elements of advice to company commander
- Determines the availability of fire support means
- Analyzes friendly weapons capabilities
- Determines optimum employment of friendly fires
- Determines availability of target acquisition assets
- Determines optimum employment of target acquisition assets
- Analyzes enemy fire support capabilities

Advise company commander
- Advises company commander on availability of fire support means
- Advises company commander on friendly weapons capabilities
- Advises company commander on the employment of friendly fires
- Advises company commander on target acquisition asset availability
- Advises company commander on target acquisition asset employment
- Advises company commander on enemy fire support capabilities

3. Plan fire support

Develop a fire support plan
- Moves from company HQ to BFIST
- Receives targets from observers
- Itemizes (consolidates) targets from observers
- Decides (resolves) targeting conflicts
- Plans fire coordination measures
- Organizes targets on target list
- Plans (develops) a fire support plan

Plan fires to support a movement to contact
- Plans fires from line of departure or contact to the objective
- Plans fires on top of the objective
- Plans fires beyond the objective
- Plans fires to the flanks

Plan fires to support a deliberate attack
- Plans fires from line of departure or contact to the objective
- Plans fires on top of the objective
- Plans smoke to isolate the objective
- Plans fires beyond the objective
- Plans fires to deceive the enemy
- Plans fires to the flanks

Plan fires to support a defensive operation
- Plans fires deep on battlefield
- Plans fires covering likely avenues of approach
- Plans final protective fires
- Plans fires for possible retrograde

Plan fires to support maneuver reconnaissance
- Plans fires from line of departure or contact to the objective
- Plans fires on top of the objective
- Plans fires beyond the objective
- Plans fires to the flanks

Plan fires to support maneuver security operations
- Plans fires to impede, destroy, and harass
- Plans fires to cause enemy to consolidate forces
- Plans fires to cause enemy to reveal main thrust
- Plans fires to cause enemy to slow his advance.

4. Coordinate, brief, and rehearse fire plan

Obtain approval for fire support plan
- Receives approval for fire plan from battalion FSO
- Moves from BFIST to company HQ
- Advises (briefs) company commander on fire plan
- Answers questions from company commander on fire plan
- Records changes directed by company commander or battalion FSO

Participate in company commander's order and battalion rehearsal
- Listens to company commander's operation order
- Communicates (presents) company fire plan
- Answers questions from platoon leaders and forward observers
- Moves to Battalion HQ with company commander
- Observes and participates in battalion rehearsal
- Moves to company HQ with company commander
- Receives last minute guidance and changes
- Moves to BFIST
- Advises (briefs) crew on upcoming operation
- Enters targets in FIST DMD

5. Perform quick (hasty) fire planning

Determine requirements for hasty fire planning
- Receives warning of short-notice tactical maneuver
- Moves from BFIST to company headquarters
- Listens to company commander's guidance
- Requests clarifying information
- Determines fire support requirements
- Advises company commander on available fire support

Conduct hasty fire planning
- Informs FDC of the situation and fire support needs
- Requests establishment of quick fire net
- Receives targets from platoon observers
- Plans (develops) a quick fire plan

Plan fires to support a hasty attack
- Plans fires from line of departure or contact to the objective
- Plans fires on top of the objective
- Plans smoke to isolate the objective
- Plans fires beyond the objective
- Plans fires to the flanks

Plan fires to support an exploitation
- Plans fires from line of departure or contact to the objective
- Plans fires on top of the objective
- Plans fires beyond the objective
- Plans fires to the flanks

Plan fires to support a pursuit
- Plans fires from line of departure or contact to the objective
- Plans fires on top of the objective
- Plans fires beyond the objective
- Plans fires to the flanks

Brief and refines fire plan
- Advises (briefs) company commander on fire plan
- Answers company commander's questions on fire plan
- Records changes on fire plan directed by company commander
- Coordinates fire plan with battalion FSO
- Transmits fire plan to FDC for execution

Respond to company commander's operations order
- Listens to company commander's operations order
- Answers questions from platoon leaders and forward observers on fire plan
- Moves from company headquarters to BFIST
- Enters targets in FIST DMD's FIREPLAN message
- Annotates maps and situational charts

6. Control and coordinate fires

Receives requests from observers for on-call targets
Analyzes targets for engagement
Determines priorities for calls for fire
Requests alternate fire support means
Requests immediate suppression, suppression of enemy air defenses (SEAD), and final protective fire (FPF)
Identifies requirement to update fire plans
Determines changes required to update fire plans
Records and transmits changes to fire plans
Requests alternate means of fire support from battalion FSE
Receives size, activity, location, unit, time, and equipment (SALUTE) Reports
Transmits SALUTE Reports

C. ENGAGE TARGETS

1. Direct field artillery fires

Conduct an impact and time registration

Chooses a registration point
Determines the call for fire
Transmits the call for fire
Transmits range and deviation corrections
Transmits HE refinement data
Observes one airburst
Transmits correction to adjust height of burst

