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DEPARTMENT OF THE ARMY
HEADQUARTERS UNITED STATES ARMY TRAINING AND DOCTRINE COMMAND
FORT MONROE, VIRGINIA 23651

25 JAN 1980

ATCD-F-A

SUBJECT: Close Support Study II

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Subject study (inclosure 1) was approved by Commander, USATRADOC, 18 January 1980.

CARL E. VUONO
Brigadier General, GS
Deputy Chief of Staff
for Combat Developments

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(SHORT TITLE (CSSG II).

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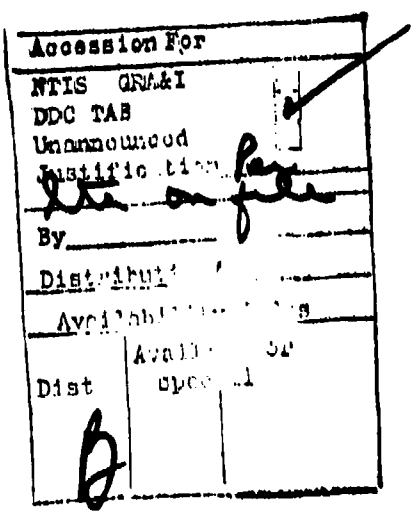

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The conclusions and recommendations of this study group have been approved by the participating school commandants.

The United States Army Field Artillery School team included Colonel John E. Donohue, the study director, and the following team members - Lieutenant Colonel Germain Gersbach, Lieutenant Colonel Richard Holiday, Lieutenant Colonel William Johnston, Mr. Roy Penepacker, Majors James Kurtz, Edward Stiles, Tom Stalzer, Robert Blackmon, David Scott, John Feret, Captains James Mead, Richard Evans and Timothy Kiggins.

The United States Army Infantry School was represented by Lieutenant Colonel T. D. Roberts and Captain Scott Adams who were replaced by Lieutenant Colonel John Burlingame and Captain Dewey George during the conduct of the study.

The United States Army Armor School was represented by Majors William Privette and Carl King, who was replaced by Captain Ronald Towater during the study.

The United States Army Signal School was represented by Captain James E. Mitchell.

The United States Army Aviation School was represented by Captain James Young.

Contributors to the study include the TRADOC systems managers for Fighting Vehicles, HELLFIRE, and COPPERHEAD.

Mr. Chris O'Connor, HQ TRADOC and Lieutenant Colonel David Smith, HQ Combined Arms Center Developmental Agency provided support and assistance throughout the study.

Lieutenant Colonel Charles W. Hendrickson (USAFAS) served as a special assistant to the chairman, especially during the latter part of the study.

ABSTRACT

This study was designed to examine each of the current fire support organizations within a brigade size element, (armor, armored cavalry, mechanized infantry, infantry, airborne, air assault) to determine the optimum organizational structure, tactics and equipment requirements. The need for fire support organizations to support air maneuver units (air cavalry troops and attack helicopter companies) was also examined. The development and fielding of new equipment for use by the field artillery was addressed as it impacts on the fire support organization. The study group developed optimum doctrine, organizations and procedures to support the introduction of digital, and laser equipment, and the ground laser designator under armor into the various fire support organizations (fire support teams and fire support sections). The findings of the study group are primarily based on subjective analysis supported by comments from field units and analytical data from studies, such as Legal Mix V, and the COPPERHEAD COEA, when applicable.

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CHAPTER 8

FIRE SUPPORT FOR AERIAL MANEUVER UNITS

8.1 GENERAL:

8.1.1 Background. The fire support team (FIST) concept approval placed FIST into the force structure as a means of facilitating the integration of fire support with maneuver at company level. A major change in doctrine, in the FIST concept, was the declaration that the FIST chief, an FA lieutenant, would replace the company commander as fire support coordinator (FSCOORD) for the company. The current force structure provides a FIST for every maneuver company/troop except the attack helicopter company and air cavalry troop. In these aerial maneuver organizations, doctrine states that the FSCOORD is the company/troop commander. The mobility differential of these units, and of the conceptual air cavalry attack troop (ACAT), over ground maneuver units is such that they can be rapidly deployed anywhere on the battlefield to meet an enemy threat or to attack enemy forces where they are most vulnerable. This characteristic means that aerial maneuver units can expect to be committed at any point over extended frontages, either in conjunction with U.S. or allied ground forces or separately as an economy of force unit. Planning requirements will exceed those of ground maneuver units because of the sheer number of contingencies made possible by the aerial maneuver unit's mobility.

When committed, the aerial maneuver unit's operations must be totally integrated with the ground commander's scheme of maneuver and plan of fire support. The aerial maneuver unit generally depends upon fire support resources already in place at the point of action. The ground force exercising operational control over the aerial maneuver unit will contain company-level FIST's, battalion and brigade FSEs, and indirect fire delivery units (mortars and FA). Tactical air control parties (TACP's) will also be in place with the ground forces, enabling aerial maneuver units to draw upon the ground force's allocation of CAS, consistent with the commander's guidance and priorities. The problem confronting the aerial maneuver unit FSCOORD--that is, the unit commander--is how to "tap in" to the ground force fire support. The size and scope of air cavalry and attack helicopter operations exceed those of ground units and make greater demands on the unit commander.

8.1.2 Purpose and Scope.

a. Purpose. To determine the specific requirements of aerial maneuver units for fire support representatives and to develop an operational and organizational concept for satisfying those requirements.

b. Scope. This chapter analyzes the fire support requirements of air cavalry and attack helicopter organizations and will develop detailed organizational and operational concepts for satisfying those requirements, in four distinct phases. Phase I addresses the fire support system in the current, voice communications environment. Phase II examines fire support operations

using automated data processing and digital communications. Phase III addresses additional requirements resulting from the advent of laser designators, laser-guided munitions, and laser acquisition systems. Phase IV describes air maneuver organizations developed as part of the TRADOC Division 86 study (Battlefield Development Plan) to determine the specific requirements of those organizations.

8.1.3 Study Group Organization. Close Support Study Group II was organized into three task forces for the study of specific type maneuver organizations. The aerial maneuver task force consisted of one representative from each of the following agencies:

- Directorate of Armor Aviation, US Army Armor School, Ft Knox, Kentucky.

- Office of the TRADOC System Manager (TSM) HELLFIRE, US Army Aviation Center, Ft Rucker, Alabama.

- Research and Analysis Section, Tactics/Combined Arms Department, US Army Field Artillery School, Ft Sill, Oklahoma.

Additional analysis was performed by resident students of the Field Artillery Officers Advanced Course, under the auspices of the USAFAS member of the task force. Assistance was also provided by members of the Directorate of Combat Developments, USAFAS. The Commander, 1st Aviation Brigade (Ft Rucker), served as an advisor to the aerial maneuver task force. Additional insights and assistance were obtained from personnel of the Battalion Analyzer and Tactical Trainer for Local Engagements (BATTLE) simulation at the TRADOC Systems Analysis Activity (TRASANA).

8.1.4 Aerial Maneuver Task Force Methodology. The task force approached the problem in four steps.

a. Define current operational concepts and identify operational deficiencies.

b. Identify fire support tasks that must be accomplished by aerial maneuver units.

c. Identify resources organic to the aerial maneuver units that can accomplish (or assist in accomplishing) fire support tasks and determine if additional resources are required.

d. Develop organizational and operational concepts for accomplishment of the aerial maneuver fire support mission in four phases:

- Phase I--Current.

- Phase II--Digital.

- Phase III--Laser.

- Phase IV--Division 86.

8.1.5 Task Force Considerations. The task force based its analysis on published and draft doctrinal literature; TRADOC resident programs of instruction (POI's) and individual training materials for commissioned and warrant officers; noncommissioned officers and enlisted personnel; the SCORES 2A threat array; a fire support mission profile derived from Legal Mix V data; review of appropriate tables of organization and equipment (TOE's); articles in military journals; and previously published study reports. Of prime importance in the latter category were a 1st Cavalry Division report entitled, "Field Artillery Support for the 6th Cavalry Brigade (Air Combat," dated 4 April 1977, and a USAREUR and Seventh Army report entitled, "Project MAXIMIZE" (FOUO), dated 3 January 1979. Project MAXIMIZE was a study directed by the Commander-in-Chief, U. S. Army, Europe for the purpose of evaluating all aspects of training, employment, communications, and support which impact on the ability of the COBRA TOW to kill tanks; identifying problem areas which degraded this capability; and recommending solutions to the problems identified. Analysis of available documents was complemented by the collective professional military judgment of task force members in arriving at conclusions contained in this chapter.

8.2 CURRENT OPERATIONAL CONCEPTS

8.2.1 Operational Concept for Fire Support. Current fire support concepts are found in FM 6-20, "Fire Support in Combined Arms Operations," which states that

> "The maneuver commander integrates all fire support and maneuver assets to maximize combat power for the combined arms team. As he develops his plan for the employment of maneuver forces, he must visualize how fire support will be used; what targets to attack with what fire support means; and the priorities for engaging targets and allocating fire units. The commander or his operations officer insures that the fire support plan is developed accordingly, and that all available fire support is considered. With a large number of targets entering the fire support system at different levels and through different channels, and with a great variety of weapons and ammunition available; the need for command, control, and coordination of the fire support system is obvious. If each part of the fire support system is to function in concert with the other components, someone at each echelon must be tasked with insuring that fire support is planned and coordinated. Planning and coordination are detailed and complex processes that require an expert. That expert is the fire support coordinator, or FSCOORD."

As the fire support advisor for the force, the FSCOORD actively injects fire support into the commander's estimates, decisions, and concepts. He does this through close interaction with the force commander and operations officer throughout the planning and execution of an operation. He anticipates missions, situations, and changes so that he can advise the commander positively on how fire support can best influence the battle. The FSCOORD has to know what fire support assets are available and how to use them collectively to maximize their effectiveness. In order to maintain close coordination and cooperation with the maneuver force, FSCOORD's organize and supervise a fire support coordination facility at every echelon from company to corps. This facility is collocated with the maneuver command post and puts technically qualified fire support personnel in continuous, personal contact with the maneuver operations personnel to insure responsive fires.

a. Company/Troop Level. The fire support team (FIST) is the fire support organization at company/troop level. The FIST has five major duties:

- Locate targets and request and adjust fire support.
- Plan fires.
- Coordinate fire support.
- Report battlefield information.
- Direct close air support (CAS) in the absence of an air force forward air controller (FAC).

The FIST chief, an FA lieutenant, serves as the FSCOORD for the company/troop. In this capacity, he plans and coordinates all fire support for his maneuver unit. This includes developing fire support plans, numbering targets, and advising the commander on all fire support matters. The FIST chief also supervises the activities of his team, which is responsible for processing all types of fire requests and adjusting fire. The FIST chief acts as liaison offficer for the supporting FA unit, keeping supporting FA operations/fire direction centers and the next higher fire support coordination facility informed of changes in the company commander's plans and in target priorities. The FIST may also be called upon to cue target acquisition assets.

b. Battalion/Squadron Level. The fire support element (FSE) is the fire support organization at battalion/squadron level. The FSE is established and supervised by the fire support officer (FSO), an FA captain. The battalion/squadron FSE is composed of the FSO's fire support section--enlisted assistants, vehicle(s), radios, and associated equipment; the air force tactical air control party (TACP); the maneuver battalion/squadron S3 Air; and representatives of other organizations providing fire support (such as a naval gunfire liaison officer). The FSE collocates with the battalion/ squadron TOC but frequently operates split, with the FSO and ALO forward with a mobile command group and the remainder of the FSE at the TOC. The FSO is the battalion/squadron commander's principal advisor on fire support matters. He recommends allocation of available fire support, prepares fire support plans, assigns target numbers, resolves duplications and may substitute fire support means. He provides staff supervision over the FIST's supporting the unit,

monitors requests for fire, and coordinates fire requests. The FSO reports changes in the status of fire units and fire support requirements to maneuver and fire support commanders, insures maximum effectiveness of available fire support, and supervises the operation of the FSE. In addition, he keeps collocated fire support liaison representatives informed on fire support matters.

c. Brigade/Regiment Level. The FSE is the fire support organization at brigade level. The direct support FA battalion commander is the brigade FSCOORD. His fulltime representative--the brigade FSO--is an FA major. The brigade FSO's place of duty is at the brigade command post. There he establishes the brigade FSE (collocated with the brigade TOC), supervises the battalion FSO's, and accomplishes the same advisory, planning, and coordinating functions as those described for the FSO at battalion level. In the armored cavalry regiment, the FSCOORD is the regimental FSO, an FA major. In the ACR the FSO and his FSS are organic to the regiment's headquarters and headquarters troop. The regimental FSO establishes and supervises the FSE within the regimental TOC and performs advisory, supervisory, planning, and coordination functions as the regimental commander's principal assistant for fire support matters.

8.2.2 Operational Concept, Air Cavalry Troop. Doctrine for employment of the air cavalry troop is contained in FM 17-95, Cavalry. The mission of the air cavalry troop is to extend, by aerial means, the reconnaissance and security capabilities of ground units and to engage in offensive, defensive, delaying, and economy of force operations as part of a larger force. Air cavalry troops are organic to air cavalry squadrons assigned to infantry; airborne; and air assault divisions, and to air cavalry combat brigades. TOE's provide one air cavalry troop organic to the armored cavalry squadron of the armored and mechanized infantry division, and one air cavalry troop to each ACR. As a result of a USAREUR Aviation Reorganization Study, the air cavalry troops of the divisional cavalry squadron and the armored cavalry regiment were converted to attack helicopter companies. However, the aeroscout sections of the air cavalry troops were retained and assigned to the combat support company of the divisional combat aviation battalion and the support troop (air) of the armored cavalry regiment. A typical air cavalry troop is composed of a troop headquarters section, a flight operations section, an aeroscout platoon, a reconnaissance platoon, an aeroweapons platoon, and a service platoon. Organization of a typical air cavalry troop is depicted at figure 8-1.

The primary mission of the aeroscout platoon is to see the battlefield for the ground commander, acquire targets, coordinate the movement of aeroweapons helicopters, and develop the situation. The reconnaissance platoon is used primarily to extend the reconnaissance capability of the aeroscout platoon by conducting detailed ground reconnaissance, establishing ground observation posts (OP's), and listening posts (LP's), and by conducting long range patrols. The aeroweapons platoon provides overwatching fires for the other elements of the air cavalry troop. While in garrison, the platoons are organized in pure configurations (scout, recon, weapons); however, while in training/combat environments, they are task organized into teams. A mixed team consists of one or more aeroscout aircraft and one or more aeroweapons

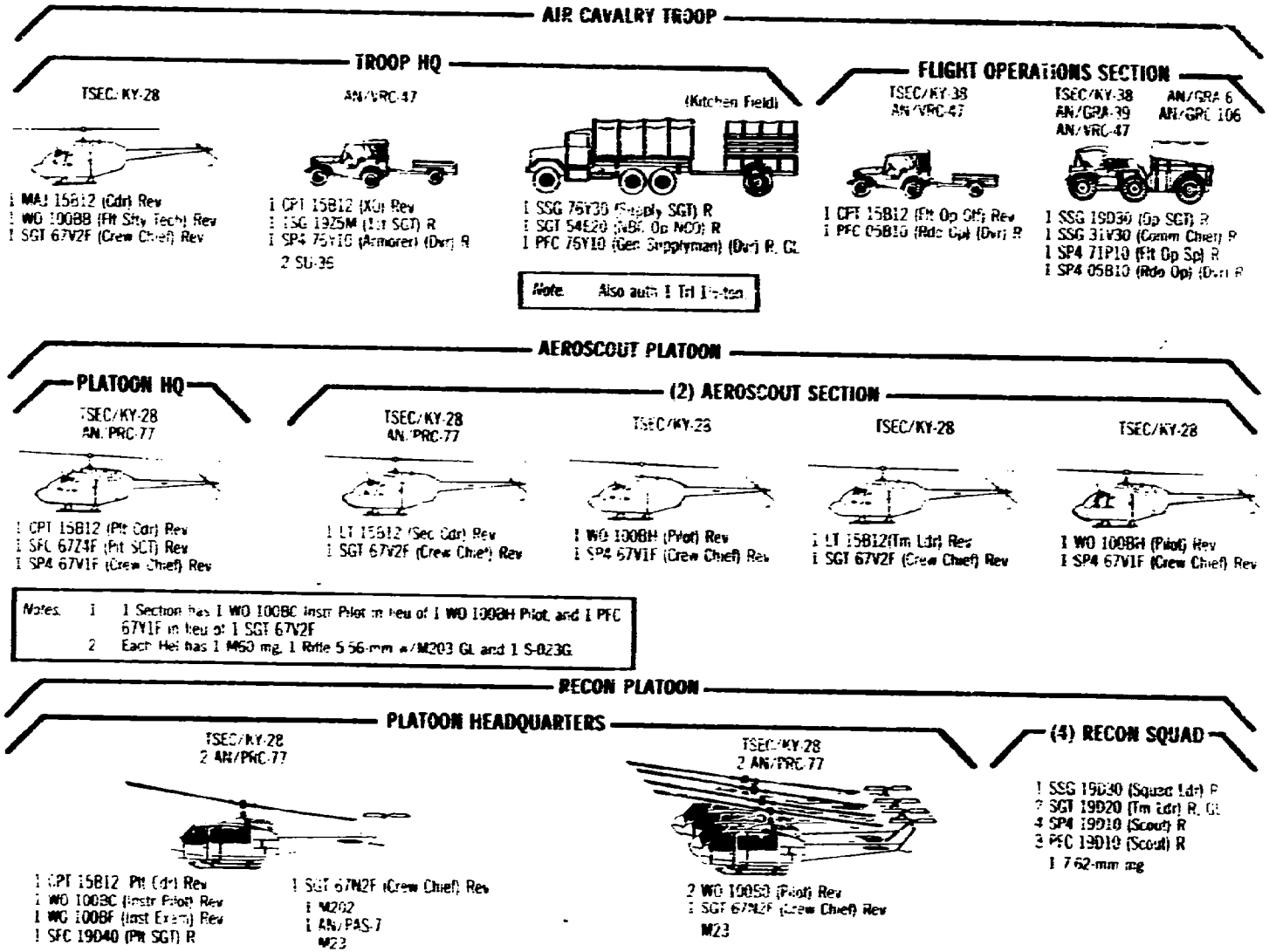


Figure 8-1. Organization of a type air cavalry troop.

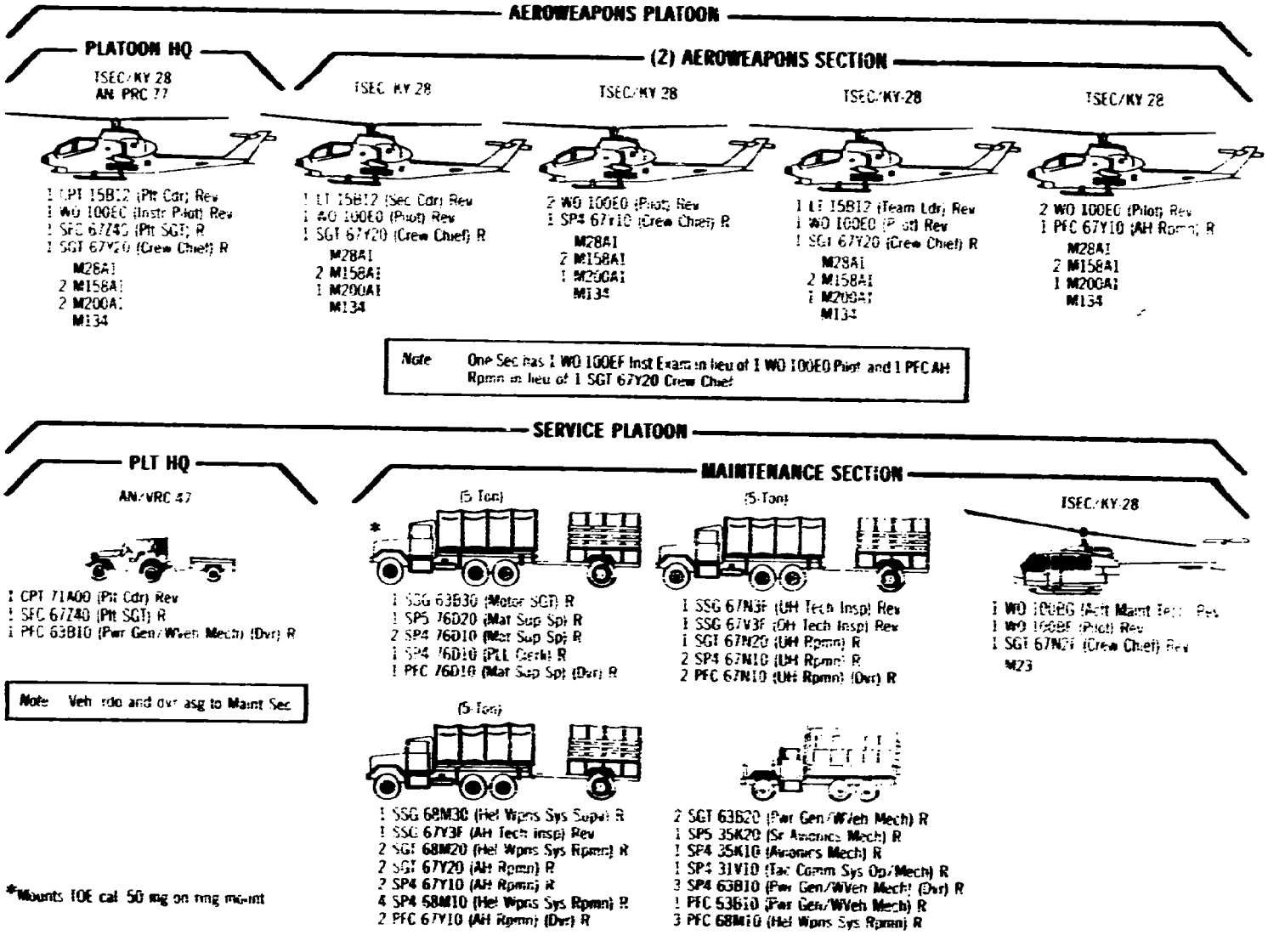
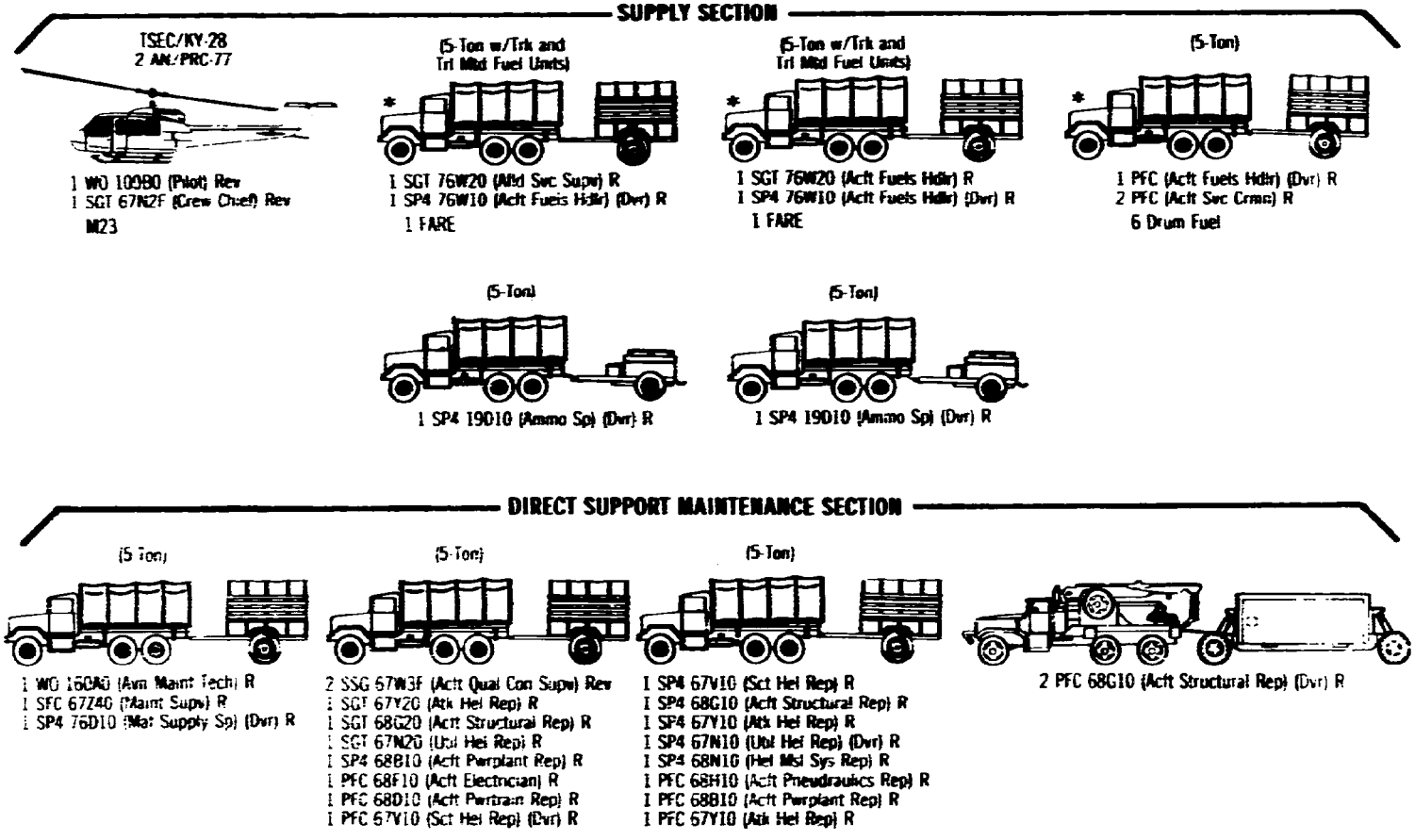


Figure 8-1 (continued). Organization of a type air cavalry troop.



*Mounts TOE cal .50 mg on rng mount.

Figure 8-1 (continued). Organization of a type air cavalry troop.

aircraft, and possibly a reconnaissance squad. The air cavalry troop is normally employed in conjunction with the ground commander's scheme of maneuver to expand the commander's reconnaissance and security capability over wide areas. The troop's mobility also permits its employment as an economy of force unit to screen unoccupied areas of the battlefield.

A review of fire support aspects of FM 17-95, Cavalry, discloses that fire support requirements for air cavalry units are essentially valuable in countering the air defense threat. Planned fires may be required to suppress enemy air defense weapons and radars during air cavalry operations and to cover withdrawal after a mission. Suppression of enemy air defenses (SEAD) fires must be well coordinated since aircraft loiter time is limited and the enemy's air defense array is lethal. Helicopter movement and fire support employment must be coordinated and integrated so that each complements, rather than restricts, the other.

Divisional armored cavalry squadrons (which contain an air cavalry troop) and divisional air cavalry squadrons normally receive FA support by a modification to the standard tactical mission given to an FA battalion. For example, the FA battalion closest to the squadron's area of operation may be placed in general support (GS) of the division, with the GS mission modified to provide the squadron a high priority in answering calls for fire. If more responsive fires are required, an FA battalion (battery) may be placed in direct support of the squadron.

FM 17-95 also addresses fire support for the ACR. Each squadron of the regiment has an organic howitzer battery. The regiment's air cavalry troop, however, is normally employed under regimental control, where there is no organic fire support. The tactical mission of one or all of the squadron's howitzer batteries can be modified to provide responsive FA support to the regiment's air cavalry troop. The ACR may receive additional FA support from divisional or corps artillery, and corps FA units may be attached to the regiment when control by the parent headquarters is difficult. When FA is attached or placed in support of the regiment and/or regimental squadrons, the squadron's organic howitzer battery may be placed under the operational control of, or attached to, the supporting FA unit.

Doctrine for employment of the air cavalry combat brigade (ACCB) is contained in FM 17-47, Air Cavalry Combat Brigade. The ACCB requirement for fire support is essentially the same as for ground maneuver units. The most common method of satisfying requirements for FA support will be to place an FA unit in direct support of the ACCB. The FSO's organic to the ACCB and its attack helicopter battalions and air cavalry squadron perform as FSCOORDs for their parent force. These doctrinal assertions were challenged by the 6th Air Cavalry Combat Brigade (ACCB) in a 1977 study on FA support requirements. The study report concluded that the ACCB can best be provided FA support by nonorganic FA units, and that assignment of nonstandard tactical missions, rather than direct support, will be the most common method of providing FA support to the ACCB.

8.2.3 Operational Concept, Attack Helicopter Company. Doctrine for employment of the attack helicopter company is contained in FM 17-50, Attack Helicopter Operations. The mission of the attack helicopter company is to destroy enemy armored and mechanized forces as an integrated part of the combined arms team during offensive, defensive, and retrograde operations. Attack helicopter companies are assigned to: (2 ea) armored/mechanized div, (3 ea) air assault div, (1 ea) armored cavalry regiments, (6 ea) ACCB. The typical attack helicopter company consists of: headquarters section, aviation unit maintenance platoon, 3 attack platoons and 1 scout platoon as indicated in figure 8-2. It is anticipated that on a day-to-day basis, 9 of the companies, 12 scout helicopters and 15 of its 21 attack helicopters can be operational ready. A variety of team configurations can be formed from available assets, but the normal team configuration is three scouts and five attack helicopters.

An attack helicopter company normally fights by applying continuous pressure, with one or more teams engaging and the remainder rearming and refueling. Attack helicopter companies should never be parceled out by platoon. Normally, attack helicopter companies are placed OPCON to a maneuver brigade and in rare instances they may be placed OPCON to battalions but should never be found any lower.

In the mid-intensity battle, success of the attack helicopter weapon system depends upon the total interaction between the scout and the attack helicopter. The mission of the aeroscout of the attack helicopter company is to see the battlefield for the attack helicopters. It is the scout who normally selects routes in and out of the battle area, coordinates with the ground commander, selects firing positions, adjusts suppressive fires, locates enemy targets and hands them off to attack helicopters. The scout controls engagements, provides local security, and maintains contact with the enemy. The attack helicopter platoon's mission is to destroy enemy armored/mechanized forces through direct aerial fires. The attack helicopter team, consisting of attack helicopters and scouts, is guided by the same principles of fire and maneuver that guide other maneuver elements of the combined arms team. Because of their considerable mobility differential over ground combat units, attack helicopter units can be moved rapidly to a critical point at a critical time and be employed there in mass, striking where and when the enemy is most vulnerable. Like a tank unit, the attack helicopter unit uses its mobility whenever possible to choose both the time and place to engage an enemy force. While attack helicopter units are not designed to occupy terrain, they can dominate terrain, denying the enemy its use for limited periods of time. Attack helicopter units can be employed in an economy of force role, independent of ground maneuver forces. Scout helicopters maintain contact with the approaching enemy, and hand off targets to attack helicopters for engagement by their direct fire weapons. The normal means of allocating and coordinating the attack helicopter company employment is to place it OPCON of a ground maneuver brigade commander, who integrates them completely into the ground scheme of maneuver and provides them with responsive fire support.

Within the framework of a ground maneuver force, fire support coordination facilities exist at every echelon, from the FIST at company level to the FSE at corps level. Fire support coordinators are charged with actively

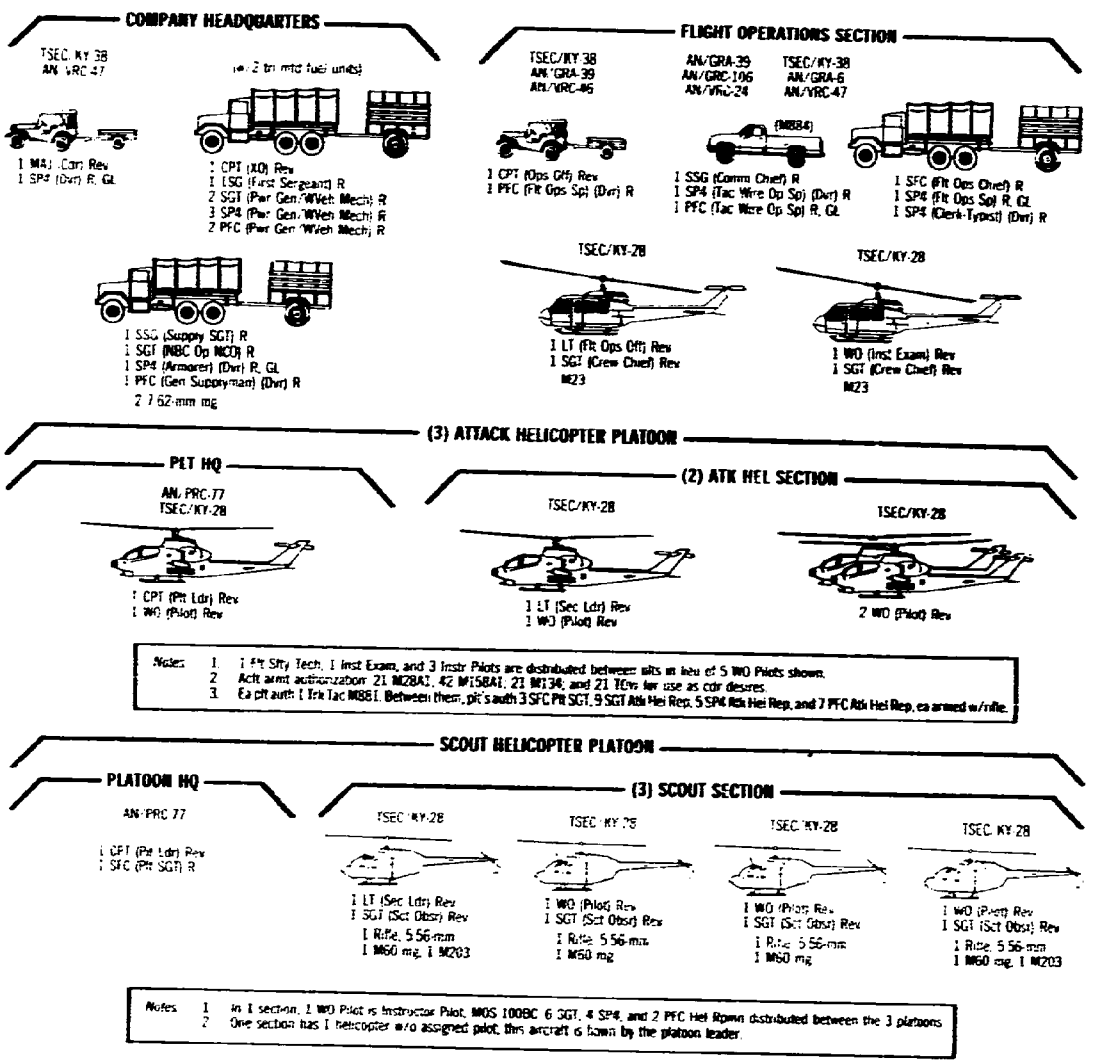


Figure 8-2. Organization of a type attack helicopter company.

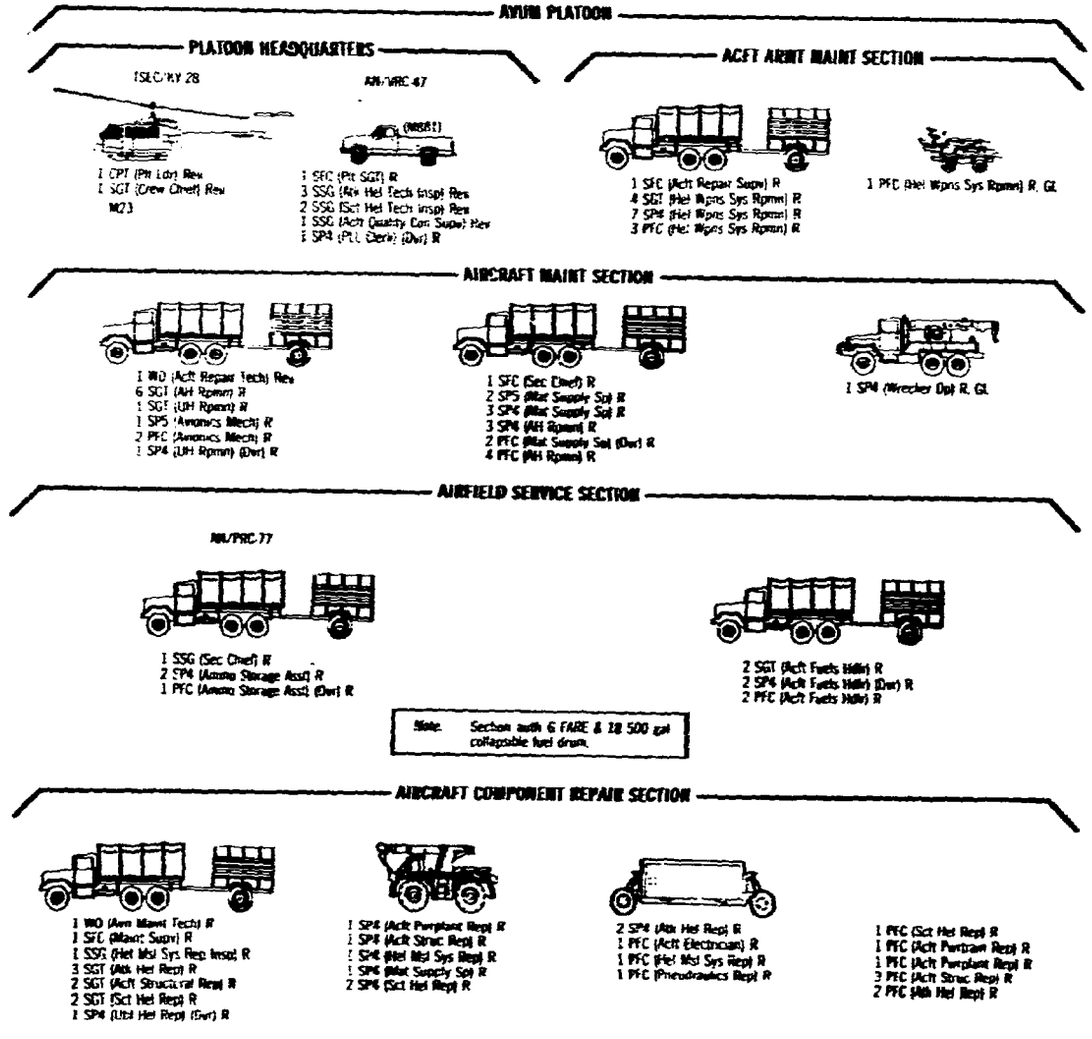


Figure 8-2 (continued). Organization of a type attack helicopter company.

injecting fire support into the commander's estimates, decisions, and concepts. Fire support communications channels are used to forward requests for fire support to higher echelons and ultimately to a fire support delivery agency. FSCOORD's at every echelon must be fully aware of attack helicopter capabilities and limitations.

When the attack helicopter unit is placed OPCON to a ground unit, concurrent planning takes place at each echelon. The attack helicopter company commander or his representative coordinates with the ground commander and they plan jointly to insure total integration of the attack helicopter into the ground force battle plan. At maneuver brigade level, it is reasonable to expect that the FSO may be called upon to brief the attack helicopter company commander on the current situation, to include what is known of the enemy target array and any hazards posed by indirect fires already in use.

Field artillery support for attack helicopter units would be used primarily to suppress enemy air defenses, (SEAD fires), permitting the attack helicopter unit to employ its point target firepower against enemy armored vehicles. Most often, attack helicopter units will obtain FA support from the FA supporting the force as a whole. An attack helicopter company under the operational control of a brigade, for example, receives a share of the fires provided by the DS FA battalion of that brigade in accordance with priorities established by the brigade commander. At the scene of the action, attack helicopter teams can receive additional indirect fires from firing units in place, such as from company and battalion heavy mortars. Attack helicopter companies employed in an economy of force role may receive support from a DS FA battalion, or through modification of the standard tactical mission of FA units positioned within range of the company's zone of action.

Larger attack helicopter forces, such as the attack helicopter battalion assigned to a corps or the ACCB may be provided an FA battalion in DS or may receive FA support through modification of the tactical mission assigned to a FA unit in range. While neither the ACCB nor separate attack helicopter battalions have organic fire support delivery assets, there is an FSS organic to the ACCB headquarters and each attack helicopter battalion to assist the commander in fire support planning and coordination and to provide interface with higher, lower, and adjacent fire support coordination facilities and with FA, air force, and naval units providing support.

8.2.4 Operational Concept, Attack Helicopter Battalion. The primary doctrinal manual governing the employment of attack helicopter battalions is FM 17-50, Attack Helicopter Operations. This manual states the mission of the attack helicopter battalion is to destroy enemy armored, mechanized, and other forces by aerial combat power using fire and maneuver as an integrated part of the combined arms team during offensive and defensive operations. An attack helicopter battalion normally will fight its companies as described in paragraph 8.2.3 of this study. Infrequently will the attack helicopter battalion fight as a battalion but when it does it will be under brigade control. Rarely will the entire attack helicopter battalion be under the control of a ground battalion. Because of their considerable mobility differential over ground

control units, attack helicopter units can be moved rapidly to a critical point at a critical time and be employed there in mass, striking where and when the enemy is most vulnerable.

FA support for an attack helicopter battalion committed in a brigade zone will come from the DS FA battalion supporting the brigade or from a general support (GS) FA battalion. The division artillery commander will modify, if necessary, the GS FA battalion's mission to provide the degree of FA support necessary.

8.2.5 Operational Concept, Joint Air Attack Team (JAAT). The JATT is a combination of US Army attack helicopters and air force close air support (CAS) aircraft operating together to locate, engage, and destroy enemy armored vehicles and other battlefield targets. There is no formal organization for a JATT. The team is formed as attack helicopter units and CAS aircraft enter the fight against the same target array on the same part of the battlefield. The employment of a JAAT usually begins with the assignment of a mission to an attack helicopter company or when A-10 aircraft are committed to provide CAS to ground forces.

In planning JAAT operations, it is necessary for the ground force commander, the S3, the FSCOORD, the tactical air control party--ALO and FAC--the attack helicopter commander or his representative to coordinate the scheme of maneuver and fire support to the maximum extent possible. Enemy information is obtained from subordinate elements through both maneuver and fire support channels. Additional planned fires may be required to insure adequate support of the JAAT. When time allows, coordination should be accomplished face-to-face. However, information may often be exchanged by radio while attack helicopter teams or A-10 flights are enroute to the operational area.

Field artillery is the indirect fire means most frequently employed to support the JATT. A typical FA operation against an advancing armor unit would include:

Initial engagement with dual-purpose improved conventional munitions (DPICM) or standard high explosive shells with variable time (proximity) or point-detonating fuzes (HE-VT/PD) to slow the attack, damage air defense radars, and cause armored vehicles to button up.

As opposing forces draw nearer, fuzing is changed to provide air bursts to minimize obscuration in the target area while keeping armored vehicles buttoned up and air defense systems suppressed (SEAD fires).

When the target array enters the range of the JATT, FA is used primarily to suppress enemy air defenses, permitting the attack team to employ its point target firepower against the enemy.

When possible, on-call suppressive fires are planned in advance against known or likely enemy locations. Planned targets are also used as known points for shifting onto targets of opportunity that appear in their vicinity.

Most often, the JAAT obtains indirect fire support from those elements supporting the force as a whole. When operating with a ground maneuver brigade, for example, support will normally be provided by the DS FA battalion and by mortars organic to the battalions and companies of the brigade. Infrequently, an FA battalion may be placed in direct support of a JAAT, or it may receive support from a dedicated battery. On other occasions, team leaders and scouts may simply be provided the communications frequencies of FA units supporting ground forces in the area of operations.

8.2.6 Operational Concept, Air Cavalry Attack Troop. The air cavalry attack troop (ACAT) is a conceptual organization being considered by the on-going TRADOC Division 86 study effort. The proposed concept would combine in a single aerial maneuver unit the air cavalry functions--to FIND and FIX the enemy--with the attack helicopter functions--to FIGHT and FINISH the enemy. The concept envisions an air cavalry attack brigade (ACAB) organic to each armored and mechanized division, with one combat support aviation battalion and two air cavalry attack squadrons of four air cavalry attack troops each.

The specific fire support requirements of these organizations are addressed later in this chapter.

8.2.7 Operational Deficiency. Following Department of the Army approval of the CSSG I report, fire support doctrine was changed to reflect the FIST concept. The fire support capstone manual, FM 6-20 Fire Support in Combined Arms Operations states that a FIST is provided to each maneuver company and troop. The fallacy in this doctrine is that CSSG I never considered the fire support requirements of air cavalry and attack helicopter organizations, and consequently made no recommendations concerning provision of fire support representatives to assist the commanders of air cavalry troops or attack helicopter companies.

Fire support officers, with enlisted assistants and required equipment, are provided, with one exception, to all aerial maneuver units above company level. The ACCB has an organic FSS at brigade level and in its air cavalry squadron and two attack helicopter battalions. Separate attack helicopter battalions programmed for assignment to the combat aviation groups of USAREUR corps will also have an organic FSE. The ACR, which will have one air cavalry troop and one attack helicopter company, also has an organic FSS. Field artillery battalions of mechanized and armored divisions provide an FSS to the divisional armored cavalry squadron, which has one air cavalry troop. Three type divisions have an organic air cavalry squadron, but only two (infantry and airborne) have provisions for a squadron FSS. Reports received from the 101st Airborne Division (Air Assault) indicate a need for a similar FSS for the air cavalry squadron of this division.

Within the current force structure, a FIST is provided for every ground maneuver company and armored cavalry troop. These FIST's are assigned to cannon battalions in divisions and separate brigades and to the howitzer batteries organic to squadrons of the ACR. The parent FA unit trains its FISTs and commits one FIST to each supported company and/or armored

cavalry troop at the onset of hostilities. Following initial deployment, FIST's remain with their supported companies and troops for the duration of the conflict without regard to changes in maneuver task organization or changes in the tactical mission of the parent FA organization. An FA battalion assigned the standard tactical mission of DS has an inherent responsibility to provide temporary, immediate replacements when casualties occur among FIST personnel with supported units. Responsibility for providing permanent replacements rests with the parent FA unit, regardless of its tactical mission. The exception occurs when a cannon battalion is placed in DS of a maneuver organization that consists of, or includes, air cavalry troops and/or attack helicopter companies. The direct support FA battalion has, by doctrine, an inherent responsibility to provide one FIST to each supported company and troop. At present, no FA battalion is authorized the personnel and equipment necessary to perform the FIST function when supporting air cavalry troops or attack helicopter companies.

8.3 ANALYSIS OF REQUIREMENTS

8.3.1 Issues.

a. ISSUE. What fire support tasks must be accomplished at air cavalry troop/attack helicopter company level?

Discussion. Collective tasks, conditions, and standards for the air cavalry troop are contained in ARTEP 17-205, Air Cavalry Squadron (Revised 1979).

Collective tasks, conditions, and standards for the attack helicopter company are contained in ARTEP 17-385, Attack Helicopter Battalion (Revised 1979).

Extracts of the Air Cavalry and Attack Helicopter ARTEP's are contained in Appendix G, Annex I. The extracts list all Level I missions and tasks, conditions, and standards pertaining to fire support for the aerial maneuver units.

Taken as a whole, the air cavalry troop and attack helicopter company ARTEP's adequately describe the tasks those units must accomplish in order to obtain responsive fire support, provided the individuals performing the published tasks understand and can accomplish all implied tasks. This reservation is necessitated by the degree of resolution present in the aerial maneuver ARTEP's. Many items that appear as standards in ARTEP 17-205 and 17-385 (under revision) are in themselves distinct tasks, with associated conditions and standards. An example is the air cavalry troop task "occupy an assembly area." One of the standards for this task states "troop establishes indirect fire support plan." Establishment of an indirect fire support plan is itself a major task containing numerous subtasks and requiring extensive coordination. Fire support tasks for members of the company-level FIST are published in FA cannon battalion ARTEP's.

To illustrate the differences in resolution between aerial maneuver ARTEP's and those published for FIST's, an extract of FIST tasks is contained at Annex J to Appendix G. The FIST tasks are extracted from the March 1979 draft edition of ARTEP 6-165, General Support Cannon Units. (Divisional general support units provide FIST's to the ground troops of the divisional armored cavalry squadron.)

Analysis of the FIST tasks for ground units and air maneuver units (unit ARTEP tasks) discloses that tasks may be placed into the following broad categories.

> Fire support planning, identify targets (known, suspect, and likely enemy positions and prominent terrain features). Process target lists to include resolution of duplications, target numberings, and forwarding target lists to higher, lower and adjacent fire support coordination facilities and to fire support delivery units (FDC's, DASC, etc.) Disseminate fire support plan to subordinate elements (team leaders, aeroscout and attack helicopter air crews) for execution.
>
> Fire support execution. Locate targets and transmit calls for fire (fire-for-effect on planned targets, adjust fire on targets of opportunity using shift from a known point and grid methods), conduct adjustment of indirect fires (using all type munitions, simultaneous mission, HE under illumination, etc.), assist flight leader of CAS attack (mark and/or identify target, initiate indirect suppressive fires, adjust ordnance of succeeding aircraft), and provide post-attack surveillance mission effectiveness.
>
> Coordinate fire support. Insure a continuous flow of targeting information, consider use of all available fire support means, use lowest echelon capable of furnishing effective support, consider airspace coordination, implement commander's priorities and target engagement criteria, substitute means when appropriate, and safeguard friendly troops.

Both the air cavalry and attack helicopter ARTEP describe the mission of FA in suppressing enemy weapons as critical. The ARTEP's describe the following as minimum FA participation in unit training:

- Fire planning--preparing target lists, target overlays, writing of a fire support annex (including requests for additional fires), and one or more fire plans.

- Fire support coordination--coordinating the indirect fires planned in support of the unit, as well as close air support.

- Use of an observer in bringing fires on the enemy or objective area--observers will be required to call for and adjust fires to support the squadron, depending on the tactical situation.

Air cavalry squadrons and attack helicopter battalions have FSOs to assist with fire planning and fire support coordination. At company/troop level, however, the burden is on the commander. For many of the fire support related tasks, ARTEP 17-205 Air Cavalry provides as a condition, an attached FA FO. Recognizing that the current force structure does not contain FOs other than the FIST's provided for ground companies and troops, it is apparent that air cavalry troops and attack helicopter companies must be able to accomplish all stated and implied fire support tasks without assistance. It must be noted that the ARTEP's prescribe collective tasks. The collective performance of a unit can only be as good as the individual performance of its members. In attempting to determine what, if any, fire support representation is required by aerial maneuver units, it is necessary to evaluate the nature of fire support training given to the individual soldiers that comprise these units.

Findings.

- Fire support tasks to be accomplished by aerial maneuver units are basically identical to those that must be performed by ground units.

- Air cavalry troop and attack helicopter company commanders, assisted by subordinates, must accomplish all fire support tasks.

- No conclusion can be drawn concerning the need for additional fire support representation until the capabilities and limitations of unit members are analyzed.

b. ISSUE. What resources currently exist in aerial maneuver units to accomplish required fire support tasks?

Discussion.

Enlisted Specialties. The basic enlisted military occupational specialty (MOS) for the soldier that performs functions related to fire support in CONUS air cavalry troops and attack helicopter companies is MOS 19D, Cavalry Scout. Soldiers with this basic specialty are assigned to the reconnaissance platoon of the air cavalry troop and to the aeroscout platoon of both the air cavalry troop and the attack helicopter company. Soldiers' manuals for this MOS (FM 17-11D series) indicate that 19D's are expected to be able to perform three tasks directly related to fire support. Skill Level I tasks are to call for supporting fires and adjust supporting fire. The commander's manual indicates that initial training for these tasks is administered during one station unit training (OSUT), with progressive follow-on training administered

during the primary noncommissioned officer course (PNCOC). In practice, initial institutional training is provided by the Indirect Fire Branch of the Weapons Department, USAARMS.

Initial-entry trainees are provided a programmed text covering the mortar call for fire. This training is followed by a practical exercise in which an attempt is made to permit each trainee to conduct one indirect fire mission, using either the 14.5mm artillery trainer or a mortar submunition trainer. Scheduling limitations sometimes preclude each trainee from conducting his own fire mission. The only other individual tasks directly related to fire support in the 19D MOS soldier's manuals is a skill Level 4 task, requiring preparation of a platoon fire plan. The commander's manual indicates that initial training for this task is presented during the advanced noncommissioned officer course (ANCOC) taught at the USAARMS. Students in this course are presumed to be proficient in the Skill Level 1 tasks calling for and adjusting fires, and actual training for the Skill Level 4 tasks consists of a 4-hour block of instruction in which students are taught how to use suppression and neutralization to facilitate maneuver on the battlefield.

CONUS attack helicopter units are currently authorized the 19D Cavalry Scout to fill the scout observer position. The actual MOS held by members of the aeroscout platoon in CONUS attack helicopter companies is 19D2F (the "2" indicates the soldier is trained to Skill Level 2, and the "F" indicates the duty position is a flying position). Duty positions documented for enlisted members of the aeroscout platoon in the air cavalry troop are presently 19D, but the USAARMS is attempting to convert these positions to reflect a requirement for MOS 19D2F. Enlisted duty positions in the reconnaissance platoon of the air cavalry troop are non-flying positions, and soldiers in the reconnaissance platoon are 19D's of the appropriate skill level (no "F" suffix). There is currently no TRADOC-sponsored air observer school, and USAREUR Project MAXIMIZE reports that an exhaustive unit training program, estimated at 30 hours ground school and 100 flying hours, is required to developed an exportable training package for use by field units. This training package includes a block of instruction on fire support and a block on adjusting fire. The fire support block of instruction includes an overview of the fire support system, its components and coordination facilities; and the mission capabilities and limitations, organization, command and control, and weapons and ammunition of FA, mortars, CAS, and naval gunfire. The lesson plan for adjusting fire includes fire direction procedures, target location, target acquisition, pre-mission briefing, survivability, calls for fire and adjustment of fire. A programmed text on FO procedures is included in the exportable training materials. The training package is designed for use by units, and is primarily classroom oriented. Development of any kind of "hands-on component" is left to the discretion of local commanders, and there are no individual training and evaluation outlines other than those in the basic soldier's manuals (FM 17-11D series).

The basic enlisted MOS that performs fire support functions in ground unit FIST's and FSE's is MOS 13F, Fire Support Specialist.

These soldiers specialize in observed fire procedures, fire planning, and fire support coordination. As with the collective tasks, conditions, and standards published in ARTEP's, there are differences in the degree of resolution contained in fire support related tasks for the 19D and 13F soldier. To illustrate the differences in depth of knowledge required of 13F's, as compared to 19D's, extracts from appropriate soldier's manuals are provided at Annex K to Appendix G. Fire support related training and evaluation outlines for MOS 19D are extracted from the Skill Level 1/2 and Skill Level 4 soldier's manuals, and tasks for all skill levels of MOS 13F are extracted from the commander's manual. While quantity of training does not guarantee quality of performance, it is evident that MOS 13F soldiers are required to demonstrate far greater proficiency in fire support than are soldiers in MOS 19D or even 19D2F. It must be noted, however, that both specialties have many skills in common, such as communications; map reading; land navigation; and target detection and identification.

Pilot Training. Pilots in aerial maneuver units, to include both warrant officer pilots and commissioned aviators, receive their entry level training in the Officer/Warrant Officer Rotary Wing Aviator Course at the US Army Aviation Center. The course is presented in two phases, with the first, or primary phase designed to qualify commissioned officers and warrant officers in primary rotary wing flying techniques and helicopter use. In the second phase of the course, student pilots undergo instrument training and become qualified in the UH-1 utility helicopter. During the final eight weeks of phase two, a dual-track combat skills course is introduced, in which student pilots acquire the knowledge and skills necessary to employ the helicopter in a tactical environment. The UH-1 combat skills track teaches the aviation and related skills necessary for the employment of the utility helicopter in a combat environment, and the OH-58 aeroscout track teaches selected students the aviation-related skills necessary for the employment of the aeroscout helicopter in a combat environment. Priority for the aeroscout is given to combat arms officers and those designated for assignment following flight school to air cavalry and attack helicopter organizations. Prior to entering the UH-1 or OH-58 combat skills track, all student pilots undergo common combat skills training.

This segment of training includes a 1-hour block on fire support coordination which covers fire support coordinating and limiting measures. All students also undergo a 6-hour block on adjustment of FA. This block consists of three hours on FA weapons and ammunition, and procedures for requesting and adjusting FA, followed by a 3-hour practical exercise in which students conduct fire missions on an FA-recording terrain board ("puff board"). It is anticipated that aeroscout track students will continue to receive the 3-hour practical exercise. Those students who continue with the OH-58 combat skills track receive an additional 7-hour block of instruction on aerial adjustment of FA. The student performance objective for this class states: "The student, in a classroom, given a tactical situation, a 1:50,000 map sheet corresponding to an FA terrain board, a gridded template, and CEOI will, without the aid of notes or references, complete an examination which will require calling for and adjusting FA fires in special situations and prepare a hasty fire plan with

85 percent accuracy." The classroom instruction is followed by a practical exercise, using the artillery-recording terrain board.

Fire support training for aeroscout students is capped during the combat skills flight training phase by having student pilots call for and adjust indirect fires while piloting the OH-58. The program of instruction for the officer/WO Rotary Wing Aviator Course provides nine rounds of 105mm high explosive per student, with point-detonating fuze, for this purpose.

Attack helicopter pilots are trained in a separate AH-1 transition course at the Aviation School, either immediately following initial entry training or following a utilization tour in the UH-1 or OH-58. Attack helicopter courses presently contain no fire support instruction.

To standardize continuation training for pilots in units, USAAVNC has developed a training publication called the "Aircrew Training Manual." These manuals can be likened to a combination of "pilot soldier's manuals" and provide sample training tables recommended for refresher, mission, and continuation training. The October 1978 draft of TC 1-137, Aircrew Training Manual--Observation Helicopter, includes tasks which require observation helicopter pilots to call for and adjust indirect fire to include naval gunfire (NGF).

TC 1-136, Aircrew Training Manual--Attack Helicopter (October 1978 draft) contains no requirement for attack helicopter pilots/crews to perform air observer (fire support) tasks.

Commissioned Officer Training. Commissioned Officers in air cavalry troops and attack helicopter companies may be of any branch, provided they have OPMS specialty code 15 (aviation). Recently approved changes to the personnel management plan for commissioned army aviators require that those holding specialty code 15 be assigned to the infantry, armor, FA, or air defense branch. While officers of any of these four branches could be assigned to leadership positions in aerial maneuver units, the armor branch was selected for analysis of commissioned officer training because USAARMS is the TRADOC proponent for air cavalry and attack helicopter doctrine. Prior to attending the Officer Rotary Wing Aviator Course, armor officers attend the Armor Officer Basic Course (AOBC). Lieutenants receive the same fire support instruction as MOS 19D trainees and MOS 19D ANCOC students. Student officers complete a programmed text on the mortar call for fire and conduct one fire mission using either the 14.5mm FA trainer or the mortar submunition training device. Armor lieutenants also receive a 4-hour block of instruction on how to use suppressive fires to maneuver on the battlefield.

At the end of AOBC, student officers take part in a field training exercise in which they rotate through all leadership positions in a tank platoon. Students acting as platoon leaders are evaluated, using GO/NO-GO criteria, on their ability to use indirect fires. Students do not actually call for and adjust fires, but are instead evaluated based upon how they say they would use indirect fires in response to a given tactical situation.

Armor officers receive additional instruction on employment of fire support during the Armor Officer Advanced Course (AOAC). Students receive 13 hours of pure fire support instruction plus additional instruction integrated into armor tactics instruction. Pure fire support instruction begins with a 4-hour block on FA organizations, missions, and capabilities. This block is designed to teach what the armor officer should know about FA support, and is followed by a 5-hour block on fire support planning. Student officers are required to develop and give commander's guidance to FSO or FIST chief. This block includes practical exercises that develop the armor officer's ability to provide fire support planning guidance covering five major areas:

- Unit mission for the next operation.
- Nature, timing, and location of desired fires.
- Restrictions on use of fire support.
- Commander's estimate of the enemy situation.
- Priority of fires (by unit and/or by nature of target).

The final block of pure instruction covers fire support coordination. Students are required to review and evaluate sample fire support plans prepared to cover a given tactical situation. Students also receive instruction on fire support coordinating measures and how these measures can be used to facilitate fire and maneuver. Examinations and the remainder of integrated fire support instruction are primarily oriented toward reinforcing pure instruction in development of commander's guidance, evaluation of fire support plans, and use of fire support coordinating measures. Armor advanced course students receive a 1-day, ungraded practical exercise on conduct of fire, using a 14.5mm FA trainer. There is currently no separate track for aviators within the Armor Officer Advanced Course, but a separate subcourse has been proposed for integration into the AOAC program of instruction. The armor aviation subcourse, does not contain any additional fire support instruction.

Training given to the armor officers, who occupy the preponderance of leadership positions in aerial maneuver units, emphasizes development of fire support planning guidance, and evaluation of fire support plans prepared by someone else. In ground companies and troops, the individual who receives the commander's guidance and prepares the fire support plan is the FIST chief. Newly commissioned FA lieutenants receive their training in the Field Artillery Officer Basic Course (FAOBC). Basic Course graduates, programmed for assignment to cannon units (that is, potential FIST chiefs), attend the follow-on Field Artillery Cannon Battery Officer Course (FACBOC). Training oriented toward the FIST chief jobs in these two courses is summarized at table 8-1.

Table 8-1. USAFAS Training for FIST Chiefs.

FIELD ARTILLERY OFFICER BASIC COURSE (FAOBC)

SUBJECT	HOURS
Observed fire procedures	54.5
Introduction to fire support planning	2.5
FA missions and organization for combat	2.5
Fire support planning	5.9
Duties of the FIST chief	2.5
Principles of fire support coordination	4.2
Application of fire support coordination	4.2
Offensive operations (maneuver)	4.2
Defensive operations (maneuver)	4.2
TOTAL	84.7

FIELD ARTILLERY CANNON BATTERY OFFICER COURSE (FACBOC)

SUBJECT	HOURS
Observed fire	11.7
Direct support artillery battalion fire planning	4.2
Fire support systems	8.4
Combined arms team in the attack (live fire FTX)	5.9
Offensive operations	5.9
Defensive operations	4.2
FIST emergency control of close air support	10.1
FIST command post exercise	8.4
TOTAL	58.8

Individual Opportunity. Regardless of the degree of proficiency of individual members of aerial maneuver units, another important consideration is the amount of time they have available and the equipment that can be devoted to accomplishing fire support tasks. The basic combat element of air cavalry and attack helicopter organizations is the team, consisting of a mixture of aeroscouts and attack helicopters. Each team is controlled by a team leader in an aeroscout helicopter. The team leader is expected to coordinate with ground forces; plan, initiate, and adjust indirect suppressive fires; direct CAS attacks; control movement of the team; select firing positions for attack helicopters; distribute the fires of the team; and control target engagements. The team leader must perform these functions while piloting a helicopter at tree top level and below, with all the attendant requirements to navigate, tune radios, monitor engine instruments, clear obstacles, etc. Present authorizations place an enlisted assistant in the scout helicopter (MOS 67V Crew Chief or MOS 19D/19D2F Aeroscout Observer). Due to the demands placed on pilots operating in a nap of the earth (NOE) environment, USAREUR Project MAXIMIZE identifies a requirement for two qualified pilots in all scout aircraft, with an urgent requirement for a second rated aviator in the team leader's aircraft. Regardless of scout aircraft manning, the team leader's responsibility is great, and his employment of fire support competes with other requirements for his time and attention.

In order for the team to successfully employ fire support, members must be trained to call for and adjust fires. What training team members do receive is perishable and requires reinforcement if proficiency is to be maintained. Even when individual crew members are proficient in observed fire procedures, certain other conditions must be satisfied before fire support can be employed at team level and integrated with the team's fire and maneuver. Obviously, crew members need to know the frequencies and call signs of fire support coordination facilities and delivery units. This information is not difficult to gather, but someone must obtain it and disseminate it to the rest of the team--often while the team is enroute to a target area.

When the aerial maneuver unit is committed in conjunction with ground maneuver forces, the team needs to know what fires have already been planned that can support the teams' fire and maneuver. When on-call fires are recorded in FDC's, there is no need for air crewmen to be compelled to determine target locations and spend time adjusting rounds to compensate for target location errors. When team members are provided target lists and overlays depicting planned fires, they can obtain more responsive fire support by requesting fire-for-effect (FFE) against an on-call target, transmitting the target number in lieu of grid coordinates in the request for fire. Planned targets, or "target reference points (TRP's)," can also be used as known points for shifting fires, and as a means of controlling and distributing the fires of both the aerial maneuver unit and adjacent ground units. Current target lists and overlays can be obtained from the ground force FSE and distributed to individual air crews.

Aerial maneuver units are not always committed in conjunction with ground forces, and when they are, fires planned by the ground force may not be adequate to support the fire and maneuver of helicopters. In these instances, listing likely enemy locations is not difficult, but a target list by

itself does not constitute a usable fire plan. Targets must be numbered and forwarded through fire support channels to the appropriate FDC, where they are recorded and where firing data is precomputed and sent to the firing weapons for use when needed. Only when these steps are accomplished does a valid, usable fire plan exist. When aerial maneuver units utilize the ground fire support, the ground force FSE will assign target numbers, consolidate target lists and resolve duplications, and forward target lists to supporting mortar and FA FDCs. When the aerial units operate separate from ground forces, as in an economy of force role, someone assigned to the unit must tend to these details of the fire planning process.

Finally, the teams require that supporting fires be coordinated. This function entails monitoring the tactical situation as it develops and making timely recommendations regarding when, where, and how available fire support should be used to facilitate maneuver. The FSCOORD expedites requests, safeguards friendly troops, and actively injects fire support considerations into the commander's estimates, plans, and orders. To be effective, a FSCOORD requires uninterrupted communications with fire support delivery agencies and higher, lower, and adjacent fire support coordination facilities. An essential aspect of fire support coordination is the management of resources within the priorities established by the commander. One such resource is the priority target. Priority targets are targets so designated by the maneuver commander by type, location, or time sensitivity. A priority target is one that the firing unit is laid on when not engaged in another mission. The intent of priority targets is to provide the maneuver unit with the greatest response possible (FA ARTEP standards require a 155mm howitzer section to fire the first volley against a planned priority target within 10 seconds of the command from the FDC). The number of priority targets in effect for a force is limited by the number of fire units available to it. Generally, each priority target will have one 6-cannon battery laid on it. The brigade commander allocates priority targets to subordinate units. The commander to whom a priority target is allocated must provide specific guidance to his FSCOORD as to when particular targets become priority targets, when they cease to be priority targets, and the effects desired on the target, to include any special type munition to be fired. Aerial maneuver units may be allocated priority targets to increase responsiveness of indirect suppressive fires, and the FSCOORD must insure that FDCs are kept informed as targets designated "priority targets" are changed.

Aerial maneuver ARTEP's clearly require team leaders to accomplish fire planning and fire support coordination, but because the normal method of operation is by company rather than by platoon, much of the planning and coordination has to be accomplished at company level. The company or troop commander normally employs his unit by applying continuous pressure, with one or more teams in contact with the enemy at all times. As teams rotate on station, the departing team leader must hand-off the engagement to an arriving team leader. The hand-off includes a full report on the situation, and the freshly committed team takes over the departing team's mission. The fire support plan developed for the team initially in contact will continue to be used as teams rotate.

Command and control assets at company/troop level are the commander, operations section, and the executive officer. Precise organizations vary according to TOE/MTOE, but roles are spelled out in general terms in FM 17-50:

> "During tactical operations, the commander must position himself where he can best influence the action. Because he may not always be in a position to observe the combat situation directly, alternate lines of command and control are used. . . The company usually will control its operations through its flight operations and platoon leaders. The executive officer and service platoon leader will control service support operations."

FM 17-95 states that an air cavalry troop command post (CP) is formed around the flight operations section, and that the CP is not usually located as far forward as the CP of a ground cavalry troop. An aerial maneuver unit tactical CP is frequently airborne. When not airborne, it may be located in the vicinity of a forward area rear/refuel point, the main CP, or a ground maneuver unit.

The USAREUR Project MAXIMIZE report emphasizes a need for more specific doctrine covering attack helicopter operations. The lack of detail in doctrinal publications has created significant variations between unit employment and combat service support concepts in USAREUR units. The report also addresses problems associated with radio communications in the NOE environment and concludes that for mission implementation, the commander and/or operations officer should be on station in an airborne command post to coordinate the operation, sequence assets into the action, and insure sufficient logistic assets are available to support mission accomplishment. To accomplish these tasks, the commander/operations officer will position himself and his aircraft as required to coordinate the various aspects of the battle. Utility helicopters authorized for use by the commander and operations officer can be equipped with a communications console to facilitate command post operations.

Findings. In terms of individual training, individuals who perform the tasks of fire support planning, execution, and fire support coordination in aerial maneuver units are not as proficient as those who perform the same tasks for companies and troops on the ground. Members of the ground FIST not only receive more thorough institutional training; they also have greater opportunities to sharpen their skills because their supported units have organic mortars and can habitually train with the same cannon FA unit.

Members of aerial maneuver units, such as the operations officer, team leaders, and individual aircrews, have ample opportunity to perform fire support related tasks, provided they are furnished sufficient information such as fire support frequencies and call signs and target lists and overlays depicting scheduled and on-call fires. The individual charged by doctrine and by air maneuver ARTEP's with performing FSCOORD responsibilities is the unit commander, and the nature of his job makes it doubtful that he will

have the time required to accomplish the details for fire support planning and employment. A quote from the final report of the CSSG I summarizes the problem:

> "The maneuver company commander is faced with a far more complex task than ever before: an extremely effective enemy; wide sectors; delicate, clever tactics; and increasingly sophisticated direct and indirect fire weaponry. While the maneuver commander will always be the orchestrator of all available combat power, he needs someone else today to accomplish the detailed coordination of indirect fire support."

To solve this problem for ground company and troop commanders, CSSG I recommended implementation of the FIST concept. The problem still exists, however, for attack helicopter company and air cavalry troop commanders, and CSSG II concluded that these commanders also need someone else to accomplish the detailed coordination of the fire support.

c. ISSUE. What additional personnel are required to permit proper and timely accomplishment of all fire support tasks?

Discussion. The significant improvements in fire support that resulted from the placement of a FIST with each ground company and troop suggest that a similar FIST would solve the fire support coordination problems of aerial companies and troops. A TRADOC study group that met in 1977-78 to evaluate requirements for the air assault division operating in a mid-intensity (NATO) combat environment proposed an "air FIST" for each attack helicopter company and air cavalry troop. USAFAS was tasked to develop this concept, and the following tentative organizations and operating concepts were forwarded to TRADOC in June 1978:

Air FIST When Operating with an Attack Helicopter Company.

Organization.

Personnel	Major Equipment
1 - FIST Chief (LT, FA)	2 - AN/PRC-77
1 - Fire Support SGT (E6, 13F)	2 - TSEC/KY-38
3 - Forward Observers (E5, 13F)	

Operational Concept.

- The proposed attack helicopter company FIST is organized into a 2-man headquarters and three 1-man observer parties.

- When the company is committed, the headquarters element is split. Either the FIST chief or the fire support sergeant is dropped off at

the supported maneuver (brigade or battalion) command post with a backpack radio equipped with a secure device. The FIST member interfaces with the maneuver unit FSO and serves to expedite requests for fire support from the attack helicopter company to the fire support agencies already available to the maneuver unit. The liaison member at the maneuver CP will normally operate on the internal CFC net. A liaison officer from the attack helicopter company may also be at the maneuver CP, with a radio on the company command net.

- The remaining member of the FIST headquarters will stay with the attack helicopter company commander. He will require one FM transmitter in the company commander's helicopter and will ordinarily operate in the CFC net. He serves as the company commander's primary FSCOORD and he supervises the activities of the FOs.

- There is one enlisted FO for each of the three scout sections. The FO rides in the team leader's helicopter and requires one FM transmitter for operation in the company fire support net and fire direction nets as required. The FO is responsible to the team leader for requesting and adjusting indirect fires. FO's will communicate with each other on the CFC net and will pass plans, target lists, and SITREP's when the company is employed according to the one-third rule.

- The FIST will normally operate in the CFC net (FM) when the company is OPCON to a maneuver brigade or battalion. When the company is employed as part of the attack helicopter battalion, the FIST's will net with the attack helicopter battalion FSO on a battalion fire support net. The battalion FSO and FIST's will use existing fire direction nets when the battalion receives direct support from a cannon battalion.

Air FIST When Operating with an Air Cavalry Troop.

Organization.

Personnel	Major Equipment
1 - FIST Chief (LT, FA)	2 - AN/PRC-77
1 - Fire Support SGT (E6, 13F)	2 - TSEC/KY-38
3 - Forward Observers (E5, 13F)	1 - GVS-5

Operational Concept.

- The air cavalry troop FIST consists of a 2-man headquarters and three 1-man FO parties.

- When the troop is placed OPCON to maneuver brigade, the FIST headquarters will be split with one member reporting to the brigade FSE and the other member accompanying the troop commander. At the brigade FSE, the liaison member will coordinate the troop's fire support needs, through the FSO, to the available fire support assets. Primary communications will be over a troop fire control (TFC) net (FM).

- When the troop is employed independently, one member of the FIST headquarters will remain with the troop commander. The other FIST member will be located with the troop flight operations section and will be equipped with a backpack radio to establish communications with the FA battalion supporting the troop.

- When the air cavalry squadron is employed pure, the FIST's will net with the squadron FSO on a squadron fire support net. When a cannon battalion is assigned the mission of DS to the squadron, existing FA FD nets will be used by the troops FIST's.

- One enlisted observer will operate with each of the two sections of the aeroscout platoon. The duties of the observer will be the same as those of the FOs in the attack helicopter company. The FO will ride in a scout helicopter and will require one dedicated FM transceiver for operations in the TFC net and appropriate FD net.

- One FO will operate with the recon platoon. He will be equipped with a backpack radio and secure device for communications in the TFC net and appropriate FD nets.

The report of the 101st Restructure Study has never been approved, and it was never staffed with USAARMS. The "air FIST" concepts developed by USAFAS were reviewed by CSSG II and it was determined that they fail to meet all the fire support needs of attack helicopter and air maneuver unit commanders.

Company/Troop Level. The concept of an FA officer and a fire support sergeant at company/troop level is sound. The manner in which aerial maneuver unit command and control is exercised, using a ground command post and/or airborne command post, requires that a fire support coordination facility at company/ troop level be capable of split operations. One fire support representative (normally the FA officer) would accompany the unit commander, and the other would accompany the company/ troop operations officer. The FA officer would replace the unit commander as company/troop FSCOORD and his noncommissioned assistant would perform duties similar to those of the fire support sergeant in a ground FIST. For those occasions when control of the unit is turned over to the operations officer, as when the commander is required to refuel, the fire support sergeant would function temporarily as the company/troop FSCOORD.

Due to the complexity of air maneuver unit operations and the number of planning contingencies made possible by the unit's inherent mobility, the FA officer assigned duties as an air cavalry troop or attack helicopter company FSCOORD will require expertise beyond that required of a ground FIST chief, preferably at the Field Artillery Officer Advanced Course level. The FSCOORD will work for and with a major (unit commander) and captain (operations officer). When the unit is employed under operational control of a brigade, the unit FSCOORD will interface directly with the brigade FSO, a major. Because of these requirements, the appropriate grade level for the FA officer

serving as FSCOORD in the attack helicopter companies and air cavalry troops is captain.