Conduct a highburst registration

Orients the G/VLLD for direction and vertical angle
Communicates when ready to observe
Presses trigger to lase the burst
Communicates data for each round

Conduct an adjust fire (manual) or fire for effect (FFE) mission

Locates target
Transmits the call for fire
Determines and transmits range and deviation corrections
Determines and transmits refinement data
Determines and transmits observed effects

Conduct a coordinated illumination mission

Locates target
Determines and transmits call for fire
Determines and transmits illumination corrections
Determines and transmits the HE call for fire
Transmits range and deviation corrections
Determines and transmits refinement data
Determines and transmits observed effects

Conduct a moving target engagement
- Estimates the enemy's speed and direction of movement
- Determines a trigger point
- Determines an intercept point
- Tracks enemy movement
- Requests fires to engage enemy as he crosses intercept point
- Determines and transmits observed effects

Conduct a suppression mission
- Transmits on-call target number and call for fire
- Determines and transmits observed effects

Conduct an immediate suppression mission
- Locates the target
- Determines and transmits the call for fire
- Determines and transmits refinement data
- Determines and transmits observed effects

Adjust final protective fires
- Selects an adjusting point
- Receives approval for adjusting point from company commander
- Determines and transmits the call for fire
- Determines and transmits observer-target direction
- Directs (calls for) each round singly
- Determines and transmits single round adjustments

Call for final protective fires
- Receives call from company commander to fire FPF
- Directs (calls for) final protective fires
- Determines and transmits observed effects

2. Direct other supporting fires

Direct a mortar mission
- Determines and transmits a call for fire
- Locates (spots) impact of rounds
- Transmits a battle damage assessment
- Determines and transmits refinement data

Conduct a mortar registration
- Determines and transmits a call for fire
- Locates (spots) impact of rounds
- Determines and transmits range and deviation corrections
- Determines and transmits sheaf adjustments

Direct a close air support mission

- Locates target for engagement
- Identifies friendly locations
- Estimates enemy air defense artillery threat
- Transmits a SEAD request
- Transmits target identification
- Requests clearance from battalion FSE
- Activates (establishes) communication with aircraft
- Requests aircraft line-up information
- Selects (marks) the target orally or with G/VLLD
- Determines and transmits observed effects

Direct a naval gunfire mission

- Determines target location
- Transmits call for fire
- Determines and transmits refinement data
- Determines and transmits observed effects

Direct an attack helicopter strike

- Locates target for engagement
- Identifies friendly locations
- Estimates enemy air defense artillery threat
- Transmits a SEAD request
- Indicates type of target
- Activates (establishes) communication with aircraft
- Tracks target with G/VLLD
- Identifies (marks) the target orally or with G/VLLD
- Determines and transmits observed effects

3. Conduct copperhead missions

Prepare for a planned copperhead mission

- Analyzes terrain for planned target locations
- Estimates planned target intercept point
- Requests firing battery location from FDC
- Determines correct footprint template from table
- Selects correct template card from template packet
- Orients template card on map
- Annotates (draws) footprint on map
- Determines plausibility of mission from footprint and angle T
- Enters planned target in FIST DMD
- Receives planned target number from FDC

Conduct a planned copperhead mission
- Searches for an approaching target for copperhead
- Identifies an approaching target
- Decides to engage target with copperhead
- Transmits request for fire on a planned target
- Informs FDC to fire on target upon command
- Aligns G/VLLD with target
- Directs FDC to fire copperhead
- Presses trigger to lase targets when directed by FDC
- Determines and transmits observed effects

Engage target of opportunity for copperhead
- Searches for an approaching target for copperhead
- Identifies an approaching target
- Decides to engage the target
- Estimates target will be visible throughout engagement
- Determines intercept point
- Determines plausibility of mission based on angle T
- Transmits call for fire to FDC
- Informs FDC to fire on target upon command
- Tracks target with G/VLLD
- Directs FDC to fire copperhead
- Presses trigger to lase targets
- Determines and transmits observed effects

Engage multiple targets of opportunity for copperhead
- Searches for approaching targets for copperhead
- Identifies multiple targets
- Decides to engage the multiple targets
- Transmits call for fire to FDC
- Informs FDC to fire first round on command
- Informs FDC to fire subsequent rounds at specified intervals
- Tracks target with G/VLLD
- Directs FDC to fire copperhead
- Presses trigger to lase targets
- Determines and transmits observed effects

D. ENSURE SURVIVABILITY

1. Conduct smoke operations

Operate BFIST smoke grenade launchers
- Decides to fire smoke grenade launchers
- Activates smoke grenade ARM switch
- Pushes switch to fire the smoke grenade launchers
- Sets the smoke grenade launchers by reloading