Because air maneuver units are normally not placed OPCON below brigade level, their command and control channels are more similar to a ground battalion than to a ground company and the FSCOORD at air maneuver company/troop level performs functions similar to a battalion FSO, therefore, the appropriate title for this duty position is Fire Support Officer. Duties performed by the fire support sergeant are also more similar to battalion-level than company level duties. The fire support sergeant must be prepared to function as the unit FSCOORD, and in particular he must be able to coordinate employment of CAS without direct assistance from an air force TACP. The attack helicopter company/air cavalry troop fire support sergeant must be able to perform MOS 13F duties at skill level 4; therefore his appropriate grade is E-7.

When operating from an airborne command post, air maneuver fire support representatives will require dedicated aircraft FM radios to perform FSCOORD functions.

When operating from a ground command post, the unit fire support coordination facility will require vehicular radios. Specific equipment requirements communications channels required will be addressed in operational concepts (8.4), but it is anticipated that the fire support coordination facility will require its own vehicle for transportation and to serve as a platform for required radios. Addition of a vehicle requires a driver/RTO. A MOS 13F fire support specialist, skill level 1, is appropriate for this function.

The three-man fire support section (CPT, E-7, Driver/RTO) proposed for attack helicopter company/air cavalry troop could be assigned to either a divisional cannon battalion or made organic to the air maneuver unit. Because air maneuver units can expect to be employed anywhere in a division zone, no single FA battalion can be expected to provide support on a habitual basis. Non-divisional air maneuver units also require a three-man fire support section (FSS), and in many cases there is no corresponding FA unit where the FSS personnel could be assigned. Members of the FSS performing duties in the airborne command post will be required to meet flying status physical standards, and may be entitled to non-crewmembers flight pay. Because of the training requirements unique to aerial maneuver unit operations, members of the FSS should be an integral part of the unit for all training. Consequently, the proposed three-man FSS and its equipment should be organic to the air maneuver unit.

As the commander's expert on fire support matters, the company/troop FSO serves as the point of contact for the fire support system. When the unit is employed under the operational control of a brigade, the FSO will accompany the commander to the brigade command post where he will obtain the ground commander's plan of fire support directly from the brigade FSO. The air unit FSO will implement the commander's planning guidance in updating the fire support plan, and once the unit is committed will continue to serve as the fire support point of contact. When the air maneuver unit is employed under the operational control of the armored cavalry squadron, the company/

troop FSO will similarly interface with the squadron FSO. Finally, when the unit is employed under division control and provided with FA support (FA in direct support, dedicated battery, nonstandard tactical mission, etc.) the company/troop FSO will interface directly with the supporting FA commander/ FDC. The FSO or his assistant will collect information (frequencies, call signs, target overlays, etc) for dissemination to team leaders and aircrews.

The addition of the three-man FSS at company/troop level will satisfy the unit commander's need for an expert FSCOORD in combat, and will also provide training benefits in peacetime. As the commander's fire support advisor, the FSO can assist in training of team leaders and aircrews. He can also serve as the commander's focal point for assisting in integrating fire support into the unit training program by establishing contact with cannon and mortar units and scheduling air maneuver unit participation in service practices and combined arms live fire exercises. Even with the increased proficiency of pilots and aeroscout observers that can be expected to accrue from an increase in fire support training within the unit, the question remains whether a full-time FO is required at the platoon, or team, level.

Platoon/Team Level. The basic combat element of both the attack helicopter company and the air cavlary troop is the "team", a platoon-size element consisting of both scout and attack helicopters. Analysis of individual training of pilots and crewmembers has disclosed a clear need to increase the capability of team members to accomplish fire support tasks, primarily requesting and adjusting indirect fires. Additional time cannot be devoted to fire support in institutional training programs without sacrificing hours required for other mission-essential training.

An aggressive combined arms training program, administered by the FSO (proposed at company/troop level), can remedy current deficiencies in observed fire training of pilots and crewmembers, but not the additional requirement that they have opportunity to accomplish fire support tasks. In combat situations where the teams need for fire support is greatest, demands on air crews will also be greatest. Simply piloting a helicopter at NOE altitudes absorbs the majority of the pilot's skills and attention. When requirements to detect and avoid the air defense threat, select engagement areas, distribute fires and control engagements are added to the requirement to fly the aircraft, it is not possible to conclude that aeroscout pilots will have time or attention to devote to conduct of indirect fire engagements. Provision of the FSS at company level will help to an extent; the FSO can provide target overlays for the area of operations so that aircrews can use fire-for-effect against planned targets whenever possible. However, a requirement can still be anticipated for aircrews to provide refinement data to maximize indirect fire effectiveness, and protracted conduct of fire diverts aircrews from their primary mission.

Experience has shown that successful employment of indirect fires from a hovering helicopter requires a two-man team: one to pilot the aircraft and one to request/adjust fire. The aerial FIST concept developed by USAFAS in response to the 101st Restructure Study provides an E5 FO, qualified in MOS 13F fire support specialty, to function as the air observer in the team leader's helicopter. Placement of a MOS 13F in the team leader's cockpit

requires displacement of the enlisted observer already present (MOS 67V Crew Chief, MOS 19D Cavalry Scout, or MOS 19D2F Aeroscout Observer). This immediate solution to the team's fire support problem creates another immediate problem because the MOS 13F would require extensive training to become proficient as a member of an aircrew. USAREUR's Project MAXIMIZE estimates that a unit level training program to train the MOS 19D cavalry scout to minimum mission standards will require 30 hours of ground school and 100 hours of flight time. Because the MOS 13F would function as a helicopter crewmember, his duties would entail much more than simply performing as an airborne FO. It is anticipated that a MOS 13F would require at least as much additional training as a MOS 19D to meet minimum mission standards. The Project MAXIMIZE report highlights problems associated with MOS 19D crewmembers in addition to the training burden placed on the unit.

Training problems are compounded by the innate ability of the soldier (GT score requirements) and the assignment of soldiers to attack helicopter companies who cannot pass the flight physical requirements for service as a flight crew member, have a fear of flying, experience continuous disorientation while airborne, etc. Additional problems are encountered while training and exercising in the specialized areas of night (unaided), night vision goggle, CBR, and inadvertent IMC (instrument meterological conditions). The USAREUR study group concluded that regardless of the enlisted soldier's trainability, the nature of the aeroscout mission, and the anticipation that the scout will require a higher utilization rate than any other aircraft on the battlefield result in a greater exposure to hazards and fatique. USAREUR concluded that the scout aircraft should be manned by two rated aviators, and in particular the lead scout or team leader requires a second qualified pilot in his aircraft. In light of these observations, the relative merits of the MOS 13F versus the MOS 19D or MOS 19D2F become a moot point.

A possible course of action considered by the study group was the substitution for one MOS 19D in each aeroscout section (two per air cavalry troop and three per attack helicopter company) by an FA "pilot observer".

The concept envisioned an FA lieutenant (FAOBC graduate) trained in the aeroscout combat skills track of the Officer Rotary Wing Aviator Course. The concept was based in part on the recently approved changes to commissioned aviator qualification and assignment policies, which specify that combat arms (AR, IN, FA, AD) officers attend their branch basic course prior to flight training. While the concept has attractive features -- it would permit assignment of an FA aviator to each scout section (for duty with each team) as a pilot-observer--it was ultimately rejected for a number of reasons:

- Provision of a second pilot for scout aircraft, or even for only the team leaders aircraft, is not feasible within current manpower constraints.

- Requirements and authorization documents specify only specialty code 15 for commissioned aviators. Aviators with specialty code 15 may be in any of the combat arms branches, and are considered capable of performing any duties specialty code 15 duties. Within current policies, there is no

means by which a particular duty position can be documented to specify a particular branch.

- Even if both the above problems could be overcome, the fact remains that replacement of an FA observer in an attack helicopter or air cavalry scout helicopter necessitates a split mission for the aircraft. Scout helicopters currently authorized are justified because of the scout mission they perform. Authorizations are austere to the point that assignment of any FA observer mission to a scout helicopter in an aerial maneuver unit will degrade the capability of the unit to accoumplish its primary mission.

An alternative to satisfying the team's need for an observer dedicated to the indirect fire mission would be to provide a separate aircraft for that mission, complete with pilot and qualified air observer. Assets to perform this mission currently exist in the form of FA air observers assigned to division artillery and FA brigade headquarters and headquarters batteries. As a result of ARCSA III aviation restructuring, aircraft and crews to support these air observers have been consolidated into division and corps aviation companies (See Appendix G, Annex L.).

It is evident that there are some inconsistencies between type divisions in numbers of FA air observers (FAAO's) and observation aircraft authorized.

The armored and mechanized divisions, for example, have the same number of FAAO's authorized as the infantry division (eight) but there are four less observation aircraft authorized in the armored/mechanized division than in the infantry division. The airborne division's observation helicopter authorization is identical to the infantry division's but has only six FAAO's. Some discrepancies can be accounted for by the fact that some aircraft are used for command and control purposes rather than air observation (the armored/ mechanized division artillery support platoon has four utility helicopters in addition to its ten observation aircraft, giving it the same total number of aircraft as the infantry division).

Historically, air observers and aircraft were provided to divisions on the basis of two per cannon battalion and two per division artillery headquarters.

In the course of a number of reorganizations and consolidations, air observer authorizations have fluctuated. The study group affirmed the effectiveness of the historical basis of issue, and concluded that FAAO and observation aircraft authorizations should be restored to the two per cannon battalion and two per division artillery (ten air observers and ten observation aircraft in armored, infantry, mechanized infantry, and air assault divisions; eight observers and eight aircraft in the airborne division).

Air observers are FA assets used by FA commanders as a means of accomplishing their observation responsibilities to the supported force. The FAAO is a FA officer trained in the coordination and employment of fire support. His scout aircraft provides the FAAO a means of moving rapidly to any sector of concern to the supported ground commander. Employment of FAAO's varies with the mission requirements of the supported force and the

nature of the threat. The division artillery commander organizes his FAAO assets for combat to assist in accomplishment of the division mission and those of subordinate elements. Operational control may be passed to cannon battalions in DS of ground brigades for use in support of the brigade. The scout helicopter increases the range at which targets can be detected and permits the ground commander to apply combat power earlier and longer in the course of the battle. FAAO's are used by the DS battalion commander to supplement ground (FIST) observation and to fill gaps while FIST losses are reconstituted. The primary role of FAAO's is to locate and attack enemy targets.

Secondary missions include reconnaissance of position areas and march routes, security patrols, camouflage checks, obtaining information of friendly and enemy forces, and maintaining liaison for control of march columns. FAAO's may also be employed under operational control of the GS cannon battalion and/or division artillery headquarters. They may be assigned specific missions to confirm and attack targets reported by other acquisition means, or they may be used to seek out and attack targets of opportunity. Employed under division artillery/FA Bde control, FAAO's are ideally suited to provide observation and security in the open areas between non-contiguous brigade battle areas. They can bring immediate long range fires to bear on an infiltrating force while providing situation reports upon which the division commander can base decisions affecting commitment of air cavalry and attack helicopter forces and/or redistribution of ground combat forces.

FAAO's are also ideally suited to perform observed fire tasks for air cavalry and attack helicopter teams. The FAAO team, consisting of a scout helicopter, pilot, and air observer, can perform as an adjunct to the team; allowing the team leader and other elements to concentrate on their primary reconnaissance (air cavalry) and destruction of enemy armor (attack helicopter) missions.

By operating on the team and/or company/troop command frequency, the FAAO can respond to the guidance of the team leader in seeking out targets for attack by indirect fires. The FAAO can also accept "hand-offs" from scouts and attack helicopters in the team, using target hand-off procedures similar to those used by scouts to identify targets for attack by direct aerial fires of attack helicopters. Normal tactics employed by aerial maneuver units feature the rotation of teams on station to keep continuous pressure on the enemy force(one or more teams on station, one at the forward armament and refuel point (FARP), and one enroute. Because the FAAO aircraft has no requirement to rearm, it can turn around more quickly at the FARP in order to return to the engagement. Even with an attack helicopter company employing the one-third rule, two FAAO teams are sufficient to provide continuous observed fire coverage for the committed team(s).

Next, the study group examined how FAAO coverage can best be provided to aerial maneuver units. It must be remembered that FAAO teams are FA assets and that they work for the FA commander, who is in turn responsible to the force commander (division or brigade) for providing fire planning, observation, and fire support coordination. Air cavalry troops are most typically employed under division control; either as part of the armored

cavalry squadron or independently. It is the doctrinal responsibility of the division artillery commander to provide adequate fire support to forces employed under division control. This can be accomplished by placing FA in direct support of the cavalry unit, by modifying the tactical mission of an FA unit in range to insure responsiveness to cavalry unit needs, or by providing a dedicated battery. In any event, once an FA unit is placed in support of the armored/air cavalry unit, the FA unit commander has the responsibility to provide an observation capability to the supported force. When the support mission is assigned the division artillery commander must provide sufficient assets--to include FAAO's--to enable his subordinate commander to discharge this responsibility. FAAO's are normally provided to cannon battalions to fill gaps in FIST observation, and these may require augmentation from division artillery assets when the FA battalion is committed to support air cavalry.

Attack helicopter companies are most often employed under operational control of a ground brigade. When the company is introduced as a component of the brigade, the DS FA battalion commander has a doctrinal responsibility to provide the required observation capability. FAAO's already under the operational control of the DS battalion can be committed to the attack helicopter company, augmented as necessary by FAAO's retained under division artillery control. When attack helicopter companies are employed under division control, it is again the division artillery commander's responsibility to provide adequate FA support, to include FAAO coverage.

FAAO's placed under operational control of cannon battalions participate in planning fires for the supported force, and their capabilities are integrated into the fire support plan. FAAO familiarity with the fire support plan is especially advantageous when air maneuver units are introduced into the battle, because they are already aware of the available fire support. When directed by the FA commander to observe for an air maneuver unit, requirements for coordination are minimized. The FAAO's simply coordinates with the air cavalry troop or attack helicopter FSO. There is no need for lengthy briefings, because the FAAO will have already been operating in the area and on the appropriate fire support communications nets. It can be anticipated that the air maneuver unit will be committed at the point of decision, and that the FAAO will have already been operating at that point. When the air maneuver unit enters the battle, the FAAO joins it to complete the combined arms team.

Non-divisional air maneuver units may be provided FAAO support from assets available in FA brigades of the corps artillery. Historically, FAAO's were authorized on the basis of two per cannon battalion and two per FA group headquarters. The current authorization of four FAAO's per FA brigade represents a considerable reduction in assets, but it must be remembered that changes in FA doctrine emphasizes use of an FA brigade to augment a division artillery, where the brigades four FAAO's would join those already in the division. FAAO assets available within the FA brigades are adequate to provide support to elements of the attack helicopter battalion to be assigned to the corps aviation group. Present authorizations are not, however, sufficient to extend complete coverage to elements of the air cavalry combat brigade. Troops and companies of the ACCB that do not receive FAAO coverage may

be required to adjust their own indirect fires. Aeroscout and attack helicopter pilots, assisted by the FSS at troop/company level, can accomplish routine observed fire tasks. FAAO support can be provided; however, it is not possible to provide two FAAO's to each troop and company simultaneously. Doctrine for the ACCB suggests that attack helicopter battalions will fight by rotating companies, and two FAAO's per battalion should be adequate to keep one on station continuously.

Reconnaissance Platoon, Air Cavalry Troop. The air FIST concept provided by USAFAS to the 101st Restructure Study included one E-5, MOS 13F Forward Observer for the reconnaissance platoon. Because the recon platoon operates dismounted, portability factors which apply to platoon FO's in the air assault infantry companies apply equally to the recon platoon. A single FO can carry his basic assault load, a backpack radio and spare battery, FO equipment, and little else. If added capabilities are required, such as a TACFIRE digital message device or a hand-held laser designator are desired, a second man must be added simply to carry equipment. The reconnaissance platoon is carried into combat by utility helicopters, and addition of a one- or two-man FO party would require displacement of MOS 19D cavalry scouts already in the platoon. Coordination with USAARMS reveals that the recon platoon will seldom be employed as a full platoon. Instead, individual squads will be employed to establish OP's/LP's or conduct ground reconnaissance. A single FO at the platoon level could not provide adequate observation coverage. Because of these factors, the study group concluded that FOs are not required by the reconnaissance platoon of the air cavalry troop. The platoon leader squad leaders, and MOS 19D cavalry scouts of the reconnaissance platoon must be trained to call for fire and adjust indirect fires.

Fire planning for the reconnaissance platoon will be accomplished by the troop FSO. Reconnaissance squads normally operate with, and are over watched by, aeroscouts and aeroweapons helicopters. The FAAO supporting the troop can also assist in requesting and adjusting fires in support of ground reconnaissance.

Findings.

- Air cavalry troops and attack helicopter companies require an organic three-man fire support section consisting of an FA captain, a MOS 13F fire support sergeant (E-7), a MOS 13F fire support specialist (E-3/4).

- There is no requirement for a full-time FO at the platoon, or team level. The team's requirements for indirect fire observation are best satisfied by an FAAO team consisting of a scout helicopter, pilot, and commissioned FAAO.

- When aerial maneuver units are committed under the operational control of a force, the senior field artilleryman with the force is responsible for providing adequate FA support to the air maneuver unit. This responsibility includes a requirement to provide a sufficient number of FAAO to provide continous observation of the air unit's zone of action. The FAAO on station will work through the fire support section at the company/troop level. The

FAAO will enter the command net of the air maneuver unit and respond to the fire support guidance of the team leader.

- FAAO's, pilots, and helicopters are required on the basis of two per divisional cannon battalion and two per division artillery headquarters. Total FAAO team requirements by type division are ten for the armored, mechanized infantry, infantry, and air assault divisions, and eight for the airborne division.

- There is no requirement for an FO party in the reconnaissance platoon of the air cavalry troop. Observed fire tasks can be performed by members of the reconnaissance platoon, assisted by FAAO with overwatching elements and by the FSS at troop level.

8.3.2 Force Structure Implications. The study group recognized that the proposed three-man FSE per air cavalry troop and attack helicopter company plus the FA staff officer (FSO) at the attack helicopter battalion level represents a significant addition to the force structure. The only identified trade-off of personnel spaces was found in the attack helicopter battalions of the air cavalry combat brigade (ACCB). Six personnel spaces can be applied against the total fire support personnel requirements (27), resulting in a net increase of twenty-one spaces in the ACCB.

Within the current active force structure, there are 28 air cavalry troops and 19 attack helicopter companies, resulting in an immediate requirement for 47 captains, E-7s, and E-3/4 spaces to support the air maneuver unit FSS. When the ARCSA III aviation force structure is fully implemented, the active force structure will contain a total of 78 air cavalry troops and attack helicopter companies. In the long term, 31 captains, E-7s, and E-3/4s will be required in addition to those needed for the current force structure.

8.3.3 Summary. The fire support coordination needs of air cavalry troops and attack helicopter companies can be satisfied by a three-man fire support section organic to each unit, supplemented by FAAO's. The following section (8.4) addresses operational concepts and specific equipment requirements of the proposed company/troop FSS in three phases; current (voice), digital, and laser.

8.4 OPERATIONAL CONCEPTS

8.4.1 Issues.

a. ISSUE. What are the command, control and communications procedures and equipment requirements of the proposed air maneuver organization in the current (voice radio) time frame?

Discussion. Operational concepts in the voice communications environment must be addressed in three cases: the air unit employed under division control with FA support provided by modification of an FA units' tactical mission; the air maneuver unit employed under control of a brigade; armored cavalry squadron, or ACR.

In the first case, the air maneuver unit is employed in its own offensive or defensive sector under division control. The division artillery commander recommends FA organization for combat that includes a provision for responsive FA support to the air maneuver unit. In a division, this might result in the tactical mission of an FA battalion within range being modified to insure the air unit has some assurance of responsive support. For example, a nearby cannon battalion in GS of the division might be assigned a modified GS mission and directed to answer calls for fire, in priority, from division artillery, the air maneuver unit, and its own observers. Or a cannon battalion GSR (general support-reinforcing) might be directed to answer calls for fire, in priority, from division artillery headquarters; the air unit, the reinforced FA unit, and its own observers. In either situation, division artillery would retain positioning authority or issue guidance to insure the cannon battalion is positioned to support the air unit, and division artillery would plan the fires of the unit.

The air cavalry troop or attack helicopter company FSS will require communications with higher and adjacent fire elements, which means, when the air unit is operating under division control, that it must be able to communicate with division FSE's and brigade FSE's. The net that links division TAC and MAIN FSE's is the division artillery fire direction net. (FM).

The division artillery TOC also operates on this net, as do all assigned and attached cannon battalions, and reinforcing division artillery. The division artillery fire net is used for fire support planning and coordination. When the air unit operates under division control, with FA support provided by modification of a GS or GSR mission, the air unit FSS must operate in the division artillery F net, requiring one FM radio in the airborne command post or ground command post. Operating in this net permits passing of targets, planned by the air unit FSS, directly to the supporting FA FDC, with the division artillery TOC and division FSEs monitoring. Because air force TACP coverage does not extend down to company/ troop level, the air unit FSS would also require a means of requesting CAS direct from the division TAC FSE (immediate) or MAIN FSE (preplanned). The division artillery F net would be used for this purpose.

The air unit operating under division control could require an FAAO to provide observation. This FAAO would be provided by division artillery to support the maneuver forces. The FAAO working with the air unit requires communications with the team leader(s), the company/troop FSS, and the supporting FA FDC. Observation helicopters are equipped with four radios: one UHF, one VHF, and two FM. The FAAO would enter the company/troop or team command net (UHF or VHF) and the GS or GSR FA battalion FD (FM). The company/ troop FSS must also enter the supporting FA battalion FD net, requiring the use of an FM radio in the airborne or ground command post. To provide continuous observation, two FAAO's are necessary--one on station while the other refuels.

Requests for fire would be transmitted by FAAO's direct to the supporting battalion FDC on the battalion FD net, with the company/troop FSS monitoring as shown in figure 8-3. Fires which might affect adjacent ground units would be coordinated with the FSE of the affected brigade on the division artillery

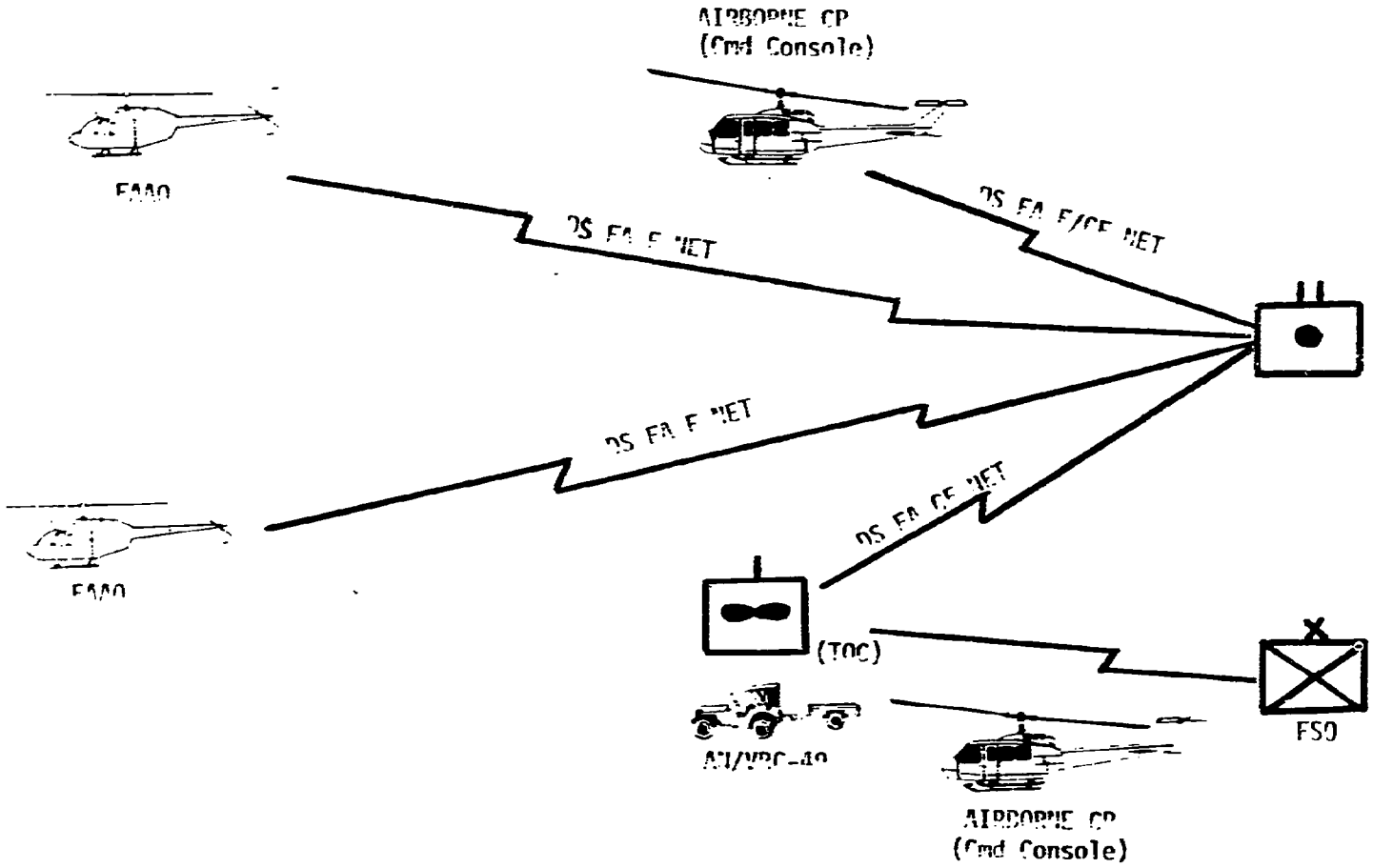


Figure 8-3. Voice Communications-FSS.

F net. The direct link with the division artillery TOC and division FSE that this net provides will also permit resolution of conflicts between air unit fire support requests and fire orders issued by division artillery to the GS/GSR battalion. For those occasions when an air cavalry troop is operating under division control with fire support provided by an FA unit with a modified GS or GSR mission, elements of the reconnaissance platoon that require FA support may switch frequencies to request fires on the FA battalion FD net (FM) or may request fires directly on a troop command net (FM) with the troop FSS monitoring, coordinating, and relaying.

An air maneuver unit employed under division control may also be provided with its own DS FA. The direct support tactical mission is ordinarily not assigned below cannon battalion level, and it is envisioned that the smallest air unit that will ever have an FA battalion in direct support is the air cavalry squadron or attack helicopter battalion. (The air cavalry combat brigade may also have a battalion in direct support, or conceivably it may have an FA brigade attached, with a cannon battalion in DS of each squadron and battalion.) In either case, the FSS at company/troop level will still require communications with higher and adjacent FSE's. The DS FA battalion command/fire net links the company/troop FSS's and the FSE at battalion/squadron level. FAAO's would be provided by the DS FA battalion commander, and they would request fires on a designated FD net (F1, F2, or F3) and the company/troop FSS would also monitor this net to coordinate fire requests. Communications between the FAAO teams and supported air cavalry/ attack helicopter teams would be over the troop/company and/or team command net (UHF or VHF) and FSS access to the command net would be assured by collocating the FSE with the company/troop FSS (ground or airborne).

The FSE at squadron/battalion/brigade level maintains communications with company/troop FSS's by operating in the DS battalion command/fire net.

A third means of providing FA support to the air cavalry troop or attack helicopter company operating under division control is to provide it a "DS battery." For example, one firing battery from a GS or GSR cannon battalion could be detached and assigned a mission of direct support modified to the air maneuver unit. In this situation, the air FSS would operate on the division artillery fire direction net (to maintain communications with division and adjacent brigade FSE's) and in the FD net of the DS battery. The cannon battery FDC would likewise monitor both the division artillery fire direction net and its own internal fire direction net. This arrangement is similar, but not identical, to the dedicated battery concept contained in doctrine. A dedicated battery is still part of a DS battalion, and has its fires augmented by the battalion's remaining batteries. The envisioned DS battery would be detached from its parent battalion and would be immediately subordinate to division artillery. Requests for additional fire would be transmitted to the division artillery TOC on the division artillery fire direction net. This net would also be used by the company/troop FSS to transmit CAS requests directly to the division TAC or MAIN FSE.

When the air maneuver unit is employed under operational control of a ground brigade, it will receive FA support from the cannon battalion. The

brigade commander must establish priorities of fire between the air unit and ground task forces attached to the brigade. FAAO coverage for the air unit is by FAAO assets under the operational control of the DS battalion commander. If additional FAAO's are required, the DS battalion commander will request them from division artillery.

An air unit employed under brigade control is equivalent to a ground task force in terms of fire support command, control, and communications.(C^3) The air unit FSS will enter the DS battalion command/fire net and maintain communications with brigade and adjacent task force FSE's and the DS battalion FDC. FAAO's will request fires on one of the DS battalion's three internal FD nets (as specified by the DS battalion commander) which the air unit FSS will monitor to provide fire support coordination. The brigade commander may also direct that heavy mortar platoons assigned to task forces within range respond to requests from FAAO's with the air unit. The second FM radio in the FAAO observation helicopter will be used for communication in mortar FD nets.

In certain tactical situations, the ground brigade commander may decide to dedicate a battery from the DS battalion to support the air unit. The dedicated battery would be provided a dedicated FD net for use by FAAO's, which the company/troop FSS would also monitor. The dedicated battery would continue to operate in the DS battalion command/fire net which would be used to request additional fires. Current doctrine states that a dedicated battery FDC monitors the command net of the support unit. Because air unit command nets are normally UHF or VHF nets, the dedicated battery FDC cannot meet this requirement. Communications with the air unit FSS and FAAO's will be on the assigned FD net and the DS battalion command/fire net.

An air unit employed under operational control of the divisional armored cavalry squadron will operate on nets prescribed by the squadron FSO. If the squadron has an FA battalion in direct support, the troop FSS will operate on the DS battalion command/fire net and both the FSS and supporting FAAO's will operate on the assigned FD net. When the squadron has only a battery in direct support, or is supported by a cannon unit with a modified GS or GSR mission, both the air cavalry troop FSS and supporting FAAO's operate on the assigned FD net. Internal coordination between the troop FSS and supporting FAAO's will be accomplished on an internal troop net (UHF, VHF, or FM).

Air units assigned to the ACR may operate under regimental control or under operational control of a squadron. Because the regiment has no organic fire support (howitzer batteries are squadron assets), the air cavalry troop and attack helicopter company, under regimental control, have no immediately responsive means of fire support. Regimental operations orders must include provisions for adequate fire support to the air units. This can be accomplished by specifiying in SOP or operations orders that squadron howitzer batteries will answer calls for fire from the air units in second priority. When the regiment operates pure (without additional FA support), there are no FAAO's available, so scout and attack helicopter pilots must function as their own

FOs. When additional FA is provided, as when an FA brigade is attached for covering force operations, the FA brigade commander is responsible for providing FAAO's from the four assigned to his headquarters.

Regardless of the means by which the regimental air cavalry troop and attack helicopter company are provided with FA support, communications requirements for the troop and company FSS remain the same. The FSS must maintain communications with higher (regiment) and adjacent (squadron) FSE's. When the regiment has no additional FA support, squadron and regimental FSE's are linked by two nets: the regimental fire support net (FM) and the regimental fire support net (AM). AM radios in command and control aircraft are operated in the regimental command net (AM), so the company/ troop FSS's link with regiment and adjacent squadrons is by the regimental fire support net (FM). Extended ranges may require that the company/troop FSS pass traffic over the company/troop commander's airborne AM radio set. Internal communications between the company/ troop and team leaders and pilots is on an internal company/troop net (UHF, VHF, or FM).

When an FA brigade is attached to the regiment, its nets are used by the regimental and squadron FSE's. The air unit under regimental control would enter the brigade CF net for communication with regiment and squadron FSE's; and both the air unit FSS and supporting FAAO's would enter the fire direction net prescribed by the commander of the brigade cannon battalion providing support.

When the air unit is employed under control of a regimental armored cavalry squadron, FA support is provided by the squadron's organic howitzer battery or by a corps artillery unit in direct support of the squadron (from the FA brigade attached to the regiment).

In the first instance, team leaders and pilots request their own fires on the howitzer battery FD net (monitored by the company/troop FSS) or on the company/troop command net (relayed on the howitzer battery FD net by the company/troop FSS. In either case, the FSS requires only the howitzer battery FD net for communication with the squadron FSE, adjacent troop FIST's, and the howitzer battery FDC. When the squadron is supported by a DS battalion from the FA brigade attached to the regiment, the air troop FSS and supporting FAAO's will operate in the FD net prescribed by the DS battalion commander. The air company/ troop FSS may also operate in the DS battalion command/fire net.

Communications requirements for the air cavalry troop and attack helicopter company FSS consist of one net for communications with higher and adjacent FSE's and one net for communications with FAAO's supporting the company or troop. The particular nets employed vary according to maneuver task organization and FA organization for combat, but the two net requirement exists for the majority of situations. When operating from a ground command post, the air unit FSS will therefore require two receiver-transmitters. Due to the extended frontages over which these units operate, effective communications will require a medium-power transmitter. Two RT-524 receiver-transmitters, mounted on a quarter-ton vehicle, will satisfy communications

requirements when the FSS operates from a ground CP. The air cavalry troop commander may, however, operate with a split command post. The unit may employ an airborne command post forward in conjunction with the ground command post, or it may employ two airborne command posts (one with the troop commander, one with the operations officer) and rotate command and control aircraft on station. When the company or troop commander elects to use a single airborne command post, the fire support representative accompanying him requires a single FM radio in the command and control helicopter. The FSO would operate this radio on the FD net for continous communications with supporting FAAO's and the FA FDC. Access to the company/troop command nets is provided by the commander's radios; and access to higher and adjacent FSE's is provided by the FSS collocated with the ground CP. The fire support sergeant would operate in both nets from the ground CP, and would relay traffic received from higher and adjacent FSE's to the FSO monitoring the FD net in the airborne CP. To facilitate rapid and responsive communications, the two RT-524's on the FSS vehicle should be combined with a C-2299/VRC control box and configured as a radio set AN/VRC-43. With this configuration, the FSS at the ground CP could switch to automatic retransmission when traffic must be relayed from or to the FSS forward in the airborne command post.

When the unit operates by rotating two command and control helicopters on station, the fire support representative in each will require two FM radios, one for "internal" communications with FAAO's and the supporting FA FDC and one for "external" communications with adjacent and higher FSE's. Required radios can be provided when command and control aircraft are equipped with a communications central, AN/ASC-15 ("command console"). When command and control aircraft are not equipped with a console, the FSO and fire support sergeant may have access to only one FM radio. In this situation, the fire support specialist/driver would be required to establish a ground-based communications and retransmission station, relaying or retransmitting messages received on the external net to the FSO or fire support sergeant on the internal net.

To provide a pre-commitment planning capability and to give the attack helicopter battalion commander assistance in coordination with supporting FA, the study group proposes that an FA staff officer be organic to the attack helicopter battalion (Atk Hel Bn) headquarters. The FA staff officer would be the battalion fire support coordinator (FSCOORD) performing the traditional duties of that position (advises, recommends, integrates). When a liaison section from a supporting cannon battalion is available, the FA staff officer forms a FSE to perform the FSCOORD function.

Because the FA staff officer will deal with brigade FSO's (majors), coordinate with the FA battalion liaison officer (a captain), provide supervision for the troop/company FSS's (captains), and work for the attack helicopter battalion commander (Lt Col), his rank should be a Major.

When the FSE is constituted, the liaison section from the supporting cannon battalion will bring with it all required radios and ancillary digital devices. The attack helicopter battalion FA staff officer has no requirement

for organic radios, and the attack helicopter battalion has no requirement for internal fire support nets. When the attack helicopter battalion is committed as a battalion, FAAO's supporting the attack helicopter companies and FSS's will enter supporting FA command/fire and fire direction nets. The attack helicopter battalion FA staff officer will net with subordinate FSS's on radios furnished by the supporting FA liaison section.

Findings.

- The proposed fire support section (FSS) at air cavalry troop and attack helicopter company level is required to operate full time in two radio nets. One net links the FSS with FAAO's at team level and with the supporting FA FDC. The second net links the troop or company FSS with higher and adjacent FSE's for fire planning and fire support coordination purposes.

- The three-man FSS requires a one-quarter ton vehicle with two medium power receiver-transmitters for operation as a fire support section from a ground command post. The best configuration of the two required receiver-transmitters is as a radio set, AN/VRC-49 to permit automatic retransmission.

- The fire support representative accompanying the unit commander or operations officer in an airborne command and control aircraft requires a minimum of one dedicated FM radio. When a single airborne CP is in use, the FSO in the airborne CP will monitor one net, and traffic received on the other net will be relayed/retransmitted by the fire support sergeant located with the ground command post.

- Responsive communications can best be achieved by providing the fire support representative in command and control aircraft with two dedicated FM radios in the communications central, AN/ASC-15 (command consoles).

- When command consoles are not available, fire support communications can be maintained in a degraded mode by providing the fire support representative in each command and control helicopter with one dedicated FM radio. The third member of the section, the fire support specialist/driver, would establish a ground-based relay station and would monitor both fire support nets, relaying or retransmitting information from higher and adjacent FSE's to the FSO/fire support sergeant as required.

- The attack helicopter battalion requires an organic FA staff officer (rank-major) (FSCOORD) to function as the commander's full time fire support advisor, to plan and coordinate fire support requirements, and to establish and supervise the attack helicopter battalion FSE, when constituted.

- The supporting FA liaison section will bring with it all personnel and equipment necessary to establish an FSE. The attack helicopter battalion FA staff officer has no requirement for organic communications equipment.

- Equipment list to support the aerial fire support section is found at Table 8-2.

Table 8-2. Aerial Fire Support Section Equipment Requirements-Phase I

A71712	Antenna: RC 292	2
B49272	Bayonet-Knife	2
B67766	Binocular: 7x50	2
C68719	Cable Telephone: DR-8	2
C89145	Camouflage Screen System	1
C89213	Camouflage Screen Support System	1
E63782	Compass, Magnetic	1
K87262	Installation Kit: MK1254 for VRC-49	1
M11621	Mask, Protective Aircraft	2
M11895	Mask, Protective Field	1
N96741	Pistol: 45 cal	2
Q55114	Radio Set: AN/VRC-49	1
Q78282	Radio Set Control Group: AN/GRA-39	2
R59160	Reeling Machine: RL-39	1
R94977	Rifle: 5.56mm	1
U01305	Speech Security Equip: TSEC/KY-38	1
V31211	Telephone Set: TA-312/PT	1
W95400	Trailer, Cargo: 1/4-ton	1
X60833	Truck, Utility: 1/4-ton	1

b. ISSUE. What are the command, control, and communications procedures and equipment requirements of the air maneuver FSE when digital communications are introduced?

Discussion. With the fielding of the tactical fire direction system (TACFIRE) and the battery computer system (BCS), nets in which the attack helicopter company and air cavalry troop FSS operate will become digital nets. Net structure will remain basically the same, and some nets will continue to be voice nets. Nets used for conduct of fire will, however, be digital nets, and the air unit FSS will require some type of digital device with which to enter data nets. Devices currently available or projected for fielding by 1986 are the variable format message entry device (VFMED) issued to brigade and battalion FSE's, the digital message device (DMD) issued to FO's in the FIST, and the FIST DMD under development to replace the current DMD in the ground FIST headquarters.

Observation at the air cavalry/attack helicopter team (platoon) level is performed either by members of the team itself or by FAAO's furnished by the supporting FA commander. When FO duties are performed by the attack teams, requests for fire will be transmitted by voice on an internal company or troop net (UHF, VHF, or FM). The FSS, collocated with the company/troop command post (ground and/or airborne) must monitor these voice requests and enter requests into digital communications channels, requiring some type of digital input-output device. When FAAO's are present, they will be equipped with a DMD to permit a data link with the supporting FA unit's TACFIRE computer or BCS. Application of the DMD to the OH-58 observation helicopter requires only the installation of an external radio harness to the intercommunications system unit located in the aft passenger compartment. A cable is passed around the center post to the observer station, providing a matching of the DMD to an aircraft FM radio. The DMD-equipped FAAO can transmit calls for fire directly to the supporting FA FDC. In order for the company/troop FSS to perform necessary fire support coordination, it must be able to monitor FAAO requests for fire and to modify/ approve/disapprove requests in accordance with the company/troop commander's guidance and priorities.

Requests for fire originating with FAAO's would be addressed from their DMD to the FIST DMD at company/troop level. When only FA support is available, the FSS will automatically readdress and retransmit requests to the supporting FA TACFIRE or BCS. When the ground commander has directed nearby mortar units to respond to air unit fire requests, these requests will be displayed so that the most appropriate fire support means can be selected by the FSS before retransmitting the requests to the TACFIRE/BCS or MFCC.

The advanced scout helicopter, currently proposed as a replacement for aeroscout and FA observation helicopters, is expected to feature a digital input-output device for use primarily in target handoff. A similar device will be mounted in the advanced attack helicopter. Aircrews equipped with the digital device could use it to hand targets off to FAAO's equipped with the device, or, when FAAO's are not present; they could request fires direct from a supporting FA or mortar FDC. The company/troop FSS would still require a FIST DMD to perform necessary fire support coordination.

Because the proposed FIST DMD will contain four communications ports, it may be used in conjunction with UHF and VHF in addition to FM radios. A single FIST DMD in the command post could be used by the commander/ operations officer for digital communications on the command net while still operating in prescribed fire support nets. The air cavalry troop and attack helicopter company will require two FIST DMD's, one for the airborne CP and one for the ground CP or alternate airborne CP.

The proposed FIST DMD device does not include a line printer for hard copy readouts of fire plans, schedules, etc. A printout of fires planned for the supporting FA unit will reduce the planning required by the air unit, in that it can use targets (and target numbers) already recorded in the FDC. When the air unit is employed under division control, it will be able to obtain printouts from the supporting FA FDC, using an FAAO as courier if necessary.

When the air unit operates under brigade control, the air unit FSO or fire support sergeant will accompany the commander to the FSE, where a copy of the brigade FA support plan can be obtained from the maneuver brigade FSO. The study group did not foresee a requirement for the VFMED in the air cavalry troop or attack helicopter company FSS.

Findings.

- Fire support operations with digital communications will use existing radio nets described in the preceding issue. See figure 8-4.

- Fire requests from attack teams will be sent by voice to the supporting FAAO (for handoff) or to the company/troop FSS for relay.

- Digital requests from aircrews or FAAO's in a DMD-equipped scout helicopter with built in device will be addressed to the company/troop FSS on the prescribed FD or internal company/troop net.

- The air unit FSS requires the FIST DMD to enable it to receive, edit, readdress, and retransmit calls for fire originated by supporting FAAO's or air unit personnel.

- The FSS requires two FIST DMD's; one for the forward (airborne CP) and one for the ground CP or alternate airborne CP.

- The air cavalry troop attack helicopter company FSS does not require a variable format message entry device. When hard copy printouts are required, they can be obtained from a VFMED at the supporting FA FDC or the next higher FSE.

- When the FIST DMD is issued to the FSS, the AN/VRC-49 can be changed to two (2) AN/VRC-46.

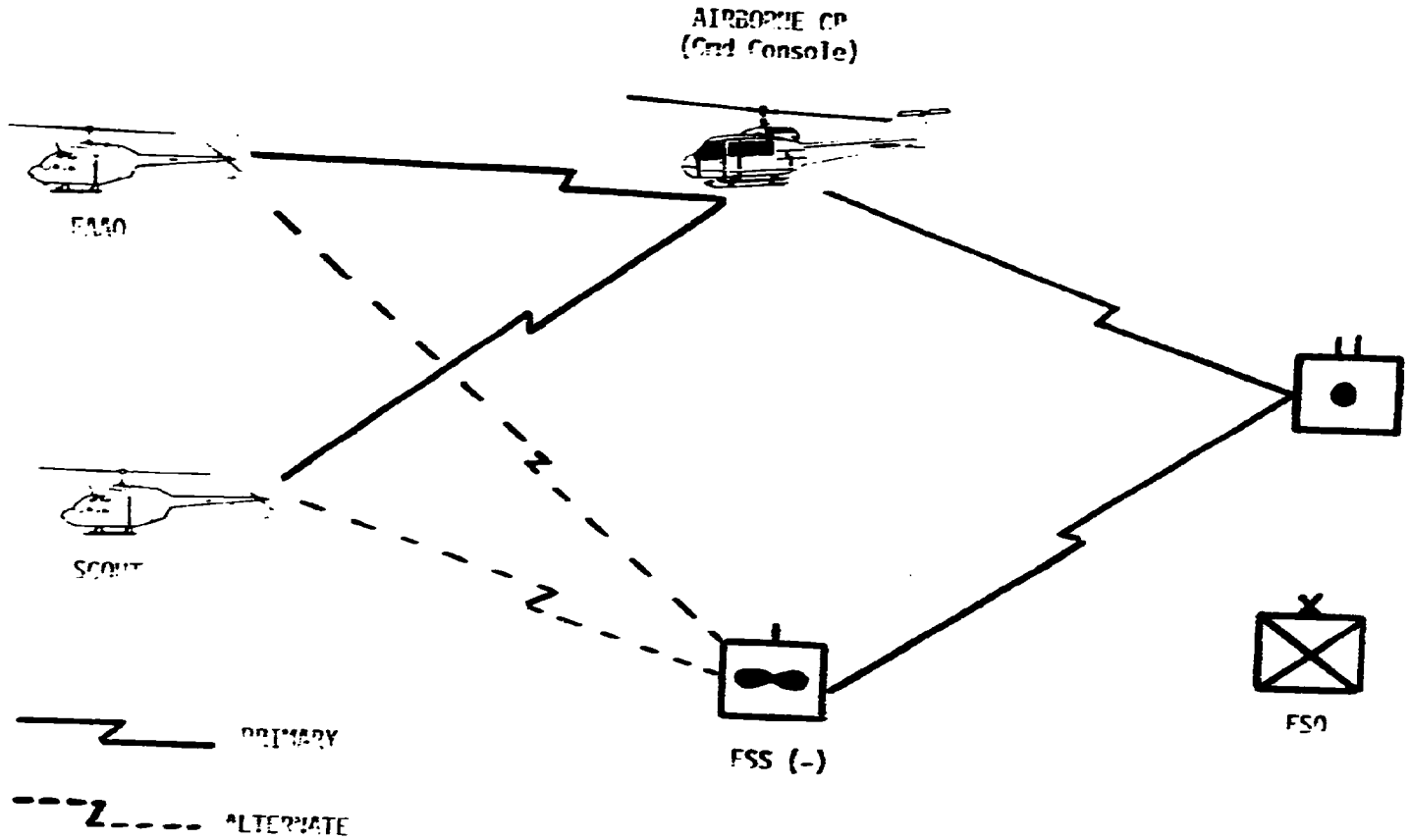


Figure 8-4. Commo links for FSS with FIST DMD.

- Equipment required to support Phase II (digital) implementation is found at Table 8-3.

Table 8-3. Equipment List Requirements, Phase II-Aerial FSS.

A72260	Antenna: RC 292	2
B49272	Bayonet-Knife	2
B67766	Binocular: 7x50	2
C68719	Cable Telephone: WD-1/TT	2
C89145	Camouflage Screen System	1
C89213	Camouflage Screen Support System	1
E63728	Compass, Magnetic	1
K87243	Installation Kit: MK1234 VRC-46 in M151	2
M11621	Mask, Protective Aircraft	2
M11895	Mask, Protective Field	1
N96741	Pistol: 45 cal	2
Q53001	Radio Set: AN/VRC-46	2
Q78282	Radio Set Control Group, AN/GRA-39	2
R59160	Reeling Machine: RL-39	1
R94977	Rifle: 5.56mm	1
V01305	Speech Security Equip: TSEC/KY-38	1
V31211	Telephone Set: TA-312/PT	1
W95400	Trailer, Cargo: 1/4-ton	1
X60833	Truck, Utility: 1/4-ton	1
X____	FIST DMD	2

c. ISSUE.' What are the command, control, and communications requirements of the air maneuver fire support structure with respect to laser designation and acquistion systems and laser/guided munitions?

Discussion. The advanced attack helicopter currently under development is scheduled to be equipped with a target acquisition designation system (TADS) and pilot night vision system (PNVS). The TADS/PNVS will permit attack helicopter aircrews to engage targets designated by a remote designator on the ground or on another aircraft, and to designate targets for autonomous direct fire engagement with the HELLFIRE missile. Other systems used with laser designators include the Air Force PAVE PENNY laser acquisition system and the Army COPPERHEAD projectile.

At present there is no airborne designator system available for use by FAAO's or by aeroscouts in air cavalry troops and attack helicopter companies. Without an airborne designator in the scout helicopter, only the TADS/PNVS will be used primarily for autonomous designation for HELLFIRE, or for remote designation of targets to be engaged by another advanced attack helicopter (AAH). The study group considered the possibility of using an AAH to designate for PAVE PENNY and/or COPPERHEAD. Attack helicopters can be expected to designate targets for hand off to PAVE PENNY equipped CAS aircraft when both are combined to form a joint air attack team (JAAT). The study group did not, however, consider it likely that the AAH will designate for COPPERHEAD. The AAH can engage close in targets more rapidly with HELLFIRE, and targets beyond HELLFIRE range which might be engaged with COPPERHEAD would require lengthy exposure of the AAH. This results in greater vulnerability of the AAH to enemy air defenses. In addition, the communications requirements for successful engagement with COPPERHEAD would force the AAH crew to leave its operational frequencies, diverting the aircraft from its primary role of destroying tanks with direct aerial fires.

Engagement of targets using remote designators in conjunction with indirect fire methods requires a great deal more teamwork and communications to accomplish the mission. The primary remote designators for the laser HELLFIRE missile will be scout helicopters. The Ground Located Laser Designator (GLLD) provides a secondary method which will sometimes be available. The GLLD may be a part of a FIST team in support of a maneuver company or a separate designator team operating in the area in which an engagement may take place. GLLD's require unobstructed fields of fire, mask clearance, cover and concealment, standoff, dispersion and mutual support.

Use of ground remote designators require special communications, command and control (C^3) procedures. Radio is the primary source of communication between the GLLD, aeroscout(s) and attack helicopter(s). Vulnerability of radios to enemy jamming and electronic countermeasures (ECM) require that "on the air" time to affect target handoff be kept to an absolute minimum. Another communications device, common to the FIST, is a Digital Message Device (DMD), which provides a digital communications link between the FIST FO and the FA TACFIRE in the request for FA fire support. Given an on-board digital communications capability, the AH-64 and scout helicopters will be able to communicate with the GLLD without voice transmissions.

The study group's envisioned C^3 requirements for ground designation of HELLFIRE would be as follows:

The attack helicopter company commander (or his representative) would initially make voice contact with the supported maneuver ground force commander to identify a requirement for ground designation of HELLFIRE. Simultaneously, the fire support officers (attack helicopter company and ground maneuver force) effect the appropriate fire support coordination (radio frequencies, pulse codes, locations,) on the DS FA Bn Command Net. Once the approval of ground designation is accomplished, the attack helicopter commander and his team(s) would proceed into the various sectors where ground designators

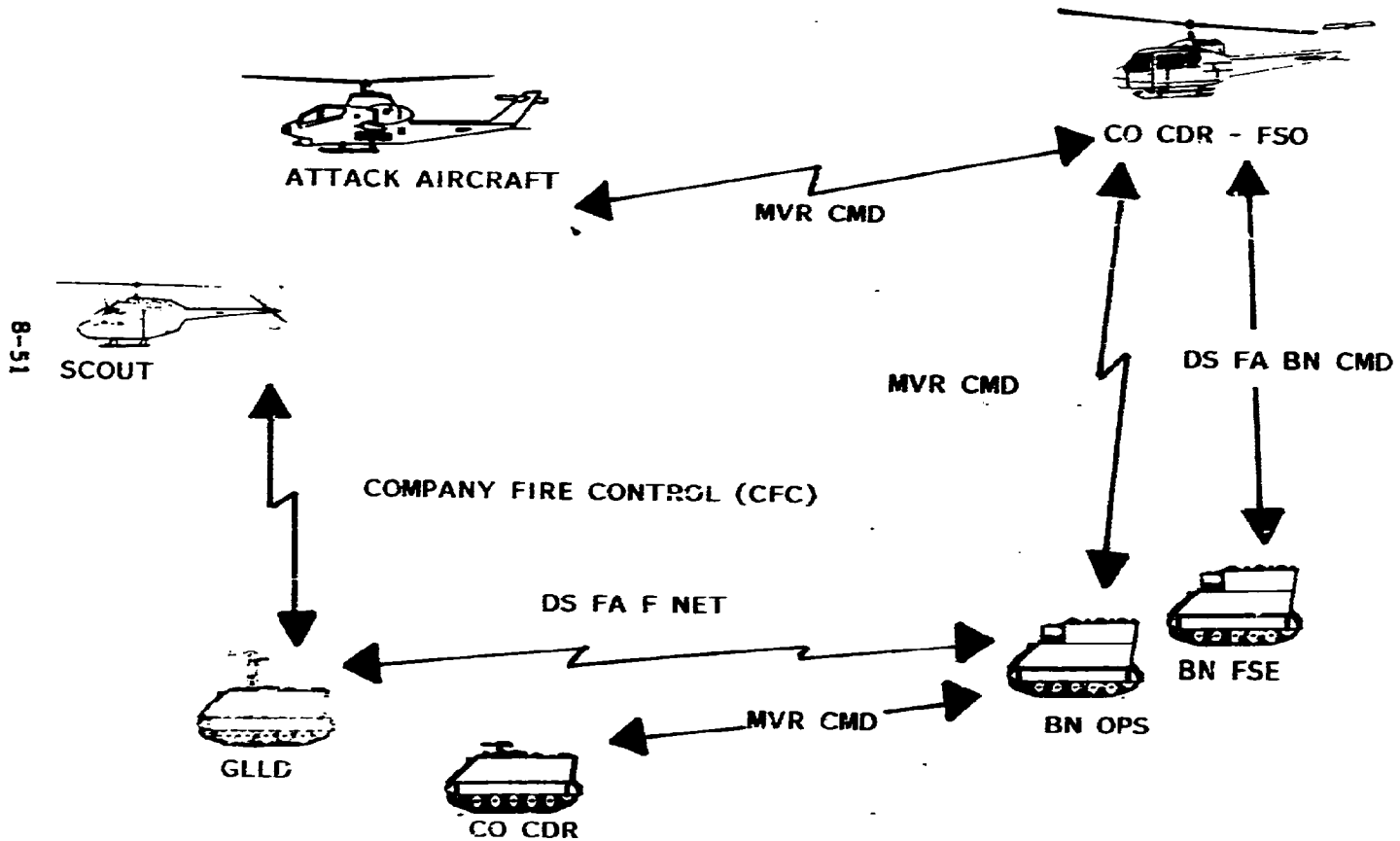


Figure 8-5. Ground Designation/HELLFIRE

are located. The attack helicopter team leader would contact the ground designator on the appropriate company fire control net (See Figure 8-5) and conduct HELLFIRE missions as envisioned in the HELLFIRE O&O Concept. Ground units would receive appropriate instructions/ information through the normal ground communications channels.

A required operational capabilities (ROC) document for the advanced scout helicopter (ASH) is currently being staffed. If the program is approved, the ASH will replace the OH-58 helicopter currently used by aeroscouts and FAAO's. The proposed ASH will contain a TADS/ PNVS system permitting aircrews to receive handoffs from other designators and to designate targets for handoff to other aircraft or for terminal guidance of HELLFIRE and COPPERHEAD.

If the scout helicopter is fielded, aeroscouts will be able to handoff targets to accompanying FAAO's for attack with COPPERHEAD or with conventional or improved conventional munitions (ICM's). While any scout helicopter equipped with a TADS could designate for HELLFIRE or COPPERHEAD, communications procedures differ and communications channels also differ. The role of the scout is to acquire targets for the attack helicopter, and it is expected that scouts will not routinely designate for COPPERHEAD. COPPERHEAD targets acquired by scouts will instead be handed off to the FAAO (TADS-to-TADS) and the FAAO will conduct the COPPERHEAD firing. Communications channels used for COPPERHEAD missions will be the FA FD net prescribed by the supporting FA commander.

Laser designation for PAVE PENNY could also be accomplished by both the aeroscout and FAAO. The normal technique anticipated by the study group will be for the team leader to designate the target with his TADS either directly to PAVE PENNY or to another scout or the FAAO for subsequent handoff to an inbound PAVE PENNY.

Findings.

- Effective employment of emerging laser acquisition systems and laser-guided munitions requires that aeroscouts and FAAO's be equipped with an airborne laser designator/acquisition system such as TADS/PNVS.

- The primary role of the TADS/PNVS on the advanced attack helicopter will be to designate for HELLFIRE (autonomous engagement or remote designation for another AAH firing direct or indirect HELLFIRE).

- When the ASH or an equivalent laser-equipped helicopter is fielded for aeroscouts and FAAO's, aeroscouts will designate targets for HELLFIRE primarily. Targets beyond HELLFIRE range will be handed off to the FAAO for engagement with COPPERHEAD conventional, or improved conventional munitions. The GLLD will also give a remote capability to fire indirect HELLFIRE. This will be rare and will require special C^3 procedures.

- COPPERHEAD firings will be conducted by the FAAO on established FD channels described in the two preceding issues (voice and digital).

- The team leader will designate targets for handoff to CAS aircraft equipped with PAVE PENNY or will hand targets off to a scout or the FAAO for subsequent handoff to an inbound PAVE PENNY.

d. ISSUE. What are the fire support personnel and equipment requirements of the Division 86 air cavalry attack brigade (ACAB)?

Discussion. The TRADOC Division 86 study proposes a combination of air cavalry and attack helicopter functions into a single unit, the ACAB. Organizational details are not completely firm, but the Division 86 study proposal is for one ACAB in each heavy division as a fourth brigade. The ACAB will contain two air cavalry attack squadrons (ACAS's) and each ACAS will contain four air cavalry attack troops (ACAT's) with four scout helicopters and six attack helicopters each.

Coordination with Division 86 study members at USAARMS reveals that the normal means of employing air cavalry attack assets will be to place an ACAS under the operational control of a ground brigade. The ACAS commander will accomplish his mission by rotating ACAT's on station in the same manner that a current attack helicopter fights by rotating teams on station. From a fire support standpoint, the proposed ACAS is virtually identical to the current attack helicopter company, and the proposed ACAT is virtually identical to the mixed team of scouts and attack helicopters prescribed in the current FM 17-50.

The three-man FSS proposed for the current air cavalry troop and attack helicopter company will satisfy the fire support needs of the ACAS without modification. Observer coverage will continue to be provided from division artillery assets, consisting of ten FAAO's. When the ACAS is employed under operational control of a ground brigade, responsibility for providing FAAO's rests with the FA commander. Because the ACAS combines the two separate functions of air cavalry and attack helicopters, and because the ACAS commander has four ACAT's with which to accomplish both functions, the number of FAAO's required to insure continuous observation will increase to three. Prior to committment of the ACAS's, FAAO's will normally be allotted to divisional cannon battalions on the basis of two per battalion, with the remainder retained under division artillery control. When operational control of an ACAS is passed to a ground brigade, the two FAAO's already in place with the DS battalion will provide initial coverage, and the third required FAAO will be provided by division artillery.

Division 86 representatives at USAARMS also indicated that the air cavalry attack brigade may be cross-reinforced with ground combat units and tactically employed as a fourth maneuver brigade.

Unfortunately, the Division 86 division does not contain an additional cannon battalion to provide DS for the ACAB employed as a maneuver brigade. Field artillery support for the ACAB will have to be provided by assigning a DS mission to the divisional eight-inch (GS) battalion or an attached, non-divisional cannon battalion. On those occasions, the commander of the FA

battalion placed in DS will serve as FSCOORD for the ACAB. The study group considered whether the ACAB requires a full time FSE, and concluded that it does not. Because FA support for the ACAB will be provided by a GS cannon battalion, the requirement for personnel and communications equipment to constitute an ACAB FSE can be satisfied by a liaison section organic to the cannon battalion. To provide a pre-commitment planning capability and to give the ACAB commander assistance in coordination with support FA the study group proposes provision of an FA staff officer to be organic to the ACAB headquarters troop. The FA staff officer would perform as an advisor to the commander, assisting in integration of fire support into peacetime ACAB training exercised by coordinating for support with division. In combat operations, the ACAB FA staff officer would function as the full-time FSO, supervising the liaison section from the supporting cannon battalion in establishment and operation of the ACAB FSE.

Because the FA staff officer will deal with brigade FSO's (majors) and supervise the FA battalion liaison officer (a captain), his rank should be major.

When the FSE is constituted, the liaison section from the supporting cannon battalion will bring with it all required radios and ancillary digital devices. The ACAB FA staff officer has no requirement for organic radios, and the ACAB has no requirement for internal fire support nets. When the ACAB is committed as a maneuver brigade, FAAO's supporting the ACAT's and FSS's at ACAS level will enter supporting FA command/ fire and fire direction nets. The ACAB FA staff officer will net with subordinate FSE's on radios furnished by the supporting FA liaison section.

Findings.

- The air cavalry attack squadron proposed for Division 86 is comparable, in terms of fire support needs, to the current attack helicopter company. The three-man FSS, organized and equipped as concluded in preceding issues, will accomplish the ACAS fire support coordination mission.

- The air cavalry attack troop proposed for Division 86 is comparable, in terms of fire support needs, to the current attack helicopter company's platoon-size teams. The ACAT requires observed fire support, and FAAO teams under division artillery control constitute the best means of providing required coverage. FAAO's will be provided by the FA commander furnishing support to the ACAS (normally the commander of a battalion in DS of a ground brigade). Continuous FAAO coverage for the four ACAT's of the ACAS will require three FAAO's. If additional FAAO's are needed by the supporting FA battalion, they will be provided by division artillery.

- The ACAB may be reinforced and committed as a fourth maneuver brigade. When it is, FA support will be provided by placing a cannon battalion in direct support of the ACAB. The DS battalion commander, will dispatch an organic liaison section to serve as the nucleus of the ACAB FSE, complete with radios and digital devices for interface with TACFIRE.

- The ACAB requires an organic FA staff officer (in the rank of major) to function as the commander's full time fire support advisor, to plan and coordinate fire support requirements, and to establish and supervise the ACAB FSE when the ACAB is committed as a maneuver brigade.

- The supporting FA battalion liaison section will bring with it all personnel and equipment necessary to establish an FSE. The ACAB FA staff officer has no requirement for organic communications equipment.

8.5 SUMMARY OF FINDINGS

8.5.1 Phase I - Current Organizations. In terms of individual training, individuals who perform the tasks of fire support planning, execution, and fire support coordination in aerial maneuver units are not as proficient as those who perform the same tasks for companies and troops on the ground. Members of the FIST not only receive more thorough institutional training; they also have greater opportunities to sharpen their skills because their supported units have organic mortars and can habitually train with the same cannon FA unit.

Members of aerial maneuver units, such as the operations officer, team leaders, and individual aircrews, have sufficient opportunity to perform fire support related tasks, provided they are furnished sufficient information such as fire support frequencies and call signs and target lists and overlays depicting scheduled and on-call fires. The individual charged by doctrine and by air maneuver ARTEP's with performing FSCOORD responsibilities is the unit commander, and the nature of his job is such that it is doubtful he will have the time required to accomplish details of fire support employment.

Air cavalry troops and attack helicopter companies require an organic three-man fire support section (FSS) consisting of an FA captain, a MOS 13F fire support sergeant (E-7), a MOS 13F fire support specialist (E-3/4).

There is no requirement for a full-time FO at the platoon, or team, level. The team's requirements for indirect fire observation are best satisfied by an FA air observer team consisting of a scout helicopter, pilot, and commissioned FAAO.

When aerial maneuver units are committed under the operational control of a force, the senior artilleryman with the force is responsible for providing adequate FA support to the air maneuver unit. This responsibility includes a requirement to provide a sufficient number of FAAO's to provide continuous observation of the air unit's zone of action.

The three-man FSS requires a one-quarter ton vehicle with two medium power receiver-transmitters for operation as a fire support section from a ground command post. The best configuration of the two required receiver-transmitters is as a radio set, AN/VRC-49 to permit automatic retransmission.

The fire support representative accompanying the unit commander or operations officer in an airborne command and control aircraft requires a

minimum of one dedicated FM radio. When a single airborne CP is used, the FSO in the airborne CP will monitor one net, and traffic received on the other net will be relayed/retransmitted by the fire support sergeant located at the ground command post.

The FSS at air cavalry troop and attack helicopter company level is required to operate full time in two radio nets. One net links the FSS with the FAAO at team level and the supporting FA FDC. The second net links the troop or company FSE with higher and adjacent FSE's for fire planning and fire support coordination purposes.

Responsive communications can best be achieved by providing the fire support representative in each command and control aircraft with two dedicated FM radios in the communications central, AN/ASC-15.

When command consoles are not available, fire support communications can be maintained in a degraded mode by providing the fire support representative in each command and control helicopter with one dedicated FM radio. The third member of the section, the fire support specialist/driver, would establish a ground-based relay station and would monitor both fire support nets, relaying or retransmitting information from higher and adjacent FSE's to the FSO/fire support sergeant as required.

The attack helicopter battalion requires an organic FA staff officer (rank of major) to function as the commander's full time fire support advisor, the FSCOORD, to plan and coordinate fire support requirements and to establish and supervise the attack helicopter battalion FSE, when constituted.

The supporting FA liaison section will bring with it necessary personnel and equipment to establish an FSE. The attack helicopter battalion staff officer has no requirement for organic communications equipment.

A maneuver battalion FSS is required for the air cavalry squadron of the air assault division. This organization appears to have been inadvertently omitted during implementation of the CSSG I recommendations.

8.5.2 Phase II - Digital Communications. Fire support operations with digital communications will use existing radio nets described in the preceding findings.

Fire requests from pilots and aircrews will be sent by voice to the supporting FAAO for handoff or to the company/troop FSS for relay.

Digital requests from aircrews or FAAO's in a DMD-equipped scout helicopter with built in device will be addressed to the company/troop FSS on the prescribed fire direction or internal company/troop net.

The air unit FSS requires the FIST DMD to enable it to receive, edit, readdress, and retransmit calls for fire originated by supporting FAAO's or air unit personnel.

The FSS requires two FIST DMD; one for the forward (airborne CP) and one for the ground CP or alternate airborne CP.

The air cavalry troop/attack helicopter company FSS does not require a VFMED. When hard copy printouts are required, they can be obtained from a VFMED at the supporting FA FDC or the next higher FSE.

Upon fielding of the FIST DMD to the FSS, the AN/VRC-49 can be converted to two (2) AN/VRC-46.

8.5.3 Phase III - Laser Designation/Acquisition Systems and Employment of Laser Munitions. Effective employment of emerging laser acquisition systems and laser-guided munitions requires that aeroscouts and FAAO's be equipped with an airborne laser designator/acquisition system such as TADS/PNVS.

The primary role of the TADS/PNVS on the advanced attack helicopter will be to designate for HELLFIRE (autonomous engagement or remote designation for another AAH firing direct or indirect HELLFIRE).

When the ASH or an equivalent laser-equipped helicopter is fielded for aeroscouts and FAAO's, aeroscouts will designate targets for HELLFIRE primarily. Targets beyond HELLFIRE range will be handed off to the FAAO for engagement with COPPERHEAD conventional, or ICM. GLLD will also give a remote capability to fire indirect HELLFIRE. This will be rare and would require special C^3 procedures which are being developed.

COPPERHEAD firings will be conducted by the FAAO on established FD channels described in the two preceding issues (voice and digital).

The team leader will designate targets for handoff to CAS aircraft equipped with PAVE PENNY or will hand targets off to a scout or the FAAO for subsequent engagement.

8.5.4 Phase IV - Division 86 Study Organizations. The air cavalry attack squadron (ACAS) proposed for Division 86 is comparable, in terms of fire support needs, to the current attack helicopter company. The three-man FSS, organized and equipped as defined in preceding issues, will accomplish the ACAS fire support coordination mission.

The air cavalry attack troop (ACAT) proposed for Division 86 is comparable, in terms of fire support needs, to the current attack helicopter company's platoon-size teams. The ACAT requires observed fire support, and FAAO's under division artillery control constitute the best means of providing required coverage. FAAO's teams will be provided through the FA commander furnishing support to the ACAS (normally the commander of a battalion in direct support of a ground brigade). Continuous FAAO coverage for the four ACAT's of the ACAS will require three FAAO's. If additional FAAO's are needed by the supporting FA battalion, they will be provided by division artillery (or FA brigade headquarters) as appropriate.

The air cavalry attack brigade may be reinforced and committed as a fourth maneuver brigade. When it is, FA support will be provided by placing a cannon battalion in DS of the ACAB. The DS battalion commander will function as the ACAB FSCOORD, and he will dispatch a liaison section to serve as the nucleus of the ACAB FSE, complete with radios and digital devices for interface with TACFIRE.

The ACAB requires an organic FA staff officer (in the rank of major) to function as the commander's full time fire support advisor, to plan and coordinate fire support requirements, and to establish and supervise the ACAB FSE when the ACAB is committed as a maneuver brigade.

The supporting FA battalion liaison section will bring with it all personnel and equipment necessary to establish the FSE. The ACAB FA staff officer has no requirement for organic communications equipment.

CHAPTER 9

GLLD UNDER ARMOR

9.1 GENERAL

This chapter discusses the requirement to place the GLLD under armor in the armor, armored cavalry, and mechanized infantry FIST, the optimum vehicle for the GLLD, and the vehicle requirements for the separate observation/lasing teams.

9.2 ASSUMPTIONS

9.2.1 The FIST will be required to designate for COPPERHEAD and HELLFIRE during the 1981-91 timeframe.

9.2.2 Laser guided munitions will be replaced by more sophisticated "fire and forget" munitions in the early 1990's.

9.2.3 The FIST vehicle (FISTV) is scheduled to be fielded in FY 84.

9.2.4 The M901 ITV will be fielded in FY 80 and will remain in mechanized infantry organizations until the 1995 timeframe. The M901 ITV will be replaced incremently in armor and armored cavalry units and mechanized infantry scout platoons by the Cavalry Fighting Vehicle (CFV) in the 1981-95 timeframe.

9.2.5 A vehicle navigation system, such as the Position Locating Reporting System (PLRS) or Global Positioning System (GPS), will be successfully fielded in the 1984-85 timeframe.

9.3 BACKGROUND

9.3.1 The CSSG I study, conducted in 1975-76, recommended that the M113A1 vehicle be used in armor, armored cavalry, and mechanized infantry FIST's. Although not approved initially as a part of the FIST concept, the request was subsequently approved by HQDA and the vehicles are being fielded in USAREUR during FY 79. The remainder of the requirement, i.e., FORSCOM units, will be fielded in DAMPL priority as vehicles become available from the M113A1 rebuild program after introduction of IFV/CFV vehicles. A specific availability date is not known. FORSCOM has approved the use of other M113A1's, e.g., maintenance and communications vehicles, for the FIST.

Current plans for fielding of the GLLD in M113 equipped FIST include employment of the designator from a machine gun pintle-mount at the commander's hatch of the M113A1. In this configuration the GLLD must be transported in its carrying case and mounted when the vehicle stops.

9.3.2 USAFAS efforts to develop a specialized vehicle or kit for use by the FIST (forward observer) were initiated as early as 1974. The first significant step was the approval of a Letter of Agreement (LOA) for a Forward Observer Kit (FOV) in June 1976. The initial work by the developer, Engineer

Topographic Laboratory, was centered on a periscope approach for a "GLLD Under Armor". The concept of placing the GLLD under armor has been validated by the "Survivability Study Task Force for Ground Laser Designators (U)", conducted by Harry Diamond Laboratories, report dated January 1978.

9.3.3 In May 1977, Emerson Electric Company briefed the Commandant, USAFAS, on a concept for installation of the GLLD on the TOW articulated head (hammerhead) of the Improved Tow Vehicle, which was then in the final stages of the development cycle. The concept included remoting of GLLD controls inside the vehicle and operator selection of viewing options, i.e., GLLD, night sight, or wide-angle optics. USAFAS support of the Emerson concept led to subsequent staffing and approval of the ROC for a FIST Vehicle System (FISTV) in March 1979. The FISTV is currently under development by the PM, ITV. The estimated availability date for the vehicle kit is 4th Qtr FY 84.

9.4 FIST VEHICLE REQUIREMENT

The requirement for a FIST vehicle with GLLD installation kit is based upon the following operational requirements:

- Mobility. The vehicle must possess sufficient automotive mobility to enable it to negotiate terrain at a comfortable speed as well as the supported force.

- Vehicle Survivability. The vehicle must possess sufficient survivability to enable the FIST to operate under the same battlefield conditions which will be encountered by the supported unit.

- Signature. The vehicle must not possess a unique physical electronic signature that will permit rapid acquisition and destruction by the enemy force.

- GLLD Survivability. The vulnerability of the unprotected GLLD and operator and its lack of mobility to respond to rapidly changing situations require that the FIST be able to operate the GLLD from under armor for protection as well as to gain the inherent survivability and increased responsiveness associated with vehicle employment.

- Improved Self-Location and Target Location Devices. The vehicle must enable occupants to acquire targets and employ fire support assets in a timely manner. The combination of self-location and target location errors associated with past equipment has precluded first round fire-for-effect on the target resulting in delays and the inefficient use of fire support assets.

9.5 PRODUCTION SCHEDULE

Figure 9-1 depicts the production schedule for the ITV (IOC FY80, completed by FY84), the IFV/CFV (IOC FY81, completed by FY 2000), FISTV (IOC FY84, completed by FY86), and COPPERHEAD (IOC FY81, production assumed complete in FY83, life cycle 10 years).

The BOIP for the IFV/CFV is four per platoon, one at the company headquarters, two at the battalion headquarters, and six for the scout platoon, for a total of 47 vehicles in a mechanized infantry battalion. Basically, these vehicles are issued on a one-for-one basis, one IFV for one M113, with the exception of the scout platoon. The scout platoon contains 10 M113's, but will receive only 6 CFV's because the CFV contains significantly increased firepower and mobility.

COPPERHEAD has a planned shelf-life of 10 years. In the early 1990 timeframe, an improved guidance system, dual IR, should eliminate the bulk of the requirement for laser designation of targets, hence the requirement for separate observation/designation teams. Because the planned shelf-life is subject to change, these conditions should be reevaluated in future studies.