Operate the BFIST smoke screen generator
- Decides to activate the BFIST smoke screen generator
- Activates the smoke screen generator
- Deactivates the smoke screen generator

Conduct an immediate smoke mission
- Determines placement point for smoke
- Transmits call for fire
- Determines and transmits corrections

Conduct a quick smoke mission
- Determines size of area to be obscured
- Determines the wind direction
- Determine maneuver-target line
- Determines HE adjusting point
- Determine duration of smoke
- Transmits call for fire
- Determines and transmits adjustment of HE rounds
- Directs (calls for) engagement with smoke

2. Conduct NBC defensive operations

Respond to an NBC alert
- Receives an NBC alert
- Verifies alert
- Decides to install warning devices
- Removes M-8 alarm from BFIST
- Installs M-8 alarm outside of BFIST
- Installs detector paper on personnel and equipment
- Moves perishables inside vehicle
- Closes ramp and hatches

Implement mission-oriented protective posture (MOPP) posture
- Receives MOPP conditions
- Dons MOPP equipment and overgarments
- Closes all hatches

Respond to an NBC alarm
- Dons the tank mask
- Dons the protective mask
- Determines and transmits NBC report

Implement decontamination procedures
- Determines contamination status
- Inspects personnel
- Inspects equipment

Respond to a survivability move order
- Monitors radio for a survivability move order
- Directs move
- Starts BFIST
- Moves BFIST
- Steers BFIST to safe location

3. Treat and evacuate injured
   - Applies first aid
   - Determines medical requirements
   - Determines evacuation requirements
   - Moves casualty for evacuation

4. Perform after PMCS

   - Performs after PMCS on BFIST hull
   - Inspects fuel gauges for low fuel levels
   - Inspects NBC system for water contamination
   - Inspects engine compartment hoses and clamps and oil level
   - Inspects intake screen for debris or damage
   - Inspects transmission oil level
   - Inspects cooling system for leaks
   - Inspects fuel system and drain for contaminants
   - Inspects fuel system hoses, valves, and fittings for leaks
   - Inspects hydraulic power unit for fuel level and leaks
   - Inspects final drive for looseness or missing fasteners
   - Inspects suspension for overheating hubs and track condition
   - Adjusts and repairs where authorized

Perform after PMCS on the smoke grenade launcher
- Removes unspent grenades from smoke grenade launcher
- Performs after PMCS on grenade launcher
- Installs rubber caps on grenade launcher tubes

Perform after PMCS on 25mm gun
- Removes 25mm gun from BFIST
- Inspects 25mm gun
- Performs after PMCS on 25mm gun
- Installs 25mm gun in BFIST

Perform after PMCS on coax machine gun
- Removes coax machine gun from BFIST
- Inspects coax machine gun
- Performs after PMCS on the coax machine gun
- Installs coax machine gun in BFIST

Perform after PMCS on auxiliary generator
- Inspects generator for fuel leaks
- Inspects generator for loose wires and attachments
- Inspects fuel and oil levels
- Adjust and repair generator where authorized

Report uncorrected during operation discrepancies
- Records and transmits during operation discrepancies on turret
- Records and transmits during operation discrepancies on communication equipment
- Records and transmits during operation discrepancies on digital equipment
- Records and transmits during operation discrepancies on targeting system

APPENDIX B

ACRONYMS AND ABBREVIATION LIST

ACRONYMS AND ABBREVIATION LIST

AP	armor piercing
BFIST	Bradley fire support vehicle
BIS	battlefield intelligence system
BITE	built-in test equipment
COLT	combat observation lasing team
CVC	combat vehicle crew member
DMD	digital message device
FA	field artillery
FDC	fire direction center
FED	forward entry device
FFE	fire for effect
FIST	fire support team
FISTV	fire support team vehicle
FLIR	forward-looking infrared
FPF	final protective fire
FRAGO	fragmentary order
FSE	fire support element
FSO	fire support officer
G/VLLD	ground/vehicular laser locator designator
GPS	global positioning system
HARDMAN III	hardware versus manpower - Version III. (A suite of interrelated computer modeling tools used to analyze the impact of change on manpower, personnel, and training, and on military system performance due to the interaction of human operators and equipment.)
HE	high explosive
HQ	headquarters
ISU	integrated sight unit
LD/R	laser designator/range finder
LR	Laser range finder
MANPRINT	manpower and personnel integration
MOPP	mission-oriented protective posture
NBC	nuclear, biological, and chemical
NSG	north-seeking gyrocompass
PLGR	precision GPS receiver
PMCS	preventive maintenance checks and services

SALUTE	size, activity, location, unit, time, and equipment
SEAD	suppression of enemy air defenses
SME	subject matter expert
TSCD	targeting station control display
TOC	tactical operations center
USAFAS	United States Army Field Artillery School

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