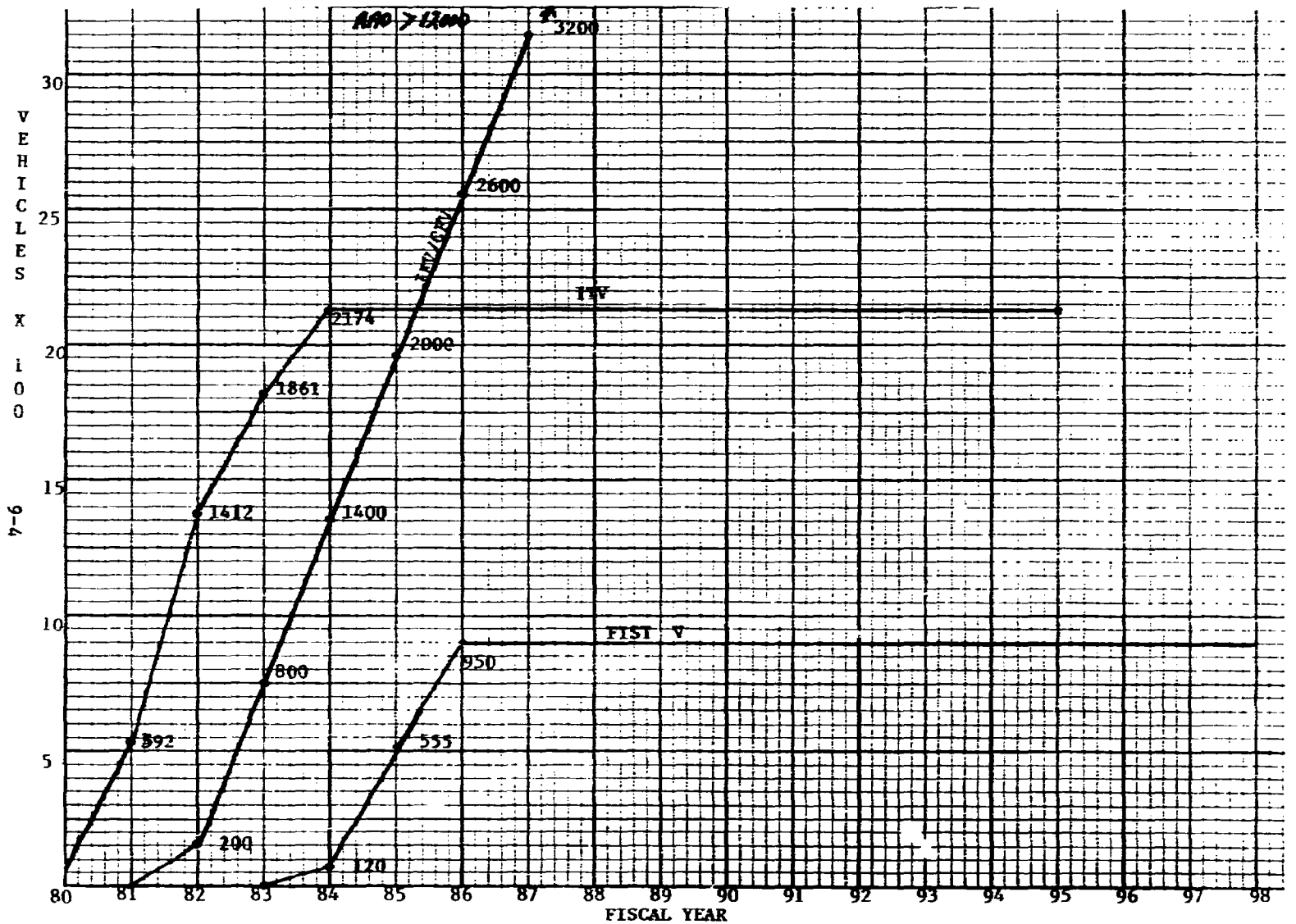


Figure 9-1. Life Cycle/Production Schedule.

9.6 FIST VEHICLE

9.6.1 System Description. The FIST vehicle (FISTV) system will be a modular, evolutionary type system for interfacing position location and direction, observation, communication, target location, and designation components. The system concept is based on an internal configuration that permits the FIST crew to operate selected equipment with the vehicle in motion or stationary. There will be a capability for dismounted operation with selected modules. The system concept envisions the integration of equipment currently under development or in production, as well as equipment required by the FISTV ROC. The system will provide the capability for addition or replacement of individual modules without major redesign. The modular system will include the following subsytems that will be installed within the FISTV:

- VHF/FM communications for internal and external use.

- Vehicle positioning equipment. A system capable of providing the FIST with an accurate location is required. This requirement will be met by separate developmental action and integrated into the FISTV when available.

- A targeting station with day and night optics.

- An observation station. This station, located near the targeting station, will permit the independent viewing of the battlefield while buttoned up using the 4X commander periscope.

The FIST V System Kit will be installed in the M113A2 chassis replacing the M113A1 now authorized for armor, armored cavalry and mechanized infantry FIST. The M113A2 chassis provides a significant increase in mobility; approaching that of the IFV/CFV family of vehicles.

9.6.2 FISTV Operational and Organizational Concept. The system is based on an internal configuration that permits the FIST HQ to operate communications equipment (intercom, radio, DMD) and limited obseration equipment (viewing blocks, commander's 4X periscope) while the vehicle is moving or stationary and in an open or buttoned-up mode. Use of the targeting station and its associated optics and equipment (7X day optics/AN/TAS-4 night sight, AN/TVQ-2 GLLD/north seeking module) is limited to stationary positions in either the open or buttoned-up mode. Radio equipment may be dismounted and/or remoted and the GLLD and night sight may be removed from their vehicle mounts for dismounted operations. The use of the Digital Message Device (DMD) in conjunction with the GLLD and radio permits the range and azimuth information to be transferred from the GLLD to the DMD for immediate use in the composition and transmission of fire requests.

The system kit will be installed in the M113 (D12087 or equivalent) FIST vehicle organic to the HQ Btry, 155m (SP) and 8-inch (SP) battalions of the armored and mechanized infantry division artillery, HQ Btry 155mm (SP) battalion of the separate mechanized infantry and armor brigades; and the howitzer battery, Armored Cavalry Squadron, Armored Cavalry Regiments. The system kit with its associated TOE equipment will be operated by FIST's

supporting all mechanized infantry and tank companies and cavalry troops within armored and mechanized infantry divisions, separate mechanized infantry and armored brigades, and ground cavalry troops of armored cavalry regiments.

The CSSG II conducted an analysis of FIST tasks derived from the task list (Appendix G), the MOS 13F Soldier's Manual, and the FIST-V ROC to determine the primary and alternate FIST HQ operator and the vehicle operating stations in which the task would be performed. The FIST-V operating stations used were targeting, observing, communications, and driver. The task list analysis used by CSSG II is at Appendix G Annex M.

9.7 ALTERNATIVE FIST VEHICLES

The study group reviewed the status of the current family of combat vehicles and Infantry/Armor Center requirements for new vehicles in the 1980-90 time frame. This review resulted in consideration of the Infantry Fighting Vehicle/Cavalry Fighting Vehicle family of vehicles for use as a FIST vehicle and for separate observation/lasing teams. An analysis of the vehicle characteristics and fielding plan, provided by PM, IFV/CFV, resulted in the determination that the IFV/CFV family should be further analyzed to determine its applicability to the uses cited above.

9.7.1 IFV/CFV Description. Principal features of the XM2/XM3 include a 2-man turret with a 25mm automatic cannon that fires both armor piercing and high explosive shells, a 2-missile TOW launcher designed to knock out enemy tanks at ranges exceeding two miles (3000 m), a 7.62mm coaxially mounted machinegun that can be fired accurately on the move, six ballistically protected firing ports that permit the crew to fire 5.56mm automatic firing port weapons at targets to the side and rear of the vehicle (IFV only), an integrated day/night sight, and a 500 horsepower turbo charged diesel engine, together with an improved transmission and suspension system to give the vehicle more mobility and speed. The XM2/XM3 can travel at speeds up to 42 miles per hour.

The CFV is a derivation of the IFV with minor interior modifications for crew size, additional ammunition and equipment storage, and elimination of the fire port and associated weapons. The primary function of the XM2/XM3 vehicles will be to provide a more heavily armored, highly mobile, highly survivable vehicle that moves troops rapidly in combat areas and is compatible with the XM1.

The TRADOC System Manager, Fighting Vehicle Systems (IFV/CFV) has forwarded a requirement to the Project Manager, Fighting Vehicle Systems, for development of a command and control vehicle for battalion/company/troop commanders. It is envisioned that vehicle will be configured on the inside with map boards, special seats and a radio shelf which may be suitable for FIST use.

9.8 ISSUES

9.8.1 Issue. What vehicle should be fielded to place the FIST/GLLD uner armor?

Discussions. The "GLLD under armor" concept was developed as a result of the Survivability Study Task Force for Ground Laser Designators which indicated that the GLLD must be afforded a degree of protection in order to survive on the battlefield. The initial work on the concept was conducted by the Engineer Topographic Laboratory under an LOA approved in 1976.

In May 1977, Emerson Electric Company briefed the Commandant, USAFAS, on a concept for installation of the GLLD in the TOW head (Hammerhead) for the Improved TOW vehicle, which was then in the final steps of the development cycle. The concept included remoting of GLLD controls inside the vehicle and operator selection of viewing options, i.e., GLLD, night sight, or wide-angle optics. Subsequent staffing of the Emerson concept led to a draft proposed ROC (DPROC) for a FIST vehicle system kit. A trade-off analysis was conducted during preparation of the ROC to determine the best approach for a vehicle to meet the requirement. Three approaches were considered:

a. Modify the ITV.

b. Purchase a foreign FOV such as the German FOV.

c. Modify the IFV or CFV.

The ITV approach was selected because it appeared that it could be fielded in conjunction with the COPPERHEAD IOC at a reasonable cost (COPPERHEAD IOC is FY81). The IFV/CFV vehicles were eliminated on the basis of cost and availability. No foreign vehicle was identified that could meet the stated requirements. The DROC for the FISTV was subsequently approved by DA and the PM, ITV was named as the developer. The estimated equipment availability date for the FISTV was established as 4th Qtr, FY 84. This is considerably later than the COPPERHEAD IOC. Fielding of the FISTV will not be completed until 1986.

The combat vehicle inventory of the maneuver battalions will begin to change during the 1981-86 time frame when the new XM-1 Tank, XM-2 Infantry Fighting Vehicle (IFV) and XM-3 Cavalry Fighting Vehicle (CFV) are fielded. Because of the large inventory of the current family vehicles and the anticipated rate of production, the time required to complete fielding of the new armored vehicles is expected to be in excess of 10 years. The current Army AAO for these vehicles does not include any requirement for use by FISTs or separate observation/lasing teams. Current plans indicate that the FISTV system (M113A2 chassis) will be used in support of maneuver units issued the new family combat vehicles.

The XM-1 tank and IFV/CFV vehicles provide a significant increase in mobility and survivability and a slight increase in mobility over the M113A2

vehicle in addition to their enhanced combat power. Given the accepted principle that a supporting element should have mobility equal to and survivability comparable with the supported force, it is evident that the FIST must be equipped with the new family vehicles in order to provide the requisite fire support. The signature of the FISTV may degrade the survivability of the FIST. The vehicle configuration of battalion/squadron elements, assuming retention of the current FISTV is depicted at Tables 9-1 and 9-2.

TABLE 9-1. Mechanized Infantry Battalion Vehicles

TIME PERIOD	TOW	FIST	CO HQ	SQUAD	ELEMENT SCOUTS	MORTARS (81MM)	COMMO
Current	M113A1	M113A1	M113A1	M113A1	M113A1	M125	M113A1
1980	ITV	M113A1	M113A1	M113A1	M113A1	M125	M113A1
1981-99	ITV	FISTV	IFV	IFV	CFV	M125	M113A1

TABLE 9-2. Armored Cavalry Troop Vehicles

TIME PERIOD	TOW	FIST	TROOP HQ	ELEMENT SQUAD	MORTARS (107MM)	COMMO
Current	M113A1	M113A1	M113A1	M113A1	M106	M577
1980	ITV	M113A1	M113A1	M113A1	M106	M577
1981-99	NONE	FISTV	CFV	CFV	M106	M577

The requirement is to equip the FIST with a vehicle which enhances its ability to (a) effectively coordinate and communicate with the maneuver commander and the fire support assets and, (b) position itself on the battlefield to control fire support. To accomplish these missions, the selected vehicle should satisfy the characteristics stated in para 9.4.

When the desired characteristics for the FIST vehicle are applied to the XM-2/XM-3 infantry/cavalry fighting vehicle, it becomes apparent that either of these vehicles are fully capable of giving the FIST the battlefield mobility, survivability, and flexibility necessary for operating in support of an armor, armored cavalry or mechanized infantry company/troop or team. Salient points are:

- Automotive mobility and survivability (battlefield mobility). The XM-2 and XM-3 possess armored protection comparable with the XM-1 Main Battle Tank and are equal to the XM-1 in terms of automotive mobility. Consequently, the XM-2 or XM-3 mounted FIST would possess the necessary battlefield mobility to enable it to operate in support of a tank unit.

- Ability to accomodate necessary auxilliary equipment: Both the XM-2 and XM-3 can be equipped similarly to the M113A2, which was found to be suitable for accepting the necessary FIST equipment. Additionally, the XM-2/3 possesses an electronically stabilized turret with a TOW launcher,

somewhat like the Improved TOW Vehicle. This turret would, therefore, be suitable for mounting a GLLD, which would give the vehicle the same capability to range and designate targets as that planned for the FISTV.

The study group concluded that the XM-2 and XM-3 are both satisfactory vehicles for use by a FIST HQ. The XM-3 does not have the six firing ports and firing port weapons, which are superfluous to the FIST mission and manning level. The XM-3 CFV appears more ideally suited for use as a FIST or separate team vehicle.

The study group also considered use of the XM-1 Tank as a FIST vehicle. The previous advantages of the tank over the M113A1, i.e., better mobility and protection, have been largely overcome in the XM-2/3 family. The mobility of the XM-2/3 vehicles is comparable to that of the XM-1.

Consideration must be given to the anticipated life cycles of COPPERHEAD/GLLD, ITV, FISTV and IFV/CFV in order to determine when the CFV should be fielded for FIST. This information is summarized at Table 9-3.

Table 9-3. Life Cycle Comparison

Vehicle/SYSTEM	Life Cycle (Years)	80	81	82	83	84	91	95	98
COPPERHEAD/GLLD	10		X				X		
ITV	15	X						X	
FISTV	15				X				X
IFV/CFV	15+		X						

Some requirements for modification of the vehicle are needed for radio mounts, laser rangefinder, and thermal night sight. Since the CFV will not be available for FIST issue until approximately 1991, according to the fielding plan, ample time is available to draft a requirement's document and obtain approval for CFV modification. A cost and feasibility study must be conducted to determine what the additional costs (cost above vehicle price) and time required is to modify the CFV for use by the FIST and separate observation lasing teams. This analysis should be based on the FIST ROC as modified by CSSG II recommendation.

If the FIST requirement is integrated into the CFV production/distribution schedule, it is reasonable to assume that the FIST vehicles will be produced in proportion to the requirement. This means that in a single month's production, the FA would receive three FIST vehicles (production rate is 50 vehicles, the approximate number required for one mechanized infantry battalion). Based on input from staff officers, it appears that the HQ DA priorities for the IFV/CFV have been driven by budgetary considerations and that changes in the production rate and fielding priorities may require Vice Chief of Staff

approval. Under current production/fielding plans no IFV/CFV will be available for FA modification until the 1991 time frame.

The final solution will require a trade-off analysis of the following three options:

OPTION 1. Remain with the FISTV until the end of its life cycle (1998) and transition into CFV generation vehicles. The advantage to this option is that an ongoing developmental program exists for the FISTV and realistically the FISTV can be fielded as a real time solution to the GLLD under armor problem. Additionally, the FISTV (an add on to the ITV) production line is open and producing improved TOW Vehicles. The FIST vehicle system kit has been designed to accept developed items such as the GLLD and DMD as modules. Time remains to begin an organized effort to develop and test the follow on vehicle of the CFV family.

The major disadvantages of staying with the FISTV and transitioning to the CFV family of vehicles in 1990's is the vulnerability of the FISTV to the massive quantities of FA fired by attacking threat forces. The FISTV does not have the armor protection that the XM2-3 family of vehicle does. Additionally, the distinct signature of the FISTV in an environment where the majority of other fighting vehicles are of the IFV/CFV family, presents a survivability problem. The only other M901 series vehicle in the forward line of contact will be the ITV which will normally be deployed in an overwatch position.

OPTION II. Transition from M113A1 to the FISTV, to the CFV well before 1990. The advantages of this solution include placing the FIST in a vehicle that has mobility equal to and survivability comparable with the vehicles of the supported force. Clearly, the CFV is a superior battlefield vehicle to the FISTV. The FIST in a CFV provides no distinct signature, thus increasing its survivability.

The disadvantages of this option include the developmental process required to adapt all the radio, positioning and lasing equipment, etc., to the CFV. Department of the Army would be required to change the distribution schedule to provide this vehicle to the FA. This course of action does not appear cost effective.

OPTION III. Transition directly from the M113A1 to the CFV family of vehicles. The major advantage of this option is that the FIST is placed in the best vehicle without buying an interim vehicle. The FIST would be outfitted with the CFV at the same time as the supported force.

The major disadvantage is that it does not appear that the FA could adapt this vehicle for its own use without an extensive developmental program. Three additional CFV-series vehicles will be required per maneuver battalion. If the production rate of 50 vehicles per month (a low rate production option) becomes a reality, the effect of the additional FIST vehicles requirement will be to delay the fill of maneuver battalions. Conceivably, one mechanized infantry battalion could be filled per month, a division would require 13 months,

and four divisions require approximately four and one-half years. This could mean that some divisions would have the M113 well into the 1990 time frame.

Findings.

- The FA should continue with the FISTV, utilizing this vehicle for its approximately 15-year life cycle.

- A FIST vehicle based on an IFV/CFV chassis should be adopted as a replacement vehicle for the FISTV.

9.8.2 Issue. What changes to the FISTV are required for use as a FIST HQ and GLLD under armor vehicle as a result of CSSG II's employment conclusions?

Discussion. The FISTV has been designed to place the GLLD under armor in the post 1984 time frame. CSSG II findings on Phase I-III indicate the following changes to the armor, armored cavalry, and mechanized infantry FIST organizations which reflect on FISTV performance characteristics:

TYPE CHANGE	ARMOR	FIST ARMD CAV	MECH INF
HQ personnel reduce from five to four	X	X	
HQ personnel increased from three to four			X
Radio configuration changed to: 3 AN/GRC-160 1 AN/VRC-46	X		X
Radio configuration changed to: 2 AN/GRC-160 1 AN/VRC-46		X	
Add FIST DMD	X	X	X

The above changes were compared to the FISTV ROC performance characteristics are:

- Seating for five personnel is required.

- Radio configuration is one AN/GRC-47 and two AN/GRC-160's.

- Storage space is required for the following TOE equipment:

Two each Radio Set Control Group: AN/GRA-39

Three each Cable Telephone: WE-1/TT DR-8

Three each Reeling Machine Cable Hand: RL-39

One each Digital Message Device

Findings.

- The current requirement for seating for five personnel can be reduced to four.

- The radio configuration must be changed to three AN/GRC-160 and one AN/VRC-46 radios.

- The vehicle storage and wiring plan must be revised to accommodate the FIST DMD.

- The reduction in radio remote and wire equipment in the mechanized infantry FIST is not significant.

9.8.3 Issue. What vehicle is required for use by separate observation/lasing teams in the armored/mechanized infantry division?

Discussion. In Phase III the study group found that separate observation/lasing teams are required to increase the effectiveness of the COPPERHEAD system, to provide additional observation capability and serve as replacements, both personnel and equipment, for FISTs.

These teams also operate in forward battle areas, therefore, and their their vehicle/GLLD and other equipment requirements are essentially the same as the FIST. A list of equipment required for the section is at table 9-4.

Table 9-4. Equipment Required for the Separate Observation/Lasing Team, Armored/Mechanized Infantry Division

LINE #	ITEM	QUANTITY
A01876	Accessory Kit: MK1265 for VRC-46 and GRC-160	2
B39272	Bayonet-Knife	3
B67766	Binoculars, 7x50	1
C68719	Cable-Telephone: WD-1/TT	2
C89145	Camouflage Screen System	2
C89213	Camouflage Screen Support System	2
Z27623	FISTV: Forward Observer Artillery	1
E63728	Compass, Magnetic	1
L91975	Machinegun: Caliber .50	1
M10936	Mask, Protective Tank	
M11895	Mask, Protective Field	3
M52650	DMD	1
M75577	Mount Tripod: M6	1
N04456	Night Vision Goggles: AN/PVS-5	1
N04982	Night Vision Sight Designator: AN/TAS-4	1
Q34308	Radio Set: AN/GRC-160	1
Q53001	Radio Set: AN/VRC-46	1
Q78282	Radio Set: AN/GRA-39	1
R59160	Reeling Machine: RL-39	1
R94977	Rifle: 5.56mm	3
V31211	Telephone Set: TA/312/PT	1
Z32103	Electro-Optical Target Designator Set: AN/TVQ-2	1

The above equipment list was compared to the equipment required by the FISTV ROC to determine what modifications, if any, would be required to adopt the FISTV for use by separate observation/lasing teams.

All equipment items are common to the FISTV; the major difference is in the radio configuration required: two less radios are required for the separate observation/lasing team. The development and use of two distinct wiring configurations for the FIST and for the observation/lasing teams are not recommended, however, because it is desirable to be able to use the separate observation/lasing team vehicles as replacements for FIST vehicle combat losses. The requirement for FISTV's in the separate observation/lasing teams adds 171 vehicles to the fielding requirement, assuming the full requirement

of 18 teams per armor and mechanized infantry division, 3 teams per ACR, as determined in phase III of the study, is approved. At the present rate of production, approximately six months are required to fill this requirement. There are indications, however, that the adpotion of the employment options developed in phase III and discussed further at paragraph 9.8.4, can reduce this total requirement. This requirement is also addressed from the perspective of the total fire support system in Chapter 13, Discussion.

Since the initial fielding of the FISTV does not occur until FY84, an interim capability, the M113A1 with pintle mount, is currently planned. Some difficulty in obtaining these vehicles is anticipated because the Army does not now have sufficient M113A1s to meet its AAO. The production of M113A1s will end in 1981, still short of AAO. Some vehicles will, however, be available from the rebuild program in the early 80's as M113A1s are replaced by the IFV/CRV. Coordination with HQ DA is required to obtain approval for the use of rebuilt M113A1 vehicles in FISTV configuration for the separate observation/lasing teams. The AAO for GLLD pintle mounts must be increased and appropriate changes made to production plans to accommodate additional observation/laser teams.

Findings.

- The FISTV is required for use by separate observation/lasing teams based on availability of vehicle chassis and the employment considerations in the COPPERHEAD O&O concept.

- The M113A1 with GLLD pintle mount is required for observations/ laser teams pending fielding of the FISTV.

9.8.4 Issue. Are the FIST employment options from Phase III valid for the mechanized infantry FIST after fielding after fielding of the FISTV and IFV?

Discussion. In Phase III, three employment options were discussed for the mechanized infantry FIST equipped with the GLLD. The first option has the GLLD and FIST HQ operating together from the FISTV. This option is still viable since it is not influenced by the type vehicle used by the company commander. The second and third employment options required the FIST to operate in the company commander's vehicle (M113A1) while the FISTV with GLLD is employed at another position, (a) within the maneuver company area under the FIST control or, (b) out of the company area under control of another FIST or the BN FSO (See Chapter 5, para 5.4.6 a). A type FIST organization for this contingency is illustrated at figure 9-2.

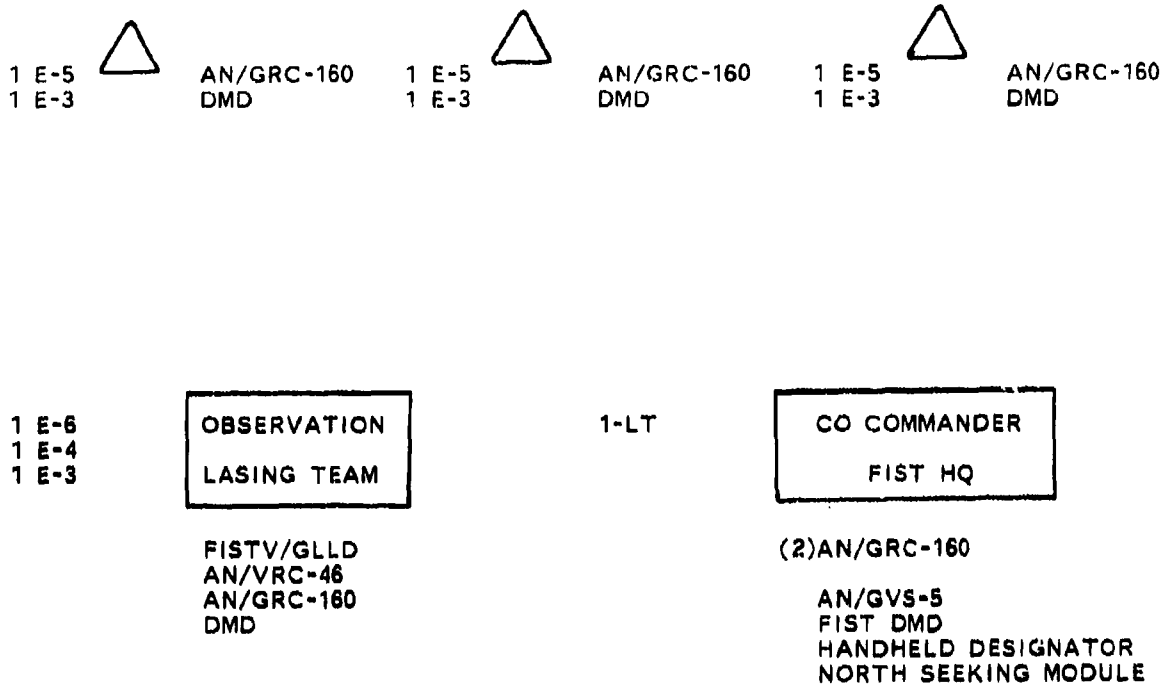


Figure 9-2. Type Mechanized Infantry FIST Organization.

The study group reevaluated the FIST employment options that place the FIST HQ in the company commander's vehicle in light of the fact that this vehicle will be the IFV/CFV family rather than the M113A1 considered in Phase III. TSM IFV/CFV states that there is room for the FIST HQ in the commander's IFV. Under this concept, two FIST HQ personnel, two radios, and ancillary equipment are transported in the command vehicle. There are no radio mounts or antennas currently available for use by the FIST HQ in this vehicle. External radio antennas and mounts are required for positive under-armor communications. CSSG II reviewed the status of the multi-coupler antenna, now under development, which allows more than one radio to work from a single antenna. This antenna is planned for the ITV and should be considered as a possible solution to the antenna problem in the IFV. TSM IFV/CFV is developing a command and control package for the commander's IFV. USAFS should provide the input to this C&C package to include radio installation kits and mounts for two AN/GRC 160 radios.

If the GLLD remained in the FISTV and the FIST HQ was in the company commander's vehicle, the FIST HQ would not have access to a target location device. However, two options are available to solve this problem. One is to add a AN/GVS-5 infrared observation device/set to the FIST and the second is to use the rangefinder capability of the hand-held designator, if available. A requirement for one hand-held device per mechanized infantry FIST was

identified in Phase III (Chapter 5, para 5.4.6 h). The designation capability of this device will be used primarily for target hand-off to airborne laser seekers, e.g. USAF PAVE PENNY.

An additional area to consider is how the FIST HQ accomplishes its primary mission of fire support planning, coordination, and execution. If the FIST HQ is separated from the company commander, i.e., in its own FISTV, a significant portion of the fire support planning, coordination, and execution must take place over the company command net, a net that is already dedicated to the maneuver elements of the company. If the FIST HQ is physically located with the company commander, FS coordination, planning, and execution take place on a face-to-face basis. Clearly this is the big advantage of FIST HQ operations in the company commander's vehicle.

If the FIST Chief operated from the company commander's vehicle, he would require a position or station that allowed him to view the battlefield to the same degree that the company commander does. The internal configuration of the IFV can accommodate two personnel in the cupola. It is envisioned that the FIST chief could occupy one of these positions to "see the battlefield"; however, this method of operation would degrade the fighting capability of the commander's vehicle. An expedient observation position the FIST could use is the rear hatch; however, this technique provides no protection from overhead fire.

Findings.

- Operation of the FIST HQ in the company commander's IFV and use of the FISTV as a separate observation/lasing team is a viable employment option.

- USAFAS input to USAIS requirements FIST HQ in the IFV command and control package is required to insure feasibility of this option.

9.9 SUMMARY OF FINDINGS

9.9.1 The new family of combat vehicles (XM 2/3, IFV/CFV) offer significant improvements in mobility and survivability for the FIST. The CFV is the preferred vehicle for use by both the FIST and separate observation/lasing teams in the armored/mechanized infantry divisions, however, the vehicle will not be available for FA use until the 1990-91 time frame. The FA should transition to the CFV upon completion of the FISTV life cycle.

9.9.2 The FISTV ROC requires updating to incorporate CSSG II changes to FIST personnel and equipment. The primary changes involved are a reduction in seating requirement, radio configuration change, and incorporation of the improved DMD (FIRST).

9.9.3 The three FIST GLLD employment options, previously developed in mechanized infantry Phase III discussions (See paragraph 5.4.6a) remain valid when the FISTV and IFV are fielded. Implementation requires, however, that USAFAS provide C^3 requirements to the USAIS for incorporation into a C^3 package to be developed for the IFV.

Chapter 10

DIVISION 86

10.1 PURPOSE

The purpose of this chapter is to provide CSSG II input to the DIVISION 86 Study.

10.2 Considerations. The primary considerations in developing issues for the chapter were: (1) DIVISION 86 operational and organizational concepts; (2) DIVISION 86 maneuver and fire support doctrine; (3) New equipment fielding schedules; and, (4) Changes in fire support doctrine developed during Phases I-IV of the CSSG II study.

10.2.1 Operational Concept. The DIVISION 86 operational concept incorporates current conventional tactics and operations of maneuver units conducting the active defense. The introduction of the new family of fighting vehicles, (XM-1 Tank, XM-2 Infantry Fighting Vehicle (IFV) and XM-3 Cavalry Fighting Vehicle (CFV)) and communications equipment (SINCGARS and ADDS) impacts significantly on fighting techniques at the company level. This statement is particularly true in the mechanized infantry where the improved mobility, survivability, and fighting capability of the IFV make it an integral part of the squad rather than the carrier for the squad. The increased capabilities of the vehicle family will make the commander's job more demanding and increase the reliance on fire support representatives to properly assist in integrating fire support into the battle.

10.2.2 Organizational Concept. The DIVISION 86 force structure provides for heavy divisions composed of ten maneuver battalions. Each maneuver battalion consists of four companies of three platoons each. The organizational structure for the armored divisions and mechanized infantry is illustrated at figures 10-1 and 10-2. The armor tank and mechanized infantry battalion are shown in figures 10-3 and 10-4. The division artillery structure is shown at figure 10-5. The quantity of fire support personnel (FISTs, fire support sections) in the direct and general support battalions is based upon current doctrinal organizations. This organization differs from CSSG II Phase I-IV results in that the size of the tank company and armored cavalry troop FISTs is five personnel vice the four-man section recommended by CSSG II. The current nine man infantry FIST is presented vice the ten man mechanized infantry FIST and the twelve man infantry FIST (Phase III) recommendations of CSSG II.

The DIVISION 86 study proposes a combination of the current attack helicopter and air cavalry functions into a single unit known as an Air Cavalry Attack Brigade (ACAB). A proposed organizational structure is at figure 10-6. Fire support requirements for this organization are discussed at paragraph 8.4.1d (Chapter 8) and are summarized at issue 10.3f.

10.2.3 Assumptions. The following assumptions were made in considering issues for this chapter.

a. CSSG II Phase I-IV recommendations will be approved.

b. The new family of fighting vehicles are fielded in accordance with current milestones.

c. The TACFIRE and Mortar Fire Control Calculator (MFCC) systems will be fielded by 1986.

d. PLRS/JTIDS Hybrid will be fielded in 1986.

e. SINCGARS will be fielded in 1986-1987.

ARMORED DIVISION

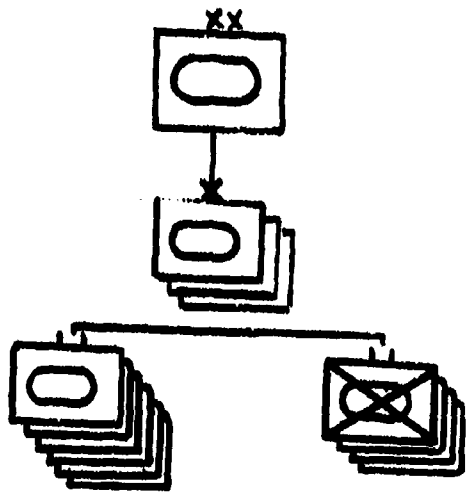


Figure 10-1 Armored Division - Division 86

MECHANIZED INFANTRY DIVISION

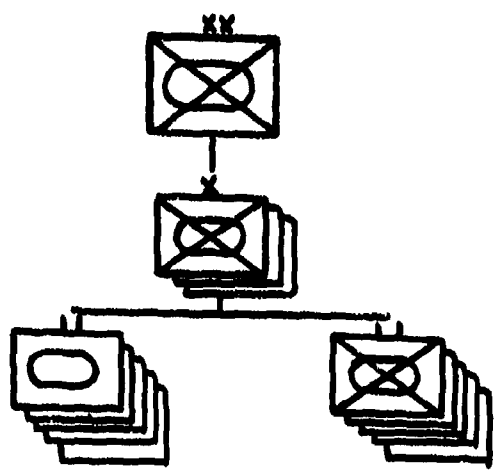


Figure 10-2 Mechanized Infantry Division - Divison 86

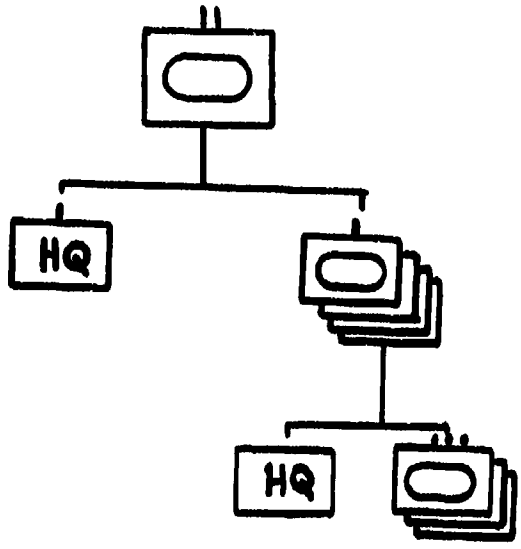


Figure 10-3 Tank Battalion - Division 86

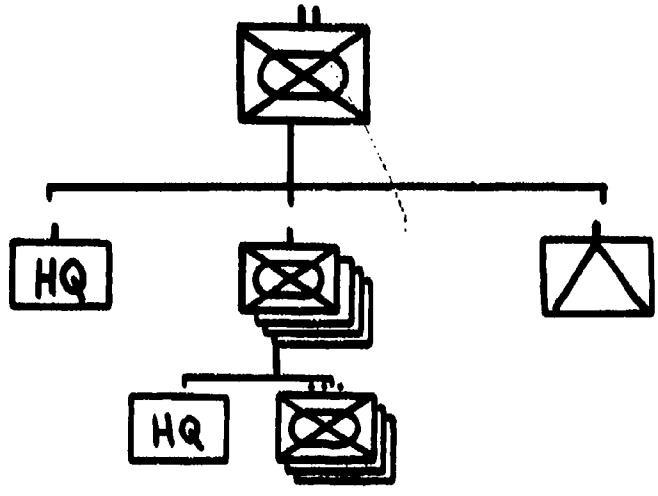


Figure 10-4 Mechanized Infantry Battalion - Division 86

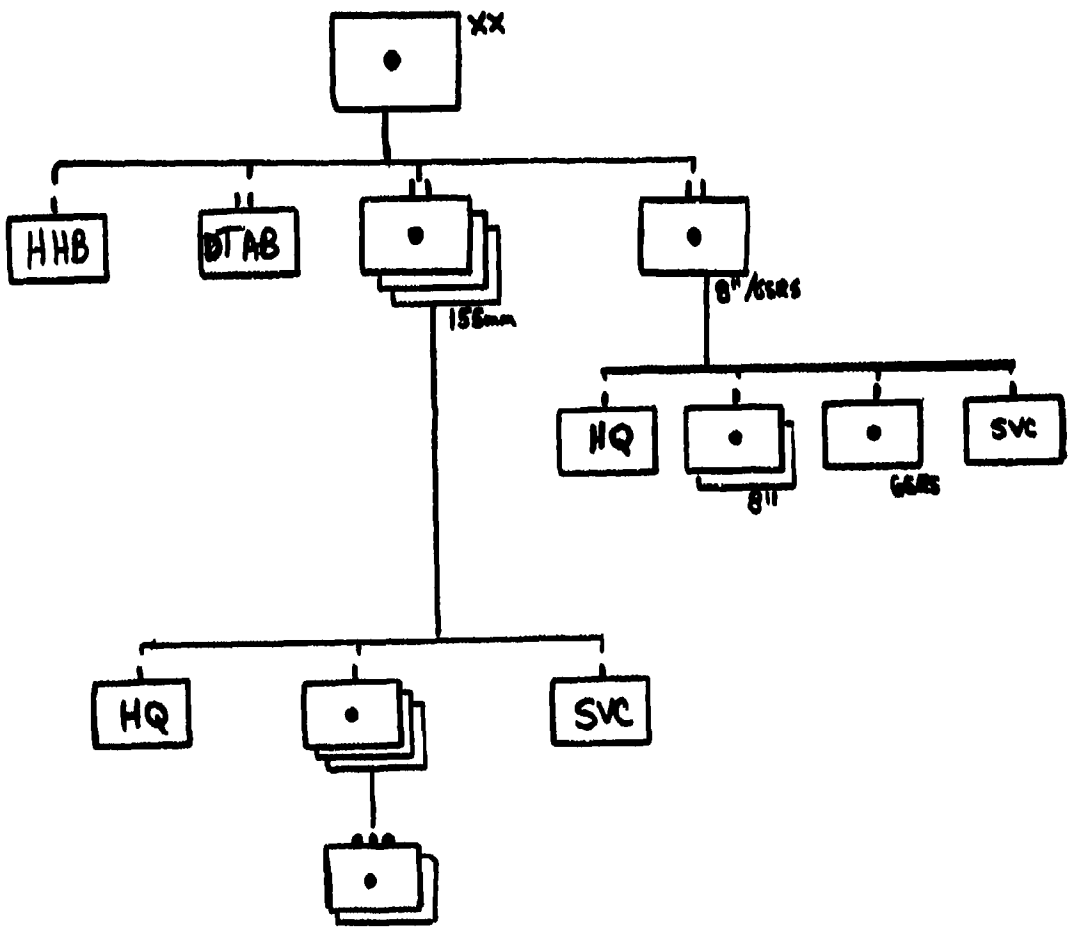


Figure 10-5 Division Artillery - Division 86

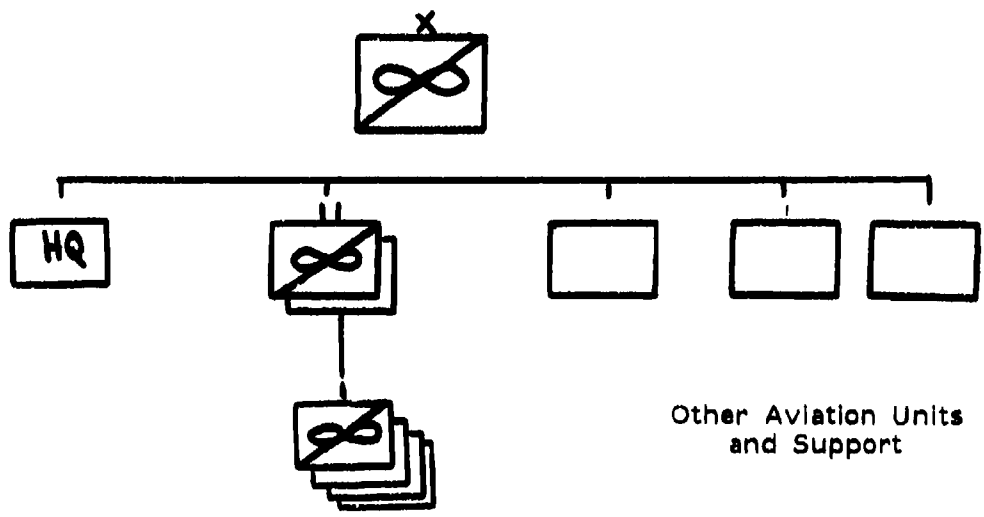


Figure 10-6 Air Cavalry Attack Brigade (ACAB)

10.3 ISSUES

CSSG II review of the above considerations resulted in the issues in subsequent paragraphs.

10.3.1. Issue. Does the deletion of the company mortars in the DIVISION 86 force structure significantly impact on the availability of fire support?

Discussion. DIVISION 86 eliminates the company 81mm mortars. It places all mortars at the battalion level, increasing the 107mm (heavy) mortar platoon to six (6) tubes. The mission of the heavy mortars has not been changed. These mortars will provide the organic indirect fire support for the battalion. They may be employed in general support, direct support, reinforcement, attached, OPCON, or in combination of these ways.

- General support permits the entire platoon to support the battalion as a whole. It provides flexibility in shifting and massing fires and simplifies C^3 and logistics support. It is appropriate when the commander desires centralized control to optimize fires in all or a major portion of the zone or section of operation.

- Direct support requires one or more sections (one tube/section) to respond to calls for fire from a specific maneuver element. When not firing for this specified element, they may fire in support of other elements.

- Reinforcement assists in increasing the massed fire capability of the mortars. The mortar platoon may be tasked to augment the fires of another mortar platoon. To effectively accomplish this, detailed coordination and good communications must be established between the two mortar elements. This arrangement does not normally occur unless the maneuver elements of the reinforcing mortar unit are not engaged in combat.

- Attachment - places one or more sections under the command of another unit commander. Normally, a maneuver company who has been assigned an independent type mission such as defense on a very wide sector may receive these mortar sections. The commander assumes the logistical and administrative support responsibilities for these sections while they are attached.

- Operational Control (OPCON) places one or more sections under the control of another unit commander without the administrative or logistical support responsibilities. This provides for decentralized control of fire, while still retaining a degree of centralized control for the logistics of the mortar platoon.

With the understanding of the employment options of the battalion mortars, they normally will be used for delivery of smoke. They are also effective in neutralization of dismounted units, suppression and illumination of targets. Their high rate of fire and high angle capabilities provide not only responsiveness but also a degree of survivability, since they can be fired from defilade. The ammunition carrying capacity of the mortars may provide a restriction in the use by the maneuver commander.

Deletion of the three tubes of 81mm mortars per company does degrade fire support at the company level, simply by their absence. No longer does the company commander have the responsiveness of indirect fires that he now enjoys.

The addition of two 107mm mortars to the battalion mortar section provides some depth in meeting the various mission type requirements and also the capability for massed fires. The added effectiveness versus responsiveness of these tubes have not been measured on the overall fire support mission. With the mortars primarily providing smoke for the battlefield a large portion of the basic load of ammunition would consist of smoke munitions. High explosive and illumination munitions would provide the remainder. The mortars do complement the FA by providing smoke and other fires for the battlefield. In that sense, they can be considered an important asset at the battalion level.

Findings. Introduction of the IFV has increased the organic firepower of the rifle company reducing the need for company mortars.

- Mortars will primarily provide smoke for the battlefield and as necessary, suppression and illumination. Battalion heavy mortars provide sufficient responsiveness to service mortar requirements.

10.3.2. Issue. Does the mechanized infantry company in the DIVISION 86 force structure require platoon forward observers?

Discussion. The mechanized infantry platoon of DIVISION 86 is envisioned to consist of three squads, with nine men each, plus a platoon headquarters of five men for a total platoon strength of thirty two. The operational and organizational concepts for the mechanized infantry mounted in Infantry Fighting Vehicles (IFV) indicates that the vehicle is an integral part of the infantry squad. The vehicle weapons systems (.25mm Bushmaster, coaxial machinegun and anti armor weapons) will assist in covering the gaps between the XM-1 tanks and supplement the fires for the rifle squad when conducting dismounted operations.

The missions for the mechanized infantry have not significantly changed. The personnel and equipment of a mechanized infantry platoon have changed to maximize the best of both. The IFV is the first true infantry fighting vehicle which affords the degree of protection required by the infantry. It has a capacity for only nine men - thus a reduced rifle squad of that number.

The battlefield of DIVISION 86 will be compartmentized, portions which will often be hidden in obscurity and broken by buildings, towns, forests and hills. These conditions will constrain close air support, making the FA and mortar fires even more critical. Also, these conditions place a premium on infantry forces fighting in broken, rugged terrain and in urban terrain with mechanized infantry company/teams expected to cover anywhere from less than 1KM to 4KM or more of frontage, depending on the actual terrain encountered. These battlefield conditions will require greater night/inclement weather capabilities since maneuver forces can expect to be subjected to continuous combat. These conditions and their constraints impact on combined arms maneuver, force mix and weapons/employment interaction.

Turning to fire support, the mechanized infantry platoon will fight from battle positions which may be situated to cover separate avenues of approach. When dismounted, these infantry elements may be separated by some distance from their vehicles in order to sufficiently cover a dismounted avenue of approach. The ability of the FIST HQ to see all portions of this type battlefield is highly unlikely based on the employment of mechanized infantry forces over varying terrains. Without some type of forward observation the platoon, fire support is reduced. An option exists to select the infantry platoon leader to call for and adjust fires for the platoon. The number and complexity of tasks facing the mechanized infantry platoon leader are formidable. Not only is he concerned with the maneuvering and fighting of his three squads, he has the additional responsibility to employ the platoon's IFV and their weapons systems into the fight, maximizing all resources available. The platoon leader will be required to decide how to employ both the vehicle and personnel weapons system under his control in both a mounted and dismounted role. This is a challenging and demanding task. Additionally, he must

concern himself with the planning and execution of other missions, such as patrol activities, security operations, emplacing and breaching minefields. All these tasks are time consuming and are the primary roles requiring the platoon leader's attention. Superimposing fire support responsibilites upon him will have an adverse effect on his capabilities to accomplish his primary roles. Under this concept, the platoon leader would command and control his platoon while perhaps simultaneously requesting fire support. In the envisioned fast moving battlefield, time would not permit the effective planning and coordination of both maneuver and fire support by this one individual, especially in the digital world of TACFIRE. The infantry platoon leader can not be expected to be an expert FO; knowledgeable of the various munitions and adjustment techniques required, plus perform his primary role of platoon leader. This platoon leader requires assistance to coordinate and orchestrate his fire support needs, freeing him to perform his infantry related tasks. The size of the infantry platoon, whether it be thirty-two or forty-one men, does not change this requirement.

The platoon FO team, two field artillerymen, MOS 13F, provides the necessary coordination to deliver timely, responsive fire support. These "shooters" assist in the planning, coordinating and implementation of fire support for the platoon. They provide battlefield observation, fire support coordination and necessary digital communication to rapidly influence the battle with additional firepower. This is done without degradation of the platoons leaders primary duties. One FO is insufficient to accomplish the fire support duties as previously discussed in Chapter 5 of the study. A two-man team is required to effect the desired coordination, carry the required equipment and provide the battlefield observation for the platoon.

Findings. The mechanized infantry platoon of DIVISION 86 still requires a platoon FO party. Duties and missions of the mechanized infantry platoon have not been reduced, even though the size of infantry platoon has been lowered.

10.3.3 Issue. Are sufficient FIST personnel provided for the DIVISION 86 force structure?

Discussion. CSSG II reviewed the proposed maneuver organization and FA draft TOE to identify if sufficient FIST personnel were provided. The proposed TOE structure did provide adequate FIST to support a ten battalion and an armored cavalry squadron force. The organization of these FIST within the artillery battalions is not such to effectively support the envisioned maneuver force structure. Reconfiguration of FIST assets will be required to plan the correct mix of FIST in each DS battalion.

For example, in the armored division, one brigade will be composed of four battalions; two mechanized infantry and two tank; the other two brigades will be organized identically with three battalions, tank heavy (two tank and one mechanized infantry). In the mechanized infantry division, one brigade will be balanced, that is, four battalions, two mechanized infantry and two tank; the other two brigades will be organized with three battalions, one tank heavy (two tank battalions, one mechanized infantry) while the other brigade will be mechanized infantry heavy (two mechanized infantry and one tank).

FIST organizations are provided in equal numbers to each of the DS FA battalions with the remainder of the FIST requirement being filled by the GS FA battalion. This creates, for example, in the armored division, 6 tank company/5 mech inf company FIST organization per DS battalion, with the GS battalion requirement for the remaining FIST. This or any similar equal distribution proposal does not meet the needs of the appropriate maneuver force, since the FA battalion would have to modify its TOE to support the appropriate force. With a stabilized force structure of ten battalions organized as indicated for DIVISION 86 the FA organization could organize its FIST assets in a better manner to optimize fire support.

The "cellular approach" to FIST organization as discussed in Phase I of CSSG II was an attempt to correct this shortfall. Also, assignment of the FIST to the maneuver company was considered. These have proven, through discussion and coordination, not to provide for the overall well being and training of the FIST, but may resolve many of the organizational problems.

Further analysis indicates that with a standard maneuver force structure for a brigade - the supporting FA battalion could be organized to meet the maneuver mix. If the brigade was organized as a balanced brigade (two tank and two mechanized infantry battalions), then the DS FA battalion should be provided with eight tank and eight mech infantry company FIST. If it were organized mechanized infantry heavy (two mech infantry and one tank battalion) then the FIST organization should reflect eight mech inf company and four company tank FIST. If the brigade was tank heavy, (8 tank/4 mech infantry company FIST) then the FIST organization would be reversed. Considering the two types of heavy divisions - armored and mechanized infantry, there are but three variations that must be made to the DS FA battalion TOE to insure the adequate mix of FIST personnel to the brigade - a basic TOE for a balanced brigade, a version for the tank heavy brigade and a version for the mech infantry heavy brigade. With the appropriate version applied to the specific FA unit/brigade force, the correct number of FIST are readily available.

The GS FA battalion would still have the doctrinal requirement to provide FIST to the divisional armored cavalry squadron and any additional maneuver units that may be assigned to the division. Under the DIVISION 86 concept, three armored cavalry troop FIST are required. No additional FIST would be necessary, nor would any transfer of FIST be required from the GS battalion to the DS battalion to support the maneuver force mix.

Findings. Sufficient FIST personnel are tentatively programmed to support the DIVISION 86 force structure. However, the proper mix of FISTs per FA battalion needs resolution. An increase in FIST personnel is required by the addition of one maneuver company per battalion.

10.3.4 Issue. Is the four-man fire support section (FSS) adequate for support of the DIVISION 86 structure?

Discussion. Current FSS's for maneuver battalions/ brigades consist of four personnel (one officer/three enlisted). Current doctrine requires that these organizations be capable of controlling up to four maneuver companies/ battalions without additional augmentation. The DIVISION 86 O&O concept applies the same doctrine. It is apparent then that the current organizational should be capable of controlling fire support for the DIVISION 86 force. The one major difference from the present is that in DIVISION 86 each maneuver battalion will have four companies, and one of the maneuver brigades will have four battalions. Conceptually, additional maneuver companies/battalions would increase the workload of the FSS. This was considered. Past combat experience indicated that a four man section has successfully coordinated fire support for four maneuver companies or four maneuver battalions when task organized into that configuration. In the digital world, additional fire support personnel at the battalion/brigade levels would not significantly improve the fire support coordination being conducted through TACFIRE, since the automated digital system would have very little, if any, difficulty handling this number of subscribers currently programmed. The problem of communications and the increased number of transmissions resulting in net loading will be discussed in a later issue.

Finding. The currently proposed battalion and brigade fire support sections developed for the DIVISION 86 force structure are sufficient to meet the fire support requirements.

10.3.5 Issue. What is the impact of the DIVISION 86 maneuver battalion organization on fire support communications?

Discussion. The DIVISION 86 organization included brigades of up to four tank or mechanized infantry battalions composed of four maneuver companies, maintenance companies, weapons platoon, and headquarters and headquarters company. A field artillery battalion, consisting of three cannon batteries with eight howitzers each, is normally placed in direct support of the brigade.

The above organization results in an increase of four maneuver companies, in a four battalion brigade, and six FA tubes, compared to current organizations. Studies indicate that the three-by-eight FA battery organization provides increased effectiveness and availability of FA fires. No changes have been made in the TACFIRE communications capabilities, however, and the CSSG II reviewed these capabilities and fire mission loads to determine their impact on responsiveness under high load (surge) conditions.

A battalion TACFIRE system computer communicates through six digital data terminals. Both radio and wire communications media can be connected to a digital data terminal. A typical arrangement of data terminals, communications means, and subscribers is listed below:

DDT	COMMO MEANS/NET	TYPE SUBSCRIBERS
A	FM Radio/Div Arty OPS	Div Arty TOC
B	FM Radio, Wire/ Bn OPS/F	Bde FSE, Radar, Bn O/I Section
C	FM Radio/Bn OPS/F	Continuity of Opns Bn
D	FM Radio/F1	Cannon Battery, Maneuver Battalion FSE, FISTs
E	FM Radio/F2	Same
F	FM Radio/F3	Same

The above nets are digital nets. The battalion also operates one voice net, the Battalion Command Net (FM) and is a subscriber in the division artillery voice command net (FM).

The TACFIRE system has been field tested under heavy loads representative of the SCORES Europe I, Sequence 2A Scenario. These loads have also been simulated in the TACFIRE COEA and AMSAA independent evaluations. Data from these sources have been used by the TRADOC System Manager (TSM) for TACFIRE to analyze communications loads and net availability under surge conditions with the DIVISION 86 organizations. This analysis is summarized in subsequent paragraphs to illustrate possible impacts on FA system responsiveness under these conditions.

TSM TACFIRE analysis was based on a four-battalion maneuver brigade in 1-hour segment of the 8-hour surge period. A fire direction net (F Net), utilized for the support of two maneuver battalions (one mechanized infantry/ one tank) was selected for the analysis. The thirteen subscribers on the net are:

° Eight FIST HQ (Platoon FOs communicate with TACFIRE throught the FIST DMD at the FIST HQ).

° Two Battalion Fire Support Elements.

° One Battalion Fire Direction Center (TACFIRE Computer).

° Two Firing Platoon Fire Direction Centers.

The target list used in this analysis, as well as field tests and simulations, represent threat targets suitable for engagement by FA located by all sensors. Those targets suitable for attack by mortars or close air support were deleted since their message traffic would not be handled on the FA "F" net. In many cases, multiple fire units were required to achieve desired

effects. The FA fire mission requirement during the 1-hour surge was fifty. The distribution of these missions and the resulting number of TACFIRE messages are as follows:

SOURCE	QUANTITY/TYPE	NUMBER/MESSAGES
FIST	20 Fire-for-effect	160
	4 Adjust Fire	64
Div Arty	16 Fire-for-effect	40
Bn FDC	10 Requests for additional fire	25
TOTALS	50	289

The fire direction net must also be used for other essential traffic such as intelligence reports, fire plans, etc. The additional messages by type event were:

EVENT	NUMBER/MESSAGES
Artillery Targent Intelligence	23
Position reports	16
Movement reports/orders	3
Fire plans (20 targets each)	40
Met message	1
Graphical Firing Table Technical Data	2
Fire plan execution	22
TOTAL	107

The amount of net time required to transmit the above traffic, based on an average message length of six seconds is shown below:

NUMBER/MESSAGES	TIME REQUIRED (MIN)	%/HOUR
289	28.9	48
107	13.6	23
396	42.5	71%

The above data indicates that the net will be busy only 42.5 minutes or 71% of the hour. This data is misleading in that it does not reflect the net contention factor, i.e., some delay in transmission can be anticipated because the net will not always be available at the instant the message is ready for transmission.

Further analysis was conducted to assess the impact of the above net loading. A detailed analysis of scenario events and a cueing analysis disclosed that messages would be delayed an average of six seconds due to net contention. When a 10-minute spike period (period of greatest intensity) within the surge hour was analyzed, net utilization rose to 100% and the average delay was 24 seconds. These delays do not consider the 10-30% of the messages

which must be retransmitted one to four times due to the net contention problem.

Many of the FA's actions depend on a guarantee of first time communications success. If the first attempt cannot get through, or there is considerable delay in transmission of the message, the specific mission may fail. In the target acquisition business, for example, cueing by other means is used to turn on the FIREFINDER radar. The cueing message must go without delay if the FIREFINDER is to locate the hostile battery.

In the central battle, targets will be engaged with FA scatterable mines or suppressive fire like smoke or dual-purpose improved conventional munitions. Assuming a target moving at 12 kilometers per hour, the target could move 150 meters during the 24-second delay described earlier. This change in location significantly reduces the effectiveness of the attack.

The net accessibility requirement for a COPPERHEAD mission is even more stringent. An observer must receive an initial lase command at least 13 seconds before projectile impact to achieve full maneuverability of the projectile and a high probability of success. If lasing is begun less than eight seconds prior to impact, the probability of hit is so low it is unacceptable. The maximum delay time for COPPERHEAD lase command messages is, therefore, 5 seconds. This 5 second standard has been adopted by TSM TACFIRE for all messages.

In their Independent Evaluation Report of TACFIRE OT III, AMSAA also addressed the communications problem. The SCORES 8-hour surge period was used. Their analysis showed that elimination of the message delay problem increased the effectiveness of the division artillery TACFIRE system as follows:

Effect of fires	- Up 30-50%
Increase in TACFIRE effectiveness	- Up 91%
Number of battery missions	- Up 67%
Number of targets engaged	- Up 91%
Percent of acquisitions fired	- Up 31%

The preceding analysis is based on computer simulations and does not reflect all real world conditions. For example, jamming communications interference, and ammunition constraints were not played. On the other hand, some additional message traffic can be expected for command and control, logistical and fire support coordination purposes. These additional factors may attenuate the problem slightly, however, a significant problem remains.

CSSG II addressed two solutions to the problem. The first is the addition of a data terminal to the battalion TACFIRE system. The current design accommodates this addition and it, in turn, would permit utilization of an additional "F" net. This approach appears to solve the problem by providing an "F" net in support of each maneuver battalion, however, a further review of the analytical data indicates this is not true. Assuming that the traffic in the TSM analysis is divided equally between two nets, each net will be utilized for approximately 35% of the hour. This figure represents full net utilization.

A second solution is the conversion to a pure digital communications system, such as the PLRS/JTIDS Hybrid System, for the TACFIRE system. (CSSG II has considered this system for FISTs and fire support sections at paragraph 13.4.2). This approach reduces delay times to practically zero even under the heavy load conditions described herein. The AMSAA analysis results, described in a preceding paragraph, were based on this type system. The PLRS/JTIDS Hybrid System is currently under development with a DA approved an LOA written by the Signal Center. Current milestones indicate that the system could be fielded in the 1985-87 time frame.

Conversion to a digital communications system appears to be the most cost effective solution. The addition of a data terminal would require programming and procurement action and could not be fielded until the 1985 time frame. Even so, it is a temporary solution to the problem and the time and effort would be more profitably applied to the digital system.

Pending fielding of a digital system FA doctrine must give careful consideration to the assignment of FISTs and FSEs to "F" nets during the fire support planning process. Fire support personnel with the maneuver battalion(s) facing the greatest threat should have access to a unique "F" net while the battalions employed against the lesser threat share an "F" net.

The movement of subscribers between nets to accommodate changes in plans is not desireable during the heat of battle because of possible resulting confusion. However, the procedures required to implement this capability must be thoroughly understood and practiced by FA units until the digital system can be made available.

Findings.

- The fire support communications required for the additional maneuver elements in the DIVISION 86 organization impose a time delay penalty on digital message transmissions. This message delay will reduce the responsiveness of FA fires and may reduce COPPERHEAD effectiveness.

- The conversion to a digital communications system is required to reduce message delays to an insignificant level and significantly improve the responsiveness of FA fires available to the maneuver units.

- Pending availability of a digital system, additional emphasis must be placed on the most effective utilization of "F" nets and procedures for the rapid transition of subscribers from one net to another.

10.3.6 Issue. How will the PLRS/JTIDS Hybrid System be employed with fire support assets in the DIVISION 86 time frame?

Discussion. In the next several years the Army will field several ADP systems, such as TACFIRE, which utilizes digital communications. The Army's current radio equipment and communications net structure pose severe limitations to the efficiency of these new systems on the battlefield and various alternatives for improvement in communications have been examined. A

promising candidate is the Position Location Reporting System/Joint Tactical Information Distribution Systems (PLRS/JTIDS) Hybrid System, proposed for fielding in the 1985-1987 frame.

The following paragraphs provide a brief description of the PLRS/JTIDS Hybrid System and describes how it, in conjunction with FM radio communications, could fulfill communications for FIST, battalion and brigade fire support elements. The concept involves changes in radio net structure and equipment.

a. PLRS/JTIDS HYBRID SYSTEM DESCRIPTION. The PLRS/JTIDS Hybrid is a near term candidate for an Army Data Distribution System (ADDS). It provides real time, secure, data communications, and in addition, provides location and navigation information for the tactical forces. It combines the desirable characteristics of the Position Locating Reporting System (PLRS) and the Joint Tactical Information Distribution System (JTIDS), and can be operational prior to 1986 (target IOC is 1984). The system consists of five major items--the Net Control Unit (NCU), the PLRS/JTIDS/(P/J) Terminal, the JTIDS Terminal, the Enhanced PLRS User Unit (EPUU), and the Input/Output Interface Box (I/OIB). Each component is described below.

(1) Enhanced PLRS User Unit (EPUU). The EPUU is a modified PLRS user unit; all PLRS capabilities are retained. The enhancement allows for secure data communications between EPUU's without the necessity for all transmissions to pass throught the NCU. Each EPUU can function automatically as a relay for other EPUU's. The EPUU will have manpack, vehicular and airborne versions and operates in the 420-450 (UHF) range using time division multiple access (TDMA), spread spectrum and frequency hopping techniques. These capabilities allow for multiple users within the network to operate simultaneously and provides an exceptional ECCM advantage.

(2) EPUU Input/Output Interface Box (I/OIB). This device allows tactical data system devices such as the Digital Message Device (DMD), Battery Computer System (BCS), and the VFMED to interface with the EPUU for passing data communications traffic. A unique interface box is envisioned for each data system, e.g., TACFIRE set.

(3) JTIDS Terminal. This is a standard JTIDS terminal which operates in the 960 to 1250 MHz (UHF) frequency range. It is a digital radio, spread spectrum, operating on 124 nets simultaneously. This device has the same ECCM advantages as the EPUU.

(4) PLRS/JTIDS Terminal (P/J Terminal). This unit, a combination of an EPUU and a low-power JTIDS terminal, perform such functions as interfacing EPUU and JTIDS nets and handling traffic for those users who must pass a larger volume of information than is possible with just an EPUU. The interfacing of the EPUU and JTIDS nets allows for PLRS/JTIDS data exchange, lateral communications for coordination and for inter-division and inter-service data communications. The typical deployment of P/J terminals at these larger data user locations will insure connectivity throughout the division area. Fire support units such as the FA battalion, FA brigade, and division artillery will have the P/J terminal. See figure 10-7 for employment of P/J terminals and other system components.

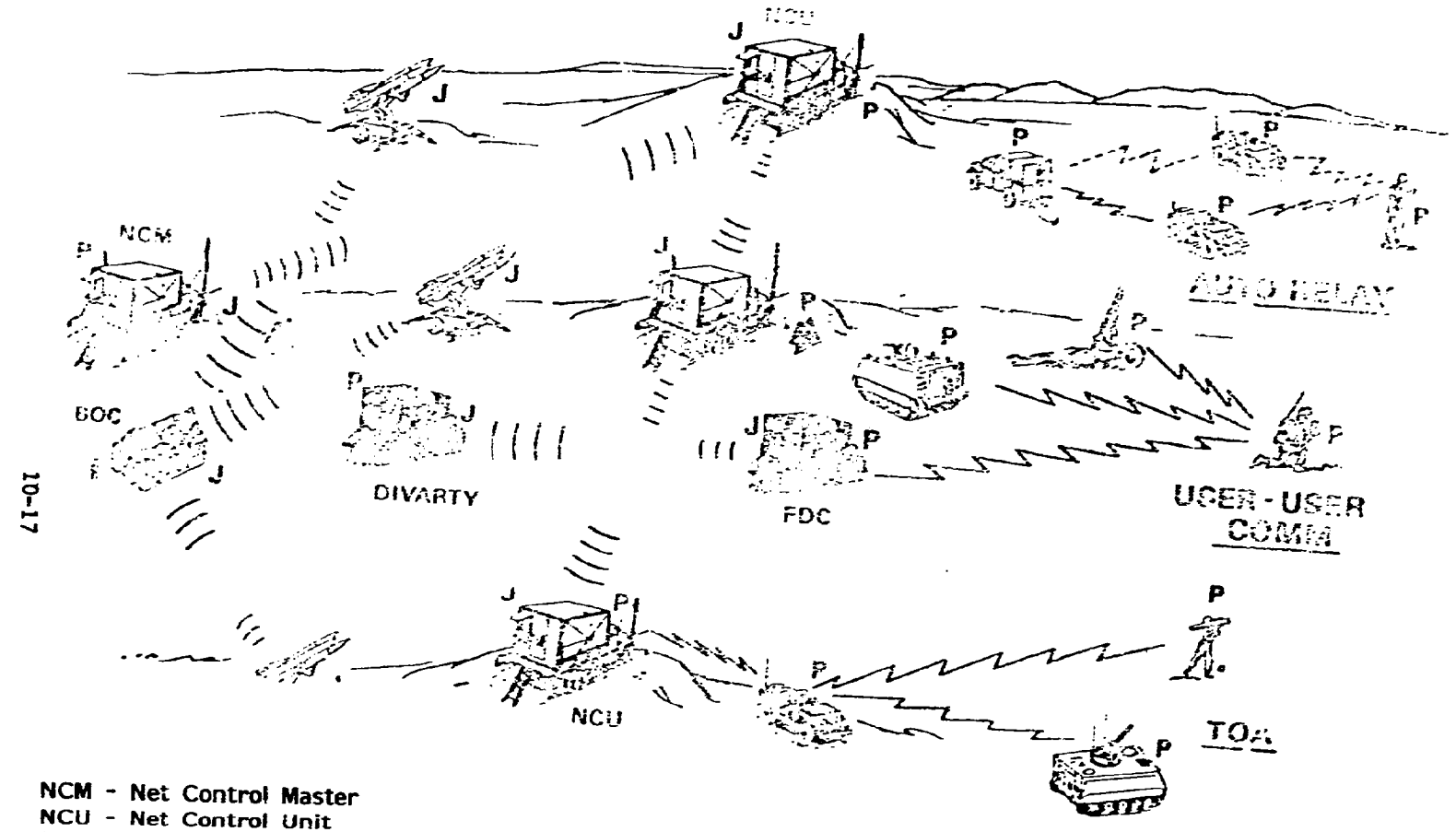


Figure 10-7. Concept Overview

(5) PLRS/JTIDS Net Control Unit or Master (P/J NCU or NCM). The NCU is the central control element of the PLRS/JTIDS Hybrid. There will be five of these S-280 shelter, 2 1/2-ton truck-mounted units in the division area (division main, an alternate and one per brigade). The unit at MAIN is designated as the Net Control Master (NCM); however, all NCU's are physically identical, and any NCU can assume the master station role, if necessary. The NCU performs the following functions:

(1) EPUU and JTIDS Net Management and Control.

(2) Friendly unit position location, identification and distribution.

(3) System Security Control (COMSEC).

(4) Communication status to supported commanders.

(5) PLRS/JTIDS data exchange.

The typical deployment of NCU's in a division is illustrated at figure 10-8. The area serviced by each NCU is indicated by the goose-egg. These areas overlap to facilitate the transfer of users between adjacent areas. The dots in the figure indicate EPUU's.

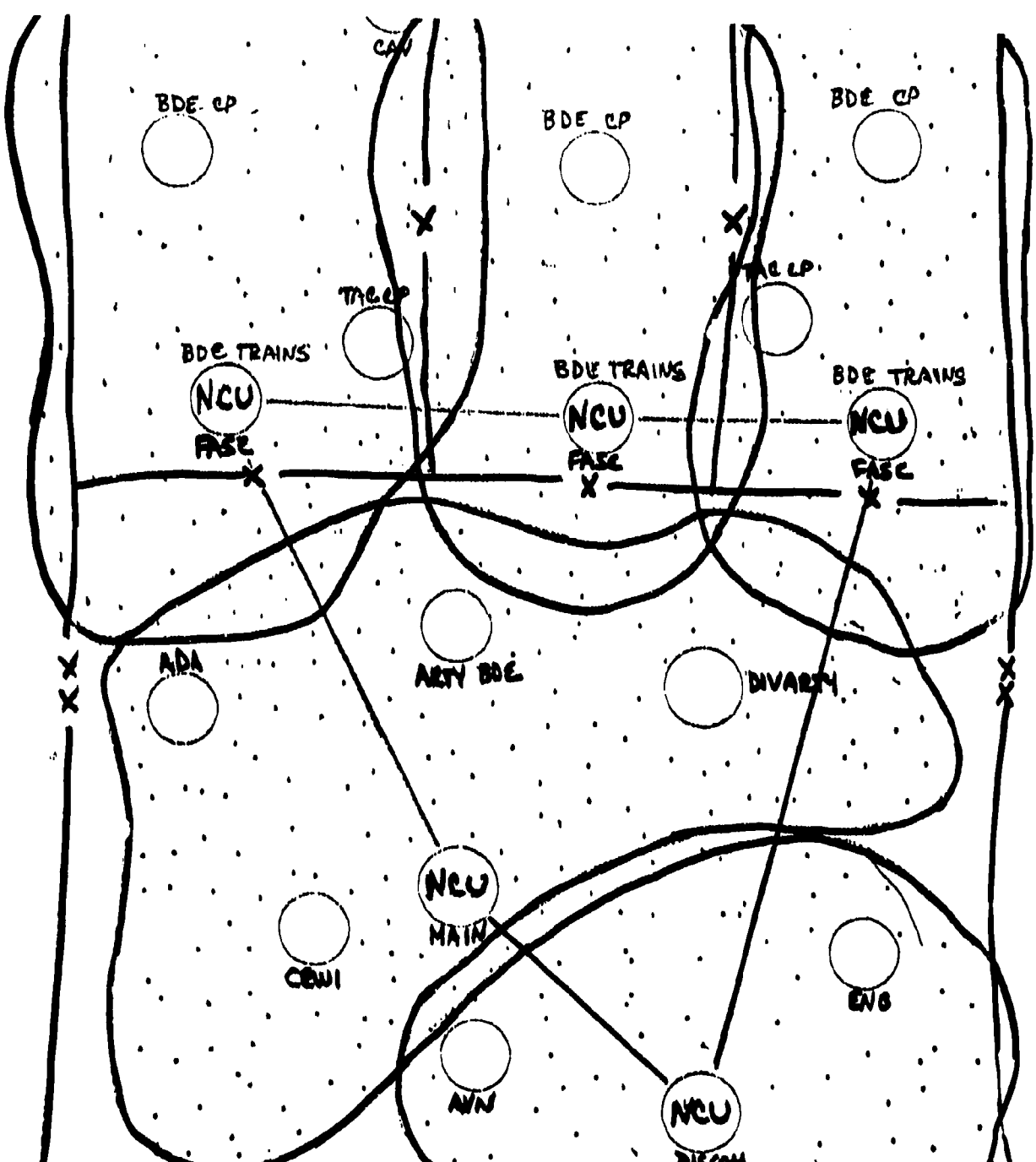
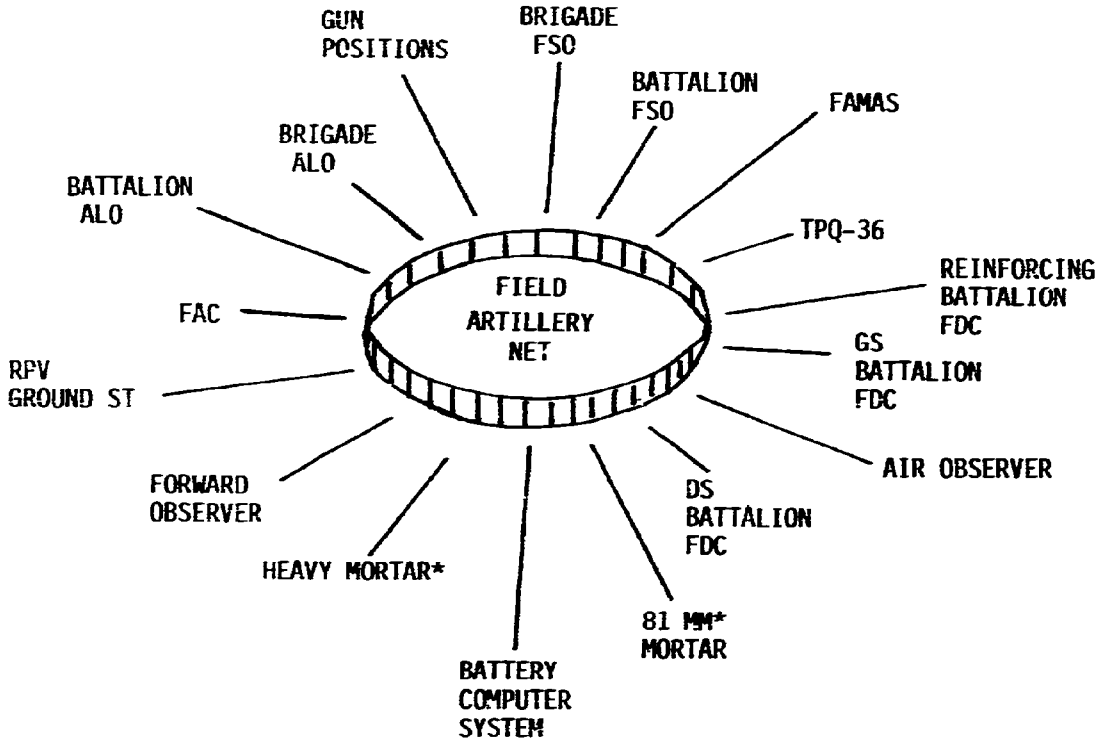


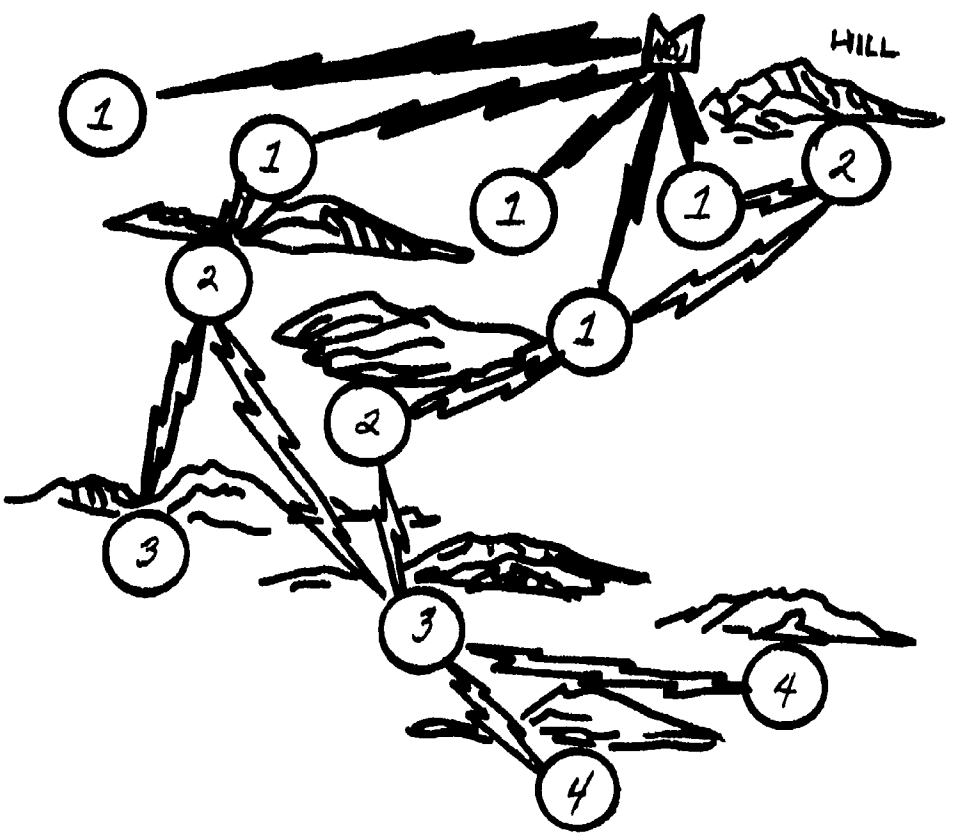
Figure 10-8. Typical Deployment of PLRS/JTIDS NCU or NCM

b. SYSTEM OPERATIONS. This sytem integrates existing PLRS and JTIDS equipment to provide the critical real time data communications support for the mid term battlefield. A typical division system is shown in figure 10-8. This is a data only system so there is no voice/data contentions. The heart of the system is the NCU/NCM which performs net management and control functions. The NCM, in addition, performs the time reference information to the net for position location. Each NCU/NCM controls up to eight (8) non-interfering time division multiple access nets (simultaneous, multiple users). An example of a brigade net structure is at figure 10-9. Each user in a net is assigned one or more time slots, and his equipment is programmed automatically by the slots depending upon the priority established for him and the amount of data required to be transmitted. His equipment is automatically programmed by the NCU/NCM which controls his user unit to transmit and receive only at the assigned times. Each PLRS net has a capacity of 512 time slots of 1.9531 milliseconds duration and each time slot can contain 75 bits of data (plus a 14 bit pre-programmed header). In comparison, the JTIDS nets contain 128 time slots of 7.8125 milliseconds duration and each time slot can contain 225 bits of data. The NCU/NCM insures connectivity between users by automatically programming certain EPUU's to act as relays for other EPUU's. Connectivity duration is based upon pre-established needliness which are stored in the NCU/NCM computer. Up to four relays can be used to insure connectivity (see figure 10-10). If that number is insufficient, the paths are automatically routed to the nearest P/J terminal which in turn routes the circuit to a P/J terminal in the area of the intended recipient EPUU via the JTIDS. The distant P/J terminal then routes to the intended EPUU. The NCU/NCM generates the crypto variables used within the net. The same variable is used for all nets of a division allowing for complete intradivision communications. Each variable is automatically generated, loaded, and implemented throughout the area by the NCM.



Note: *Non-FA TOE Assets

Figure 10-9. Typical FA Net Structure Within a Maneuver Brigade.



Line of Sight to NCU

Non-Line of Sight to NCU

1 Level 1 User/Relay

2 Level 2 User/Relay

3 Level 3 User/Relay

4 Level 4 User/Relay

Figure 10-10. PLRS/JTIDS Coverage Via Relaying.

c. FIST/FSE NEEDLINES. Subscriber needlines are established as a part of the hybrid system initialization. The needlines identify who the subscriber must communicate with and may be modified at any point in time to accomodate special attachments and/or any task organization directed by the maneuver commander. Typical subscriber needlines are listed at table 10-1. The table lists separate entries for the FIST chief and FSO because these personnel may be required to move to the commander's vehicle or may be required to personally communicate with another subscriber.

Table 10-1. FIST/FSE Needlines.

TO / FROM	FO PARTY	FIST HQ	COMPANY MORTAR FDC	BN FSE	BATTALION HEAVY MORTAR FDC	BCS DS BTRY	TACFIRE DS BN	BDE FSE
FO PARTY DECENTRALIZED		X	X	X	X	X	X	
FO PARTY CENTRALIZED		X						
FIST HQ	X		X	X	X	X	X	
FIST CHIEF		X	X	X	X	X	X	
BN FSE		X			X	X	X	X
BN FSO				X	X	X	X	
BDE FSE				X			X	X

d FM RADIO NETS. When the hybrid system is fielded, an FM radio net capability is retained for voice communications and alternate digital channels. All FM nets will utilize the SINCGARS or the AN/PRC-68 radio. These nets will be secured using the VANDAL COMSEC devices with the exception of the AN/PRC-68 nets. The SINCGARS will provide a means for data and voice communications without the contention problem that currently exists with the VRC-12 series radios. AN/PRC-68 should not be issued to the FIST organization until the P/J Hybrid System is fielded. This is due to the limited range of the PRC-68. Dual issue of the P/J user unit and the AN/PRC-68 will replace the AN/PRC-77 and ultimately provide redundant means for the FIST to communicate but without a significant increase in weight. The P/J user unit is expected to be issued prior to the SINCGARS.

(1) Company Fire Control Net (CFC) FM (voice). The net is a regularly installed net, used within the company/troop for the following purposes:

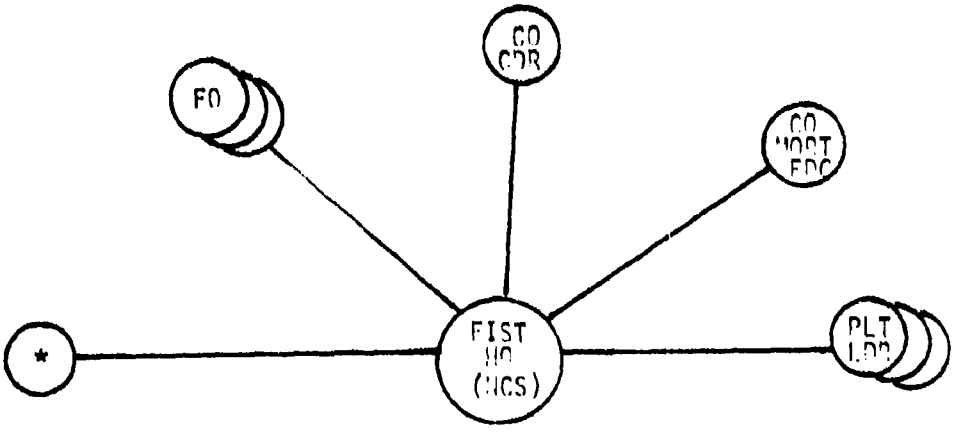
(a) Administrative FIST traffic.

(b) Fire support traffic between company/troop commander, platoon leaders and FIST elements.

(c) Alternate fire request net if the hybrid system is not available.

(d) Fire request net, digital of voice, for elements not equipped with the hybrid system, e.g., maneuver platoon leaders.

Net subscribers are illustrated at figure 10-11.

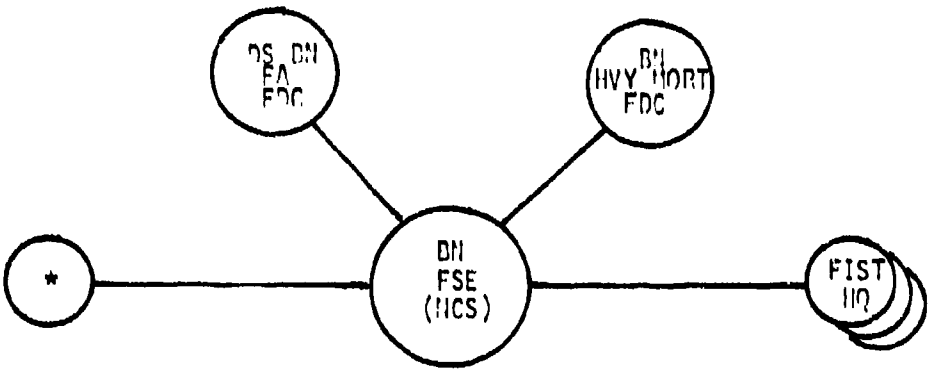


*Attached maneuver unit, FO or FIST Chief operating from separate location.

Note. In armored cavalry units the net title is Troop Fire Control Net (TFC).

Figure 10-11. Company (Troop) Fire Control Net Subscribers.

(2) Field Artillery/Mortar Fire Direction Net (FAMFDC) FM (voice). A combined net replaces the separate FA and battalion heavy mortar FD nets currently used by the FA DS battalion and maneuver battalions. This conceptual net provides a means for conduct of fire support coordination by voice means when utilizing the hybrid system and as an alternate means for digital traffic during a period when the hybrid network is non-operational or when critical digital subscribers have non-operational hybrid equipment. Net subscribers are illustrated at figure 10-12.



*FSO when separated from FSE or additional fire support assets.

Figure 10-12. Field Artillery/Mortar Fire Direction Net Subscribers.

c. Command Nets. Introduction of the hybrid digital equipment does not eliminate the requirement for FM voice command nets. Selected nets and the associated FIST/FSE subscribers are listed at table 10-2.

Table 10-2. Selected FM Command Nets and FIST/FSE Subscribers.

Net	FIST	BN FSE	BDE FSE
Maneuver Company Command	X		
FA Bn Command		X	X
Division Artillery Command			X
Maneuver Battalion Command		X	
Maneuver Brigade Command			X

e. FIST/FSE COMMUNICATIONS EQUIPMENT

The requirements for PLRS/JTIDS Hybrid, FM radio, and digital equipment required for the implementation of the hybrid system in a ten-man FIST and the maneuver battalion/brigade FSE are listed at table 10-3.

Table 10-3. FIST/FSE Communications Equipment Requirements.

	EPUU I/OB	AN/PRC-68 Vehicular Mode*	AN/PRC-68 Hand-Held Mode*	AN/VRC-46 SINCGARS Equivalent	AN/GRC-160 SINCGARS Equivalent	KY57 OR VANDAL	DMD	FIST DMD	IMPROVED VFMED
FO PARTY (EACH)	1		1				1		
FIST HQ	1	1		1	1	1		1	
FIST CHIEF (SPLIT OPS)	1		1				1		
BN FSE	1			2		2			1
BN FSO (SPLIT OPS)	1				1	1	1		
BDE FSE	1					1			1
BDE FSO (SPLIT OPS)	1				1	1			

Note: *May be replaced by a SINCGARS equivalent.

f. COMMUNICATIONS CHANNELS. Communications channels for the FIST/FSE are illustrated in figures 10-13 through 10-16.

a. Digital Fire Planning channels are illustrated at figure 10-13. When voice requests for fire are received, they are placed in digital format at the receiving agency, e.g., FIST or FSE and then re-transmitted via the digital device.

(2) The FM radio nets used primarily for voice fire support coordination and command are illustrated at figure 10-14. The DMD and FM radio may be used for transmission of digital traffic in the event the hybrid system, or a portion thereof, is unavailable.

(3) Figure 10-15 illustrates digital fire request channels on the hybrid sytem when the FIST is operating in the centralized mode; i.e., all platoon FO requests for fire are first submitted to the FIST HQ.

(4) Digital fire request channels on the hybrid system with the FIST operating in the decentrilized mode are illustrated at figure 10-16. In the decentralized mode the FIST chief may direct one or more platoon-observers to send fire reuqests directly to a fire support agency.

(5) Further combinations of the net structure and operational procedures are limited only by the ingenuity of the user. The availability of communication means will determine the system architecture within the Bde/Bn/Co areas.

(6) SINCGARS equivalent radio configuration

AN/VRC-46----------SINCGARS V(5)

AN/GRC-160----------SINCGARS V(3)

AN/PRC-68----------SINCGARS V(1)

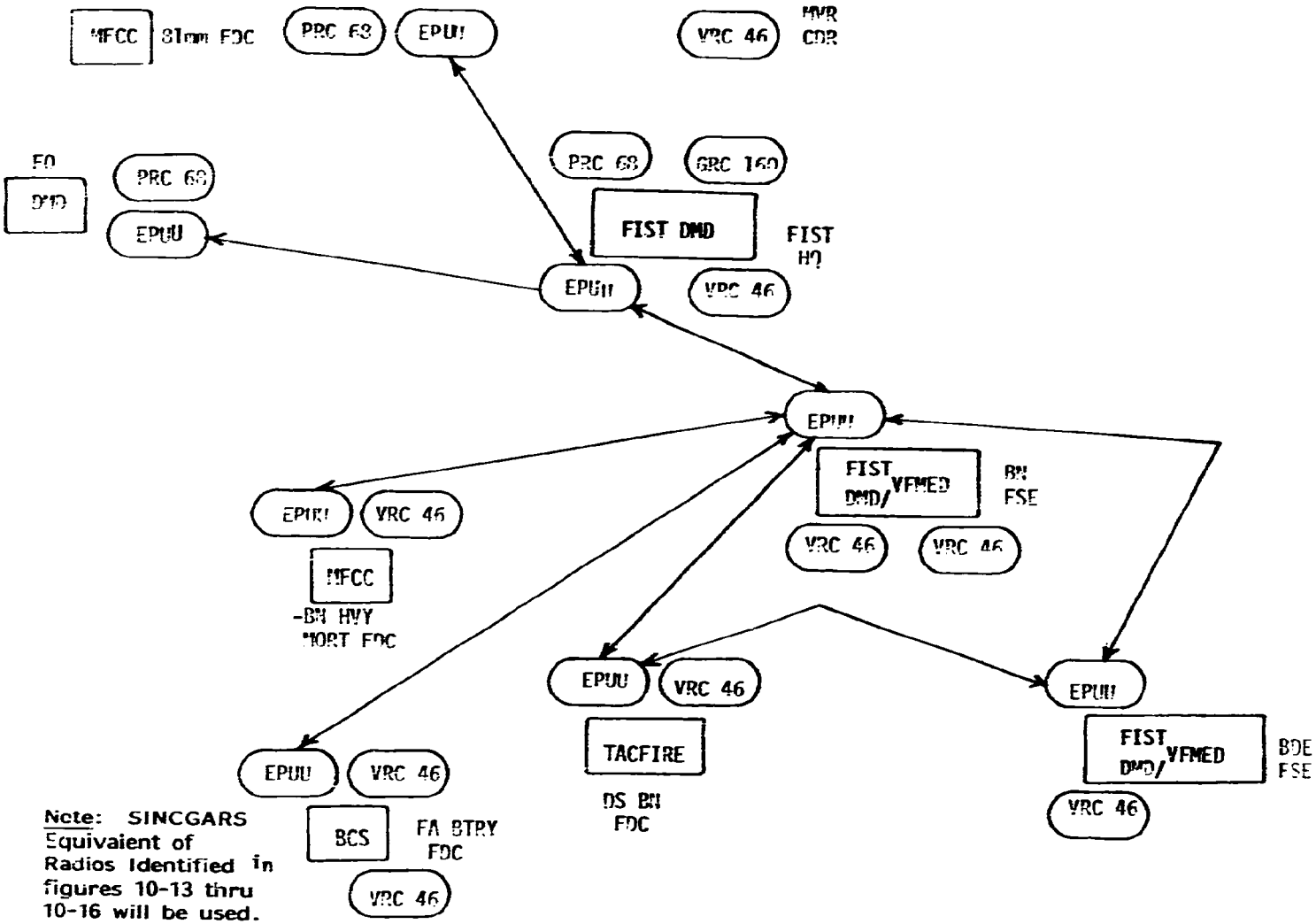


Figure 10-13. Digital Fire Planning Channels Using the Hybrid System.

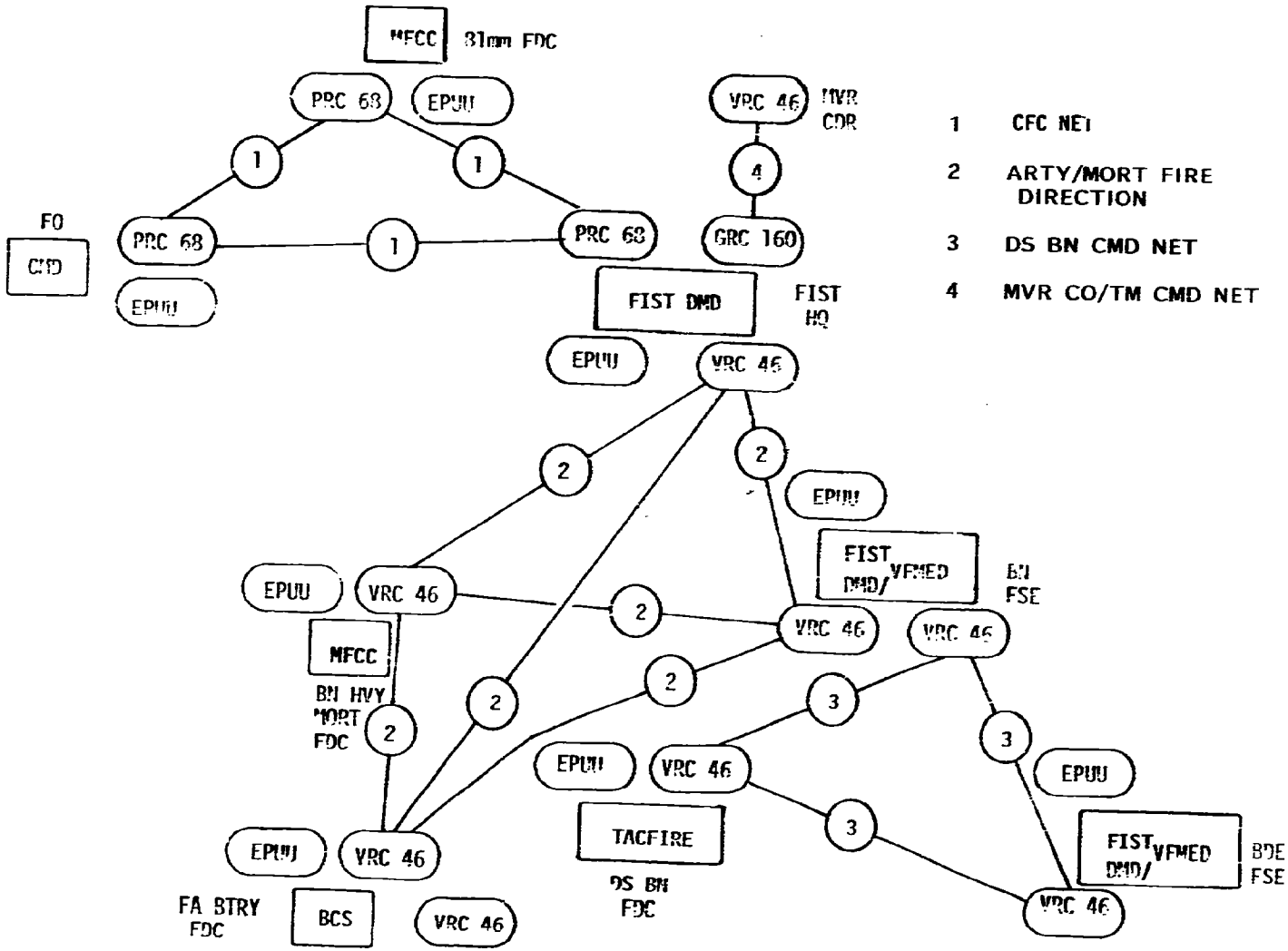


Figure 10-14. FM Radio Nets Available for Fire Support Coordination.

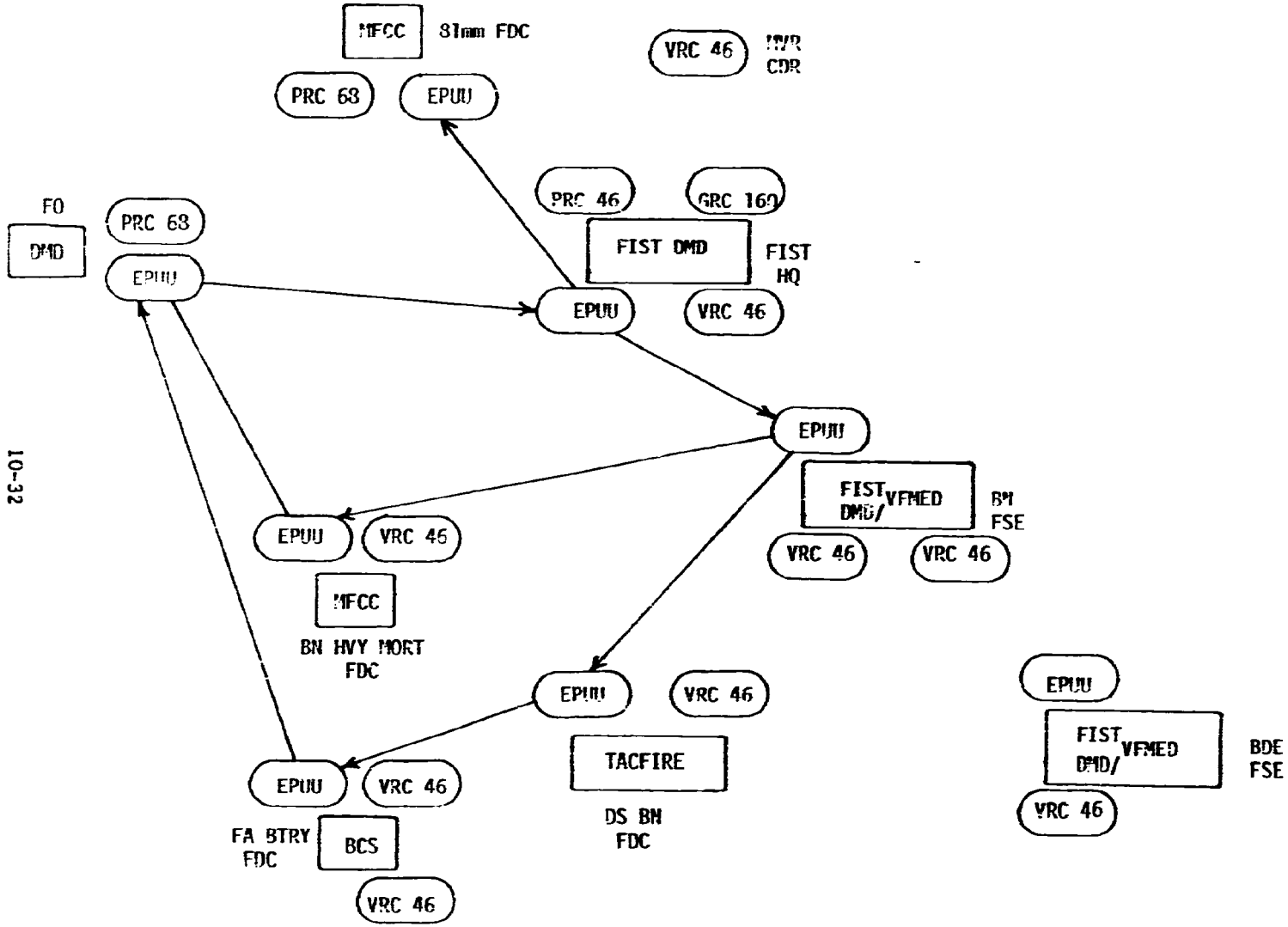


Figure 10-15. Centralized Fire Request Channels on the Hybrid System.

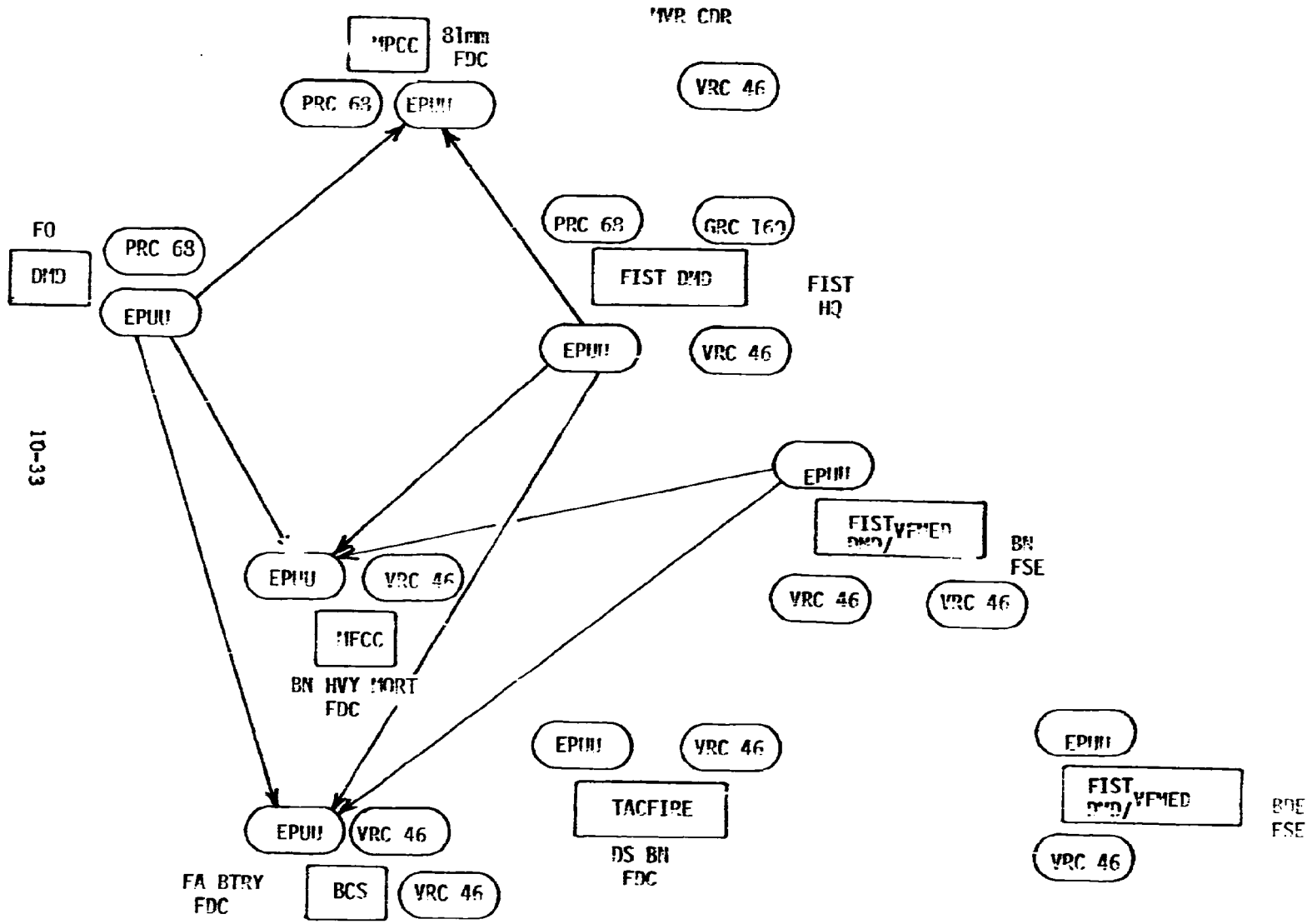


Figure 10-16. Decentralized Digital Fire Request Channels on Hybrid System.

Findings.

- The fielding of the PLRS/JTIDS Hybrid does not eliminate the requirement for fire support voice coordination.

- Voice coordination will be accomplished by SINCGARS radios and/or the AN/PRC 68. The following voice nets appear to be optimal for fire support voice coordination:

NET	SUBSCRIBERS (MINIMUM)
CFC	FIST HQ (NCS), FO PARTY, CO MORATAR FDC
FAMFD	BN FSE (NCS), DS FA BTRY FDC, BN HEAVY MORTAR FDC, FIST HQ (4 ea)
MVR CO COMMAND	CO CDR (NCS), PLT LDRS (3 ea), FIST HW
MVR BN CMD	MVR BN CDR S-3 (NCS), GN FSE, CO CDR
FA BN CMD	BN FDC (NCS), BDE FSE, BN FSE, BTRY FDC
DIV ARTY CMD	DIV ARTY TOC (NCS), BN FDC DIV FSE, BDE FSE

- Voice communication channels could be used as a backup means for digital transmission.

- FA need lines and equipment requirements are as stated in Tables 10-1 and 10-3.

10.3.7 Issue. What fire support representation is required for the aerial maneuver units of the DIVISION 86 force structure?

Discussion. CSSG II Phase I recommendations include a three-man (one officer/two enlisted) fire support section, (FSS) for each air cavalry troop and attack helicopter company. Fire support representation at the platoon level is provided through the employment of supporting division FA air observers (FAAO). The detailed discussion on these requirements is provided in Chapter 8, Aerial Maneuver.

In the DIVISION 86 force structure divisional air cavalry and attack helicopter companies are combined in an Air Cavalry Attack Brigade (ACAB). The ACAB consists of two air cavalry attack squadrons (ACAS), each containing four air cavalry attack troops (ACAT) (See figure 10-6). A comparison of the current and DIVISION 86 organizations is shown below.

CURRENT ORGANIZATION	FIRE SUPPORT REPRESENTATION	COMPARABLE DIVISION 86 ORG
None	None	ACAB
Attack Helicopter CO/ Air Cavalry Troop	Three-man Fire Support Section	ACAS
Attack Helicopter PLT/ Air Cavalry Team	FAAO	ACAT

A comparative analysis of the above organizations indicates that the fire support requirements of the DIVISION 86 organization can be accomplished through the use of the fire support section in the ACAS and the employment of FAAO's in support of the ACAT. The operational concept is similar to the CSSG II recommendation, i.e., the section advises the squadron commander of the employment of the fire support, coordinates fire support requirements with higher and lower fire support representatives, and coordinates the activities of the FAAO's employed in support of the ACAT's. Fire support rpresentation is also required at the brigade level (ACAB). CSSG II analysis indicates that this requirement can be met by an FA staff officer (FSO), in the grade of major. His duties are similar to those described earlier for the fire support section. He is the FSCOORD for the ACAB.

Nonmechanized divisions have not been studied; however, assuming that one ACAB is organized per AIM division, a space savings of forty three personnel, compared to the CSSG II recommendations for the sixteen division active force structure, will occur. This saving is illustrated in table 10-4.

Table 10-4. ACAB Personnel Requirements Divisional

	SPACE REQUIREMENTS			
	FIRE SUPPORT SECTION		FA STAFF OFFICER (FSO)	
	CSSG II	DIV 86	CSSG II	DIV 86
1. Divisional Requirements-				
Armor/Mechanized Infantry	9	6	0	1
Infantry	12	6	0	1
2. Force Structure				
Armor Divisions (4)	36	24	0	4
Mechanized Infantry (5)	45	30	0	5
Infantry (5)	60	30	0	5
TOTAL	141	84	0	14

3. Net Reduction = 141 - (84 + 14) = 43

Findings.

- A three-man fire support section (Captain, E7, E4/3) organized in a manner similar to CSSG II recommendations for current aerial maneuver units is required for the air cavalry attack squadron (ACAS).

- A field artillery staff officer (FSO), in the grade, of major, is required as the fire support coordinator for the air cavalry attack brigade.

10.4 SUMMARY OF FINDINGS

10.4.1 Removal of the 81mm mortars at the infantry company level as a fire support asset was partially offset by the addition of two additional heavy mortars at the battalion level. Battalion level mortars will provide necessary suppression and illumination.

10.4.2 Platoon FO's are still required to accomplish fire support tasks. Organizational changes pertaining to the size of the infantry squad/platoon does not decrease the requirement for a platoon forward observer party. The platoon leader will not have sufficient time to handle both the infantry and fire support tasks required. The majority of his time will be devoted to his infantry tasks to include the use of the IFV. A platoon FO party, trained to handle the fire support tasks such as calling for and adjusting fires, provides this necessary and essential support.

10.4.3 The DIVISION 86 force structure is tentatively programmed to provide sufficient FIST and FSS to the various maneuver units. However, the proper mix of these fire support personnel and equipment assets to support maneuver units has not been developed. Additional FIST are required to support the additional maneuver company per battalion.

10.4.4 The addition of maneuver companies to the DIVISION 86 force structure has not increased the overall requirements for larger battalion fire support sections. The currently envisioned four man FSS at the battalion and brigade level can handle the fire support tasks.

10.4.5 Current FA communications means cannot accommodate the addition of a fourth maneuver company and its FIST without overloading. Solutions to this problem include adding more communications nets which, although increasing subscribers through a given data terminal, allows the FDC to structure nets on data terminals as the need dictates; continued development of a pure digital communications system which will be responsive to the number of planned subscribers and would interface with current TACFIRE equipment. Effective utilization of existing "F" nets must be stressed until a responsive digital system can be fielded.

10.4.6 The fielding of the PLRS/JTID hybrid does not eliminate the requirement for a voice capability for fire support coordination. This voice coordination will be accomplished by SINCGARS and the AN/PRC-68 radio. The AN/PRC-68 should not be issued until the EPLRS is fielded. The voice nets established provide an alternate means, if necessary, for digital traffic.

10.4.7 With the reorganization of aerial units into the DIVISION 86 structure, fire support representatives are still required at the ACAS and ACAB level. A three man FSS is required at each ACAS, while an FA staff officer (FSO), is required at each ACAB. These individuals would continue to coordinate the fire support requirements for the aerial maneuver units. An overall reduction in the FSS can be recognized upon implementation of the ACAB concept.

10.4.6 The fielding of the PLRS/JTID hybrid does not eliminate the requirement for a voice capability for fire support coordination. This voice coordination will be accomplished by SINCGARS and the AN/PRC-68 radio. The AN/PRC-68 should not be issued until the EPUU is fielded. The voice nets established provide an alternate means, if necessary, for digital traffic.

CHAPTER 11

CLOSE AIR SUPPORT

11.1 Introduction. Close air support (CAS) is defined as air attacks against hostile targets which are in close proximity to friendly forces and which require detailed integration of each air mission with the fire and movement of those forces (JCS Pub 1). This chapter will concentrate on that close air support which directly involves the company fire support team (FIST).

11.2 Current Concept. The current concept for employment of CAS is for such support to be employed as a fire support asset. The responsibility for insuring the coordination of CAS with other fire support assets lies with the FSCOORD at each maneuver echelon. To assist in this coordination process, the air force provides representation to each maneuver echelon above company level. This Air Force representation, the tactical air control party (TACP), advises on the employment of CAS, and provides for the execution of such support. The TACP's provide the communications interface between the ground and air forces. They are concerned with tactical air support provided by US air forces, and with that support provided by the air forces of allied nations. While the bulk of the CAS for Army forces is provided by the US Air Force, support can also be provided by US Marine or Naval Air. Representation for US Marine or Naval Air is provided to battalion, brigade and division levels by members of the air and naval gunfire liaison company (ANGLICO). Their functions parallel those of the Air Force TACP. Air Force TACP's are deployed with Army forces on a full time basis, whereas the ANGLICO is provided only when support is provided by Marine or Naval Air. These representatives, either USAF TACP or the ANGLICO, will normally provide the total functions required for the execution of CAS. However, considering that this representation is not normally provided below maneuver battalion level (with the provision existing to deploy representation to one company at a time), the FIST has been tasked with assisting in the execution of CAS attacks. Further detail regarding the current concept for the employment of close air support is contained in FM 6-20, Fire Support in Combined Arms Operations, and is detailed herein, as applicable to specific issues.

11.3 Background. The following provides a background regarding the development of current and proposed doctrine for employment of CAS. A concept paper approved by the Chiefs of Staff of the Army and Air Force in 1965, provided the basis for joint air-ground doctrine. The 1965 letter of agreement was by and large predicated on the threat that existed at the time; particularly the threat encountered in Southeast Asia. As attention began to shift toward the mid-intensity, Central European Threat, new concepts for CAS began to emerge. The significant threat posed by sophisticated air defenses necessitated an immediate reevaluation of forward air controller (FAC) procedures and concepts of operation. A joint Tactical Air Command/ Training and Doctrine Command (TAC/TRADOC) task force was convened in 1975 to accomplish the needed evaluation, to include requirements for interface and coordination with ground forward observers in the 1976-1985 time period. The Forward Air Controller/Forward Observer (FAC/FO) task force concluded

that the airborne forward air controller (AFAC) could not survive while performing the classical FAC mission of locating and identifying targets, and providing control to attack aircraft. The task force recommended that a FAC would be situated in a fixed-wing aircraft and displaced rearward to counter the air defense and communications jamming threats. The airborne FAC would function as a coordinator, relaying CAS requests to the air support operations center (ASOC), assigning targets to inbound fighters, and providing target briefings to the attack flights. In the absence of a ground-based FAC with the maneuver battalion, the Army FO (FIST) would act as the "eyes" of the system, providing visual target identification and target location information. The concept stated that attack clearance would be given by the airborne FAC at the orbit point, but that both the battalion ALO and the company FO would retain a cancel option.

Close air support missions would be controlled by the airborne FAC and the ALO at the maneuver battalion command post. There would be no direct communications between the Army requestor and the attack aircraft; the FO would be in communication with the ALO.

The report of the 1975 FAC/FO Interface Task Force was briefed to Army and Air Force major commands and responses indicated a need for additional study. A follow-on task force was convened in 1976 to continue the study effort in three phases. First, the concept developed in 1975 was to be refined and specific procedures developed, based on comments/procedures/systems that surfaced during the world-wide briefings. Next, procedures developed in phase I were to be tested in joint exercises. Phase III was to be the development of a joint procedures manual.

The follow-on FAC/FO task force that met in 1976 refined the 1975 study's close air support organizational and operational concepts. This task force proposed procedures to be used by the forward observer (now FIST chief) in conjunction with the ground forward air controller (GFAC) or during the absence of a GFAC when one is not available or positioned for the conduct of CAS attacks. Many features of the 1975 FAC/FO study report were retained - but organization of the Air Force tactical air control system (TACS) which the 1975 study had recommended changing significantly, was again modified to conform more closely to that described in the 1965 joint agreement. The 1976 FAC/FO study group also addressed in greater detail problems associated with command and control of close air support in an environment of intense electronic warfare. The group proposed that Army FM communications channels be used as a backup for more vulnerable Air Force high frequency channels in processing requests for close air support.

The 1976 FAC/FO Interface Task Force report also recommended the following areas for detailed testing:

- The effectiveness of the Army FO in locating targets, processing air support requests, identifying targets to attacking aircraft, providing abort instructions and bomb damage assessment.

- The effectiveness of primary (Air Force) and alternate (Army) communications channels used to transmit air requests, responses, target update data, marking coordination, battle damage assessment, strike control, terminal control, and fighter briefings. These means were to be tested for degradation by jamming and heavy radio traffic using various techniques such as chattermark, brevity codes, terrain masking, burn through, and directional antennas.

- The methods of coordination, and timing procedures for target marking.

- The ability of attack aircraft pilots to acquire targets in different battle situations and the related risks involved to the maneuver unit commander.

- The ability of the ground forward air controller to operate from the Army observation helicopter in a high threat environment to include the ability to acquire/designate targets as well as communicate, coordinate, and control CAS missions while operating from a helicopter nap-of-the-earth (NOE) profile.

- The feasibility of using laser designator equipment in support of the tactical air control system.

In response to a directive from the TRADOC commander, the Field Artillery School began teaching CAS procedures to officer basic course (OBC) students in December 1976. Instructions cover the Army Air-Ground System and the Tactical Air Control System and the concept and procedures contained in the 1976 FAC/FO Interface Task Force report; culminating in a field exercise in which each student actually directs a CAS attack under supervision of qualified FAC's. Aircraft deliver practice ordnance and in March 1977, the exercise was modified to include one live ordnance drop per class (500-pound bombs).

During 1977 representatives of both the Army and Air Force prepared a test plan for joint TAC/TRADOC testing of the concepts and procedures published by the 1976 FAC/FO Interface Task Force. A joint field test/tactics development and evaluation (TD&E) was scheduled to be conducted at Nellis Air Force Base, Nevada, in January - February 1978. Lack of sufficient funds for the test forced postponement, and a joint planning conference was convened in January 1978 to prepare a modified test plan and establish justification so the test could be conducted in FY79.

At the joint planning conference, test objectives were reviewed and it was determined that there was considerable overlap with other tests, both completed and in progress. It was also questioned whether the planned test would produce anything new since by the time the test could be commenced, USAFAS would have been teaching procedures for emergency control of CAS for more than two years. The planning conference recommended that the TD&E be cancelled, and that a training circular be prepared to provide a basis for field evaluation by Army and Air Force units in the field. The training circular would contain FAC/FO interface concepts, techniques, and training requirements: Need for a TD&E would be reconsidered after units had had a chance to evaluate and comment on the training circular.

The joint planning group's recommendations were approved by TAC and TRADOC, and USAFAS was tasked in January 1978 to take the lead in preparation of a joint training circular. This circular was forwarded to TRADOC in March 1978. The draft was reviewed by the Air Land Programs Office at HQ, TAC (TAC ALPO) and USAFAS was tasked to expand the scope to include emphasis on means of countering the EW Threat; coordination procedures required for the ground FAC to control and distribute aircraft to several FIST's; techniques and procedures required for FIST's to use in coordination with Airborne FAC (either helicopter or fixed wing); and techniques and procedures required when, due to emergency, control shifts from a FAC to ALO's at different echelons while a FIST continues to provide direction. In effect, the TAC response was to ask USAFAS to undertake a tactics development study, since the additional areas had not been addressed by either the 1975 or 1976 FAC/FO Interface Task Force.

The Air Land Programs Office at HQ, TRADOC, (ALPO) also reviewed the draft prepared by USAFAS and also requested that it be expanded to cover additional topics not previously addressed, such as the FIST marking targets with the laser designators for hand off to the Air Force PAVE PENNY laser acquisition system.

The additional topics required by TAC and TRADOC ALPO's were beyond the expertise of USAFAS, and consequently, a FAC/FIST Interface Procedures working group was convened at HQ TAC in May 1978. The working group consisted of representatives from USAFAS, the Tactical Fighter Weapons Center, the Air Staff, FAC detachments serving with Army units in CONUS and Hawaii, TAC ALPO, and the TRADOC tactical doctrine office (TRADOC TDO assumed proponency for the training circular from TRADOC ALPO prior to the working group meeting). The working group prepared another draft of the joint training publication, but agreed that certain areas require additional study by individual services before they could be published in a joint manual. These included:

- Communications jamming procedures. Procedures must be developed considering Army and Air Force communications equipment compatibility, and capabilities and limitations.

- Digital communications. Equipment procedures and formats for use in AAGS/TACS and air-to-ground joint communications must be developed simultaneously to insure compatibility.

- Frequency exchange procedures. Methods must be developed and standardized to insure that Army and Air Force elements employing CAS can operate with common frequencies and codes contained in their respective service CEOI/frequency lists.

- Target marking with laser designators. The working group considered this subject but Air Force members objected that no procedure has been developed and thus, none should be published. The main limiting factor appeared to be the tactics to be used by fighter aircraft equipped with PAVE

PENNY. The group concluded that when fighter tactics were developed by the Tactical Fighter Weapons Center (TFWC), ground laser designation procedures could be derived.

After several more drafts, the FAC/FIST Operations Manual (TRADOC Training Text, TT6-20-7/TAC Pamphlet 50-21) has been approved for publication.

The manual is intended to address FAC/FIST operations in general terms, and will not address specific procedures such as frequencies to be used, communications, and command and control procedures to be used for laser designation/hand-off, etc.

Another major area of concern regarding concept is FAC manning levels. The FAC/FIST concept calls for one forward FAC (FFAC) and one air liaison officer (ALO) in each maneuver battalion. The concept also calls for a forward attack coordinator - airborne (FAC-A) operating from a fixed-wing aircraft to the rear of the FEBA, outside the enemy air defense envelope. This concept was first proposed by the FAC/FO Interface Task Force. The following is a quote from the 1976 task force report:

> "It was realized during the course of the Task Forces' work that the retention of a FAC and ALO at battalion level along with provision for FAC's to fill the attack coordination role would result in increased manning requirements. In the past FAC's and ALO's associated with units in reserve provided a surplus from which to meet the shortfall of required ALO's, AFAC's (now FAC-A's) and GFAC's (now FFAC's) for units in combat. On the modern battlefield, however, it is likely there will be no sizable reserve and hence no surplus pool of qualified FACs. Under these changed circumstances, an increase in the number of FAC's available appears to be justified in order to maintain the quality of CAS at a high level.

Recent coordination with TAC ALPO reveals that there never has been an increase in worldwide FAC manning. Air Force manning documents still authorize FAC's on the basis of two per maneuver battalion TACP, with no extras authorized to fulfill the FAC-A role; however, indications are that each Army maneuver battalion can expect to receive only one officer in the deployed TACP to function in both the ALO and F-FAC role.

The FAC/FIST concept described in TRADOC Training Text 6-20-7/TAC Pamphlet 50-21 states that the FIST will direct CAS attacks only in situations when an F-FAC cannot observe the target area. When the FIST is required to perform F-FAC duties, the CAS mission will be indirectly controlled by the ALO at the battalion TACP. If the TACP consists of only one officer (the ALO) then a F-FAC will never be available and FIST's will direct all CAS attacks.

In addition to studies of the FAC/FIST interface problem, other studies have been devoted to CAS. A battlefield systems integration study was conducted by the Joint Army Science Board/Air Force Scientific Advisory Board in Summer 1978. One task group of the study panel examined CAS allocation and engagement and recommended means to streamline these processes to improve responsiveness of CAS. A major recommendation of the study group was to modify the preplanned and immediate request procedures detailed in the 1965 Army/Air Force letter of agreement and in current doctrine, and to instead, allocate sorties to divisions and brigades. Once allocated, these sorties would become, in effect, on-call missions that would be flown upon request of the Army Commander to whom the sorties are allocated. This study also recommended means of countering the EW threat and specific procedures for joint use of laser devices.

11.4 Issues. The study group examined all aspects of CAS. Issues surrounding this examination are surfaced in regard to the general areas addressed.

a. ISSUE: What are the appropriate terms to identify CAS requests by fire support personnel?

Discussion. Although the terminology associated with CAS is a subject which may go beyond the purview of the CSSG II, discussions revolving around the total concept indicated difficulties with some of the current terminology. Two specific terms which were found either inadequate or inappropriate were "preplanned" and "immediate" as associated with types of CAS requests. The generally accepted connotation of these terms is that a preplanned mission is one where the request is submitted hours prior to the desired time of attack, whereas an immediate request indicates that the attack is desired as soon as possible, and that the target has not been planned. For the fire support personnel, there are two basic categories of targets - planned targets, and targets of opportunity. A planned target can be further categorized as one on which attack is desired at a specified time, or one where it is anticipated that attack will be desired, but the exact time is unknown.

The current terms "preplanned" and "immediate" do not adequately serve to describe the desires of fire support personnel. For example, an immediate request might be for attack of a target which was planned but not scheduled for a specific time. Use of standard fire support terminology, that is, planned, scheduled, etc., would provide a uniformity of understanding throughout fire support channels. This terminology appears in FM 6-20, Fire Support in Combined Arms Operations. One possible shortcoming in the use of such terminology is that there is no provision for identifying an urgent requirement. In such situations, the term "immediate" might be appropriate for use as a warning order within the request, with this term alerting fire support personnel and subsequently Air Force personnel to the immediacy of the requirement. All other requests should be referred to merely as "close air support requests" which would be further identified, based on the desired time of attack, as either scheduled or on call. With regard to identification of CAS targets, one additional term was found to be required - "predesignated target zone (PTZ)."

This term, which is currently in the stages of adoption into formal terminology documentation, serves to define an area in which CAS is desired. There is no current terminology which adequately describes such an area, and the term is therefore considered needed.

Findings.

- CAS should not be categorized as preplanned and immediate, but rather the term "immediate" should be used only as a warning order in the request.

- Doctrine for CAS, and glossaries which identify terminology (NATO glossary, JCS Pub 1, etc.) should expand the definitions of planned target, scheduled target, on-call target, and target of opportunity to encompass CAS usage.

b. ISSUE: What is the role of CAS when employed with the attack helicopters?

Discussion. Concepts are currently being developed and refined for employment of attack aircraft in conjunction with attack helicopters as a joint aerial attack team (JAAT). This concept is based primarily on the characteristic capabilities of the A-10 attack aircraft - those capabilities closely paralleling the capabilities of the attack helicopter. The basic concept places the attack aircraft under the tactical control of the attack helicopter unit. The significance of such employment from a fire support standpoint, is that the attack aircraft in this concept are employed essentially as a maneuver weapons system versus a fire support system. A dichotomy exists between the employment of the A-10 with the JAAT and in a CAS role. Several questions arise concerning such employment:

1 - What is the role of the FSCOORD regarding such employment? Doctrinally, the FSCOORD at each echelon of command has been charged with the coordination of all fire support for the maneuver commander. Attack aircraft have been identified as a fire support system, with the FSCOORD being charged with the overall coordination of their efforts. However, in the JATT concept, the attack aircraft could be associated as a maneuver system and not coordinated with other fire support assets. While this presents some basic problems caused by the responsibility for coordination of aircraft shifting from one role to another, the most significant problem comes in transitioning the aircraft from a maneuver role back to a fire support role, should the situation dictate. For example, when the FSCOORD identified a need to employ fire support assets, does he consider only those assets normally associated with this role, or can he also consider those A-10 aircraft which are performing a maneuver role with the JATT? Going more spcifically into such an example, the FSCOORD might identify the need to attack targets which are suitable for attack with either precision guided field artillery munitions, attack aircraft, or a combination of the two systems. Those attack aircraft being employed in conjunction with the attack helicopters are not being coordinated through the FSCOORD, and he is not therefore in a suitable position to consider their use. Even if it was determined that such aircraft

should be employed against the target, it would require that they be diverted from the maneuver weapons role to the fire support role. This would require the shifting of their coordination channels.

2 - What is the role of the ALO or FAC with regard to employment of attack aircraft in the joint attack team? The TACP normally works with and through the FSCOORD in the coordination of CAS. The value of this party in coordinating efforts of attack aircraft dictates that they be closely involved with the employment of attack aircraft within the JATT. This would necessitate that they work through maneuver operations channels versus, or in addition to, the normal fire support channels. This becomes critical when a member of the TACP joins the JATT command and control element. Under these circumstances, the air force representatives would have to work back through the maneuver channels and if the availability of such representation were limited, additionally this same individual would also work through fire support channels to provide for the coordination of CAS in a fire support role.

3 - At which point in time, or at which echelon are attack aircraft sorties identified for use in a JATT or as CAS, and what is their status upon such identification? It is envisioned that the determination to devote CAS sorties to the JATT would be made at the echelon which deploys the attack helicopter assets, i.e., divisions or corps level. The specific question that arises is whether once the attack aircraft sorties are identified for either use, are they then available for consideration of use in the other role, i.e., fire support. For example, if a division had a total of 20 A-10 sorties available, and the decision was made to employ ten of those sorties with the attack helicopter company, does the FSCOORD address the availability of 20 sorties or the availability of 10 sorties (considering that 10 sorties are being employed as a maneuver asset)?

4 - How will suppression of enemy air defenses (SEAD) be handled? The assumption has been made that the JAAT will be able to operate in a SEAD environment. Fire support planning and coordination for suppression must be accomplished. Whether this is done by the team leader or the fire support representative is part of the question. The FSCOORD should be greatly involved in the SEAD operations, and the planning and execution of these fires. These and other questions are raised, not to question the viability of the JAAT concept, but rather the "formalities" surrounding such employment.

Employment of attack aircraft as both fire support and maneuver intermittently surfaces some problem areas. However, if the aircraft are coordinated purely as fire support assets regardless of the actual method of employment, overall procedures are greatly simplified. Attack aircraft support would be requested and coordinated through FS channels. When employed with attack helicopters, this coordination would be accomplished by the fire support section (note - CSSG II found in Chapter 8, Aerial Maneuver, that attack helicopter companies/air cavalry troops should be provided with a three-man (FSS). The actual directing of attack aircraft in the JAAT would be considered as the integration of FS with maneuver, i.e., integration of attack aircraft with attack helicopters, and could be accomplished as a joint effort of the fire support representative and the attack helicopter company commander.

Findings. When attack aircraft are employed in a JATT, they should be addressed as a fire support asset, supporting the attack helicopter unit.

c. ISSUE: What communications channels should be used for the requesting of CAS?

Discussion. Two channels of communications have been identified for requesting CAS. Immediate requests are processed through air force communications equipment directly from the tactical air control party (TACP) located with the maneuver battalions, brigades, and divisions to the direct air support center (DASC) located at corps. The range of the communications equipment permits direct transmission from the lowest echelon (battalion) to the DASC, whereas use of conventional FM communications would normally require the relaying of the request. The second communications channel relies on normal Army communications systems, be it radio, wire or messenger, where requests for preplanned air strikes are submitted through each succeding echelon. The problems associated with these communications channels lie primarily in the doctrine establishing them. In the case of the immediate requst originating at company level, the company commander is identified as sending the request to the battalion FSE over the battalion command net (see FM 6-20, Fire Support in Combined Arms Operations). Such a procedure finds the company commander, versus the FIST chief who is the company FSCOORD, requesting fire support for the company. The FIST chief is doctrinally responsible for CAS, and is trained to request this support. Additionally, the battalion command net does not provide a direct link to the battalion fire support element. Although the battalion FSE is in close proximity to such a net monitoring station, it is not one of the normal operating frequencies for the FSE.

A more appropriate channel for requesting CAS at company level is for the FIST chief to request this support over a fire support net in which the FSE is operating. In the planning stages of an operation, this would normally be the direct support battalion command fire direction net, which is used for planning of other targets as well. In subsequent stages of the operation, the CAS requests could be submitted over either the FA fire direction net or the battalion mortar fire direction net. Regardless of which is used, the request would originate in fire support channels, and would be processed through fire support channels. With regard to the two separate channels of communications, the study group found that while two such channels (one Army and one air force) are appropriate, for redundancy purposes, the type of communications should not be determined by the type of request (see issue 11.4a reference terminology). The use of fire support nets for the transmission of CAS requests is deemed appropriate since it would place the request in fire support channels at each echelon. These frequencies can be identified as the FA fire direction net for the FIST to the battalion FSE, the FA command fire or command operations net from battalion to brigade FSE, the division artillery command fire net from brigade to division, and the corps command fire net from division to corps FSE. The air force air request net should be employed as a backup to the primary Army system, or when the speed of transmission would be facilitated by use of the air force nets. The other advantages of using the Army channels as the primary communications means deals with the

EW environment. Multiple short distance transmissions have been found to be less susceptible to enemy jamming and intercept than one long distance transmission. Additionally, the capability to process a CAS request over digital communications nets (see issue 11.4.e) provides a very rapid means for processing requests.

Findings.

- Requests for CAS should be processed through fire support channels.

- Army fire support communications should be considered as the primary communications for CAS requests, with the air force air request net as a backup.

d. ISSUE: What is the role of the S3/G3 Air in the planning and coordination of CAS?

Discussion. Current doctrine calls for involvement of the S3/G3 air personnel in the processing and coordination of CAS and is conflicting in regard to the degree and type of involvement. FM 6-20, Fire Support in Combined Arms Operations indicates that S3/G3 Air personnel receive requests for preplanned CAS and after coordinating with the fire support personnel and air force personnel process the request through S3/G3 Air channels. FM 6-20 indicates that for immediate CAS requests, the S3/G3 Air personnel validate or coordinate the request in conjunction with the air force personnel and the FSCOORD. While FM 6-20 states that at battalion, brigade, and division level the immediate request is monitored by the TACP which coordinates the request with the S3/G3 Air and the FSCOORD, it states that at corps level, it is received by the DASC which forwards it to the G3 Air in the TASE for coordination with the FSCOORD. The significant difference here is the implication that at corps level the request is not coordinated in conjunction with air force personnel and that the FSCOORD is located in the TASE. It is implied in FM 71-1, The Tank and Mechanized Infantry Company Team, while not specifically addressing the processing and coordination of CAS indicates that tactical air support is the responsibility of the task force S3 Air. FM 100-5, Operations, and FM 71-100, Armored and Mechanized Division Operations, while not specifically addressing the processing and coordination of CAS, surface an even deeper problem. FM 100-5, in Chapter 3, How to Fight, alludes to fire support being only field artillery, and FM 71-100, in Chapter 3, Preparation for Combat Operations, implies that the division FSCOORD is responsible for the coordination of only field artillery fires. Furthering this implication, the foldout on page 717 identifies the G3 section of the tactical command post element as having responsibility for processing immediate CAS requests, and the G3 section of the main command post element as having responsibility for preplanned CAS requests. The fold-in on page 7-18 of FM 71-100 does not specifically associate the FSE with CAS, but identified the USAF TACP as having responsibility for coordinating immediate requests and use of CAS at the tactical command post element, and the responsibility for planning CAS operations at the main command post element. FM 71-100 states, on page 3-14, that USAF TACP coordinate aircraft support when preplanning

is not permitted, and it is not until a comparison is made between the statement on page 314 which states "CAS must be an integral part of fire support," and the fold-in on page 7-18, which indicates that the FSE plans and coordinates fire support, that we find an indication of involvement of fire support personnel in CAS.

The questions that arise with regard to the employment of CAS are what specific roles the FSCOORD, the TACP, and the S3/G3 Air should assume. The TACP can provide technical advice regarding the employment of tactical aircraft, and provides a communications system capable of rapidly placing information into air force elements concerned with CAS. The TACPs do not, in themselves, have the ability to coordinate tactical air assets with other fire support assets. The FSCOORD at each echelon is the focal point for all fire support available to the force. The FSEs, together with appropriate representation such as the TACP, can insure a coordinated effort of all fire support assets, and, can in conjunction with the operations element of the maneuver force, provide for the integration of total fire support into the overall operation.

The S3 Air at maneuver battalion level is primarily an assistant operations officer. It is this individual and the S3 that provide for a 24-hour operational capability, and the ability to split the operations center between a TOC and a forward command group. The S3 Air, as an assistant operations officer, must be concerned with the integration of CAS into the overall combat operation. His detailed involvement in the process for planning and coordinating CAS would not be within the purview of this function and fragments the fire support coordination process. At the brigade level, there is an Assistant S3 and an Assistant S3 Air, but here again it is envisioned that this individual will act as an assistant operations officer in addition to his involvement with the other than fire support applications of aviation/air assets, such as tactical airlift. Interjection of the S3 Air personnel into the process for the planning and coordination of CAS does not facilitate the planning and coordination, and only tends to fragment the process. At the division and corps level, the G3 Air personnel are an extension of the G3 in a specialized area. While they are concerned with other than fire support application of air support, they can be used by the G3 as the interacting agency for CAS. The coordination of CAS should be accomplished by the FSE in conjunction with the TACP, and the integration of this fire support into the overall combat operation should be accomplished through interaction of the FSCOORD and the G3 or his representative, the G3 Air personnel.

For example, an engaged task force or team may require additional support to defeat an enemy force. While it may not be appropriate to employ another maneuver unit (attack helicopter company), it would be appropriate to provide the engaged unit with necessary support in the form of fires. This fire support could be provided by FA, CAS, or other means, such as mortars. To have the fire support coordinator consider only FA or CAS might well result in less than full utilization of a valuable combat asset. Employing attack helicopters as a maneuver unit to accomplish this task requires the integration of their fires with other fire support systems being employed.

Finding. Examination of the current doctrine regarding coordination of CAS requires streamlining through elimination of the S3/G3 Air personnel in the formal coordination channels.

e. ISSUE: What procedures should be used for requesting CAS with digital communications?

Discussion. A previous issue identified FS communications channels as the appropriate primary channels for the requesting of CAS. With the advent of TACFIRE and the MCCC, the primary communications nets for the FIST will be digital. While voice traffic, i.e., CAS requests, could be passed over a digital net, the advantages of digital communications dictate that consideration be given to this means of requesting close air support. Digital traffic provides a more reliable means of overcoming enemy jamming and intercept efforts due to the short burst transmissions. Further, preparing a message for digital transmission provides the operator with an opportunity to review the total message for accuracy and completeness prior to actual transmission. Although current digital message devices (VFMED and DMD) do not contain specific formats for CAS requests, the plain text message formats could be utilized. Ideally, digital message devices should contain a format for CAS requests. Use of a formatted CAS request message would facilitate preparation of the request, and would insure completeness of the request. The FIST could prepare a request for CAS on his DMD, forwarding the request to the battalion FSO's VFMED through the TACFIRE computer. The battalion FSO would forward the request to the brigade FSO, once again through the VFMEDs and the TACFIRE computer. With the incorporation of the FIST DMD at the company, and a similarly capable device at battalion, the request could be reviewed at battalion level prior to submitting it to TACFIRE (this made possible by the ability of the FIST DMD to "talk" directly to another FIST DMD).

Use of automatic data processing (ADP) equipment and digital communications opens even further possibilities for processing CAS requests.

For example, the requests could be submitted to TACFIRE, with the computer forwarding the request to each echelon - battalion FSE through corps FSE. This would provide a rapid means of transmitting the request for CAS, and with each echelon receiving a copy of the request, would suffice for the current function of each echelon approving or disapproving the request (currently accomplished for immediate requests through monitoring by the TACP of the air force air request net, and in preplanned requests by virtue of passing through each echelon). Looking further at the possibilities for applying automatic data processing to CAS, it is conceivable that TACFIRE could accomplish a tactical fire control solution to the request at the time of forwarding. The current division artillery TACFIRE computer already has some capabilities with regard to tactical fire control for CAS. Further, software changes might be considered to enable the TACFIRE computer to assist in the preparation of suppression of enemy air defense (SEAD) programs for particular missions. Such assistance would involve identifying enemy air defense type targets within the target area, and scheduling those targets for attack with available and appropriate systems at the appropriate times.

Findings.

- All requests for CAS should be requested through digital fire support communications channels.

- Message formats for CAS requests should be incorporated into TACFIRE system digital message devices.

- The feasibility of further using the automatic data processing capability of TACFIRE to assist in the processing and execution of CAS should be examined from a technical aspect, with consideration given to broadening the scope of current capabilities.

f. ISSUE: What is the role of the FIST in directing CAS?

Discussion. The air force TACP provided to each maneuver battalion and brigade has the ability to control strikes by air force aircraft. This control is provided by a forward air controller (FAC), located either on the ground, or airborne. These personnel hve the necessary training to provide for the execution of CAS strikes, and additionally have the necessary equipment to communicate with higher air force echelons and with air force aircraft not equipped with FM communications. The problem of counting totally on these air force personnel for all aspects of controlling CAS lies in the general requirement to observe the target area. Observation of the target area essentially provides two items - assisting the air force pilot in identification of the target, and identification of the location of friendly forces. Identification of the target may be accomplished by describing the target location, or by actually marking the target with marking rounds or a laser spot. Identification of friendly locations may mean the actual identification of friendly locations to the attack aircraft, or may be only aborting the strike if it appears that it will endanger friendly forces. While an airborne FAC could conceivably provide a target observation capability over a relatively large area, i.e., the zone of a maneuver brigade, the survivability and continuous availability of an airborne FAC is limited.

A ground FAC has a greater degree of survivability in most cases, but his limited mobility precludes responding to requirements for CAS over widely separated areas.

The TACP can provide for indirect control of CAS aircraft, that is, briefing the flight leader on the tactical situation to include air defense threat, nature of the target, suppressive (SEAD) fires, etc., and this can be accomplished without the FAC having direct observation of the target. This indirect control requires only that the FAC have a knowledge of the tactical situation, and that he have communications with the aircraft. The shortcoming for directing CAS is the inability of the FAC to provide sufficient observation capability for the battlefield. This observation limitation can be overcome by the FIST providing the necessary "eyes" for the FAC. For the FIST's observation capability to provide the requirements, the FIST must provide information to the CAS aircraft. The FIST can provide this information either through

direct communication with the aircraft, or by providing the information to the TACP who would relay it to the aircraft. In the later case, the TACP, either the FAC or the air liaison officer (ALO) located with the battalion FSE could accomplish the necessary relay functions to the aircraft. In either the direct or indirect control options, the FIST is not controlling CAS strikes, but merely assists the air force TACP in the execution of such strikes. The involvement of the FIST is to provide the necessary observation capability and associated requirements in the absence of an observation capability of the TACP personnel. He also performs the normal fire support coordination functions which may include the planning and execution of SEAD fires.

Findings. The involvement of the FIST in the directing of CAS strikes should extend to assisting air force TACP personnel in those instances when the air force TACP cannot provide observation of the target area.

g. ISSUE: What communications channels should be used by the FIST when it is assisting in the delivery of CAS at company level?

Discussion. Once attack aircraft are brought "on station", the FIST chief may be called upon to either direct the aircraft, or to assist either the ALO or FAC in directing the aircraft. Considerations surrounding these options are that the FIST is equipped with only FM radios. For the FIST headquarters, to operate at full efficiency, it must utilize all available radios. In those instances when the attack aircraft are not capable of netting with the FIST, i.e., when the aircraft does not have FM radio, the TACP personnel are the only individuals who will have communications with the aircraft. Under these circumstances, the only alternative is for the FIST chief to relay to the aircraft through TACP personnel. Discounting the field artillery digital fire direction net as too busy to accommodate this voice traffic, there are three other alternatives - the company fire control net, the battalion heavy mortar fire direction net, or a net in which the FIST does not normally operate on a full time basis (an air force net, or the field artillery command fire net). The decision as to which net to use should be made by the battalion fire support element in conjunction with the TACP which is collocated.

Whichever net is chosen, the FIST can then relay through the battalion FSE (who in turn passes the information to the TACP), or if they have the capability, the TACP can come up on the FM net with the FIST. In the case of FM equipped aircraft, the aircraft should be directed by the TACP to net with the FIST on an appropriate net. Considering that the strike is being directed from company level, the most appropriate net is the company fire control net. This is the net over which company fires are coordinated, and should generally handle the communications for CAS.

Findings.

- When aircraft are not equipped with FM communications, the FIST should relay messages to the aircraft through the battalion FSE (TACP collocated), where the TACP forwards the message to the aircraft.

- When aircraft are equipped with FM communications, the aircraft should be directed by the TACP at battalion to net with the FIST chief on one of his voice radio nets (e.g., the company fire control net).

h. ISSUE: What are the Army communications nets and procedures for use of ground laser designators with CAS?

Discussion. The FIST equipped with laser devices can mark targets accurately for CAS aircraft equipped with the PAVE PENNY system. For aircraft equipped with FM communications, the FIST chief uses the same procedures when he acts as an emergency FAC. Once the CAS aircraft reaches the target area the TACP in coordination with the FSCOORD brief the CAS pilots as to the tactical situation, laser pulse codes and radio frequencies in use by the FIST. The TACP will direct the CAS aircraft to contact the FIST on the designated FM net (usually the CFC). The FIST and aircraft will establish communications, update the tactical situation to include the enemy ADA threat and verify laser pulse code information. The FIST will begin designating the target when the aircraft reaches its IP or on command of the pilot or FSO. Laser designating will continue until ordnance impacts or until told by the pilot, FAC or FSO to cease lasing. The FIST chief makes appropriate corrections for subsequent aircraft or terminates the strike and gives bomb damage assessment. Should an abort be necessary at any time during the mission, the FIST chief of pilot would communicate this desire over radio. Absence of a laser mark by the FIST would also create a condition for an abort.

For aircraft not equipped with FM communications, the procedures are similar to those used by the FIST chief/TACP during indirect control of air strikes. Caution must be exercised in this mode of operation, since direct communication between ground observer and aircraft do not exist. In this case, the FIST chief would establish communications with the battalion FSE/TACP over a predesignated net.

All communications with the aircraft would be relayed to the FIST from the FSE/TACP. Once the aircraft reaches the target area, the same basic procedures apply for target designation. The FIST will lase the target on command from FSE and continue to designate until ordnance impacts or until told to cease lasing. If the FIST desires to abort the mission, he must stop lasing immediately and notify the FSE/TACP. The possibility exists that the CAS aircraft may have visually acquired the target and may not be aware of the abort. This is the hazard when voice communications are not available between the ground designator and CAS aircraft. The preponderance of CAS aircraft will be equipped with FM communications; however, during those instances where FM communications do not exist directly between the ground designator and the CAS aircraft, and additional risk is involved, that is, lack of an immediate communication link. All participants in the mission must be aware of this deficiency.

Digital communications will not be used between the aircraft and ground since CAS aircraft are not programmed to be equipped with a digital communications system.

Findings.

- FM communications procedures for current emergency direction of CAS by the FIST can be utilized with laser devices.

- Lack of direct FM communications between the FIST and CAS aircraft add a degree of risk to mission accomplishment but still affords the opportunity to utilize CAS.

- Digital communications by the FIST will not be used in conjunction with laser designation for CAS.

11.5 Summary of Findings.

a. The current use of the terms preplanned and immediate for requesting CAS should be eliminated. Standard fire support terminology would provide uniformity of understanding throughout fire support channels. These definitions should be expanded to encompass CAS usage. The term "immediate" should only be used as a warning order in the CAS request.

b. Fire support coordination is required with the employment of the Joint Air Attack Team (JAAT) concept.

c. Requests for CAS should be processed through Army fire support channels with the air force air request network as a backup, especially with the advent of automated digital systems and the use of EW measures by enemy forces.

d. The role of the G3/S3 Air should be examined in respect to the formal coordination channels for CAS. The duties and functions of the G3/S3 Air include the integration of CAS, however, the planning and coordination aspects of CAS should be handled through the fire support coordination process.

e. The FIST has the capability to control CAS in the absence of air force personnel or to assist air force personnel in the identification and marking of targets. This can be accomplished through a direct communications channel (FM voice to A/C) or indirect communication channel (FM voice to FSE/TACP to A/C). In either mode, the observation capability of the FIST can be utilized in the employment of CAS.

f. The normal communication net for control of CAS within the company is the CFC. The FIST may transmit information to the FSE/TACP over a predesignated net (FA CF or Bn Hvy Mort FD) when required to relay information due to an absence of an FM capability on the CAS aircraft.

g. Laser designation can be accomplished by the FIST for CAS. Existing communications procedures would apply with the possibility of increased risk when direct communications does not exist between FIST and CAS aircraft.

CHAPTER 12

ROBUSTNESS, RESILIENCY, REDUNDANCY (R^3)

12.1 CONCEPT

The basic underlying idea of R^3 is to provide a force structure which will permit forces to be reconstituted to continue sustained combat operations without loss of effectiveness. The Human Dimension Task Force, under auspices of the U.S. Army Administration Center (ADMINCEN), has been charged with the responsibility to insure that the notional division of 1986 is "designed with the most combat effective organization possible". This then became a starting point in the development of the R^3 concept. ADMINCEN has developed a methodology to study the redundancy aspect which within itself overlaps significantly with the resiliency and robustness aspects of R^3. Additionally, Task Force Delta, under the direction of TRADOC, developed a white paper postulating the overall concept of R^3 through a discussion of analytical models. Through the analysis of these models, it is expected that the R^3 concept can be applied in the examination of the FIST and its members. The impact of this R^3 concept on the Fire Support Team (FIST) and its members are examined in this paper.

12.2 DEFINITIONS

Prior to any in-depth discussion and analysis a simple understanding of terms is required. Within the military context, these terms are defined as:

a. Robustness - ability of the unit to receive battle damage/casualties and continue to perform its mission.

b. Resiliency - ability of the unit to restore its processes to a steady state of functioning.

c. Redundancy - depth in the structure of the unit to provide immediate backup or replacement of critical function.

These definitions help identify the basic elements, then, we can move forward in the analysis of the FIST and fire support sections (FSS's).

12.3 HISTORICAL BACKGROUND

12.3.1 Since the advent of the field piece, there has always been an inherent requirement for observing and adjusting fires. During the American Civil War, the first written account of a distinct observer adjusting FA cannon fires through the use of signal flags is recorded, thus the birth of the "forward observer (FO)."

12.3.2 Prior to World War II, the FA had no FO's with maneuver elements. Each battery of FA had a reconnaissance officer whose duties included the establishment of a battery observation post.

This post was then manned by either the reconnaissance officer or the battery commander, and all observed fires were conducted from the battery OP by one or the other of these two officers. Traditionally, observed fires were fired by only one battery. Massing of fires in this time frame was done only for unobserved fires on targets located by sound through the observation battalion (later to be known as the FATAB - Field Artillery Target Acquisition Battalion) or in planned schedules and programs of fire in support of various maneuver operations.

12.3.3 At the onset of World War II, the need for more FO's to direct the deadly and devastating fire of the FA was recognized (not formally in the table of organization and equipment of the unit) by informally placing experienced and available soldiers from the units in observation posts. Initially, the TO&E of a firing battery provided only one FO to support, as a minimum three maneuver companies. To increase observation, the battery reconnaissance officer was traditionally used as an additional FO. In addition, the firing battery assistant executive officer was often used as an additional observer to support committed maneuver companies. This essentially provided an observer party with each of the maneuver elements. In many cases, however, observers would move from one company to another as these companies passed into reserve or were committed into battle. A continuous relationship of observer to a specific company could not be established. In the event of FO casualties, replacements were provided through the personnel replacement process or by searching the FA units or, in some cases, maneuver units for soldiers to act as observers.

12.3.4 At the conclusion of World War II, artillery conferences were held in Augsburg, Germany (Seventh Army Artillery Officer's Conference) and at Fort Sill. Recommendations for improvement to the FA system were forwarded to the Department of the Army. This resulted in DA approval for three FO's within each cannon battery of a DS battalion. An additional assistant executive officer was provided to the cannon battery. The direct support battery then had a total of eight officers (battery commander, executive officer, three FO's, a reconnaissance officer, and two assistant executive officers). Most general support and additional non-divisional light and medium FA units also retained an FO section within the headquarters or cannon battery. The heaviest FA (i.e., 240mm towed howitzer and 280mm towed gun) did not have FO's. This provided an adequate pool of manpower and was sufficient for FA operations during the Korean conflict.

12.3.5 After Korea, some personnel austerity measures were imposed upon the Army and the FA. The assistant executive officers and the reconnaissance officer were removed from the TO&E. This cut the cannon battery down to six officers (the battery commander, executive officer, three FO's and an assistant executive officer). With the formalization of the battery FDC and the creation of a battery FDO (filled by the assistant executive officer) the ability of the battery to provide replacement observers was diminished. The FO's in the GS FA battalions were also lost. The pool of observers that the FA enjoyed from the end of World War II through Korea was now gone.

12.3.6 The Vietnam conflict further tested and improved FO operations. Mortar FO's, found in maneuver units, comprised the majority of ground observers, while the FA provided a three-man FO party led by a commissioned officer to each maneuver company. Replacements were provided through the replacement system and from personnel available within the FA units.

12.3.7 Turning to the liaison section (now fire support section) we find that in World War II, light FA battalions had two (7-man) liaison sections while medium and heavy FA battalions normally had one section. The duties of this section were:

a. To represent the FA commander at the headquarters to which dispatched.

b. Act as the FA advisor to the supported unit.

c. Provide a communications link between the supported unit and the artillery (i.e., provide the status of friendly FA and disposition of maneuver forces).

d. Assist in observation and adjustment of fires.

These duties have not drastically changed throughout the years; however, the composition and nomenclature of the section have been modified.

12.3.8 After the Korean War, there were three liaison sections of one officer (CPT) and four enlisted men in divisional light FA battalions while the divisional medium FA battalion and non-divisional light, medium, heavy and very heavy battalions had one section consisting of one officer (CPT) and two enlisted men. The disparity of personnel was based on the actual duties required of the liaison section. Divisional light FA units generally provided the maneuver forces with the responsive fires required. The divisional medium FA and the supporting non-divisional assets provided the additional or augmenting fires. These liaison sections were deployed to the supported FA unit headquarters and performed those liaison duties already mentioned.

12.3.9 During the Vietnam conflict, liaison officers were found in the headquarters and headquarters battery of FA units. At the divisional artillery level there was a section of 3 men. At the DS battalion level there was a section of 3 men supporting the maneuver brigade and for each maneuver battalion there was a section of 5 men. Sufficient maneuver brigade/battalion liaison sections were provided to each type division to support the maneuver forces. The divisional GS battalion had two liaison sections of 3 men each while non-divisional FA battalions retained the one section of three men. The duties of the sections were as previously described.

12.3.10 At the conclusion of these hostilities, fire support sections, (FSS's) were introduced to better identify the support provided maneuver brigades and battalions. Liaison no longer inferred the entire spectrum of duties. It now became a communication link for information and responsive augmenting fires.

Fire support sections establish FSE's and manage the fire support requirements of maneuver units. They provide these maneuver units with the FSCOORD's at all levels, from battalion to corps, to accomplish fire support tasks. Personnel manning both type sections are still identified by the same MOS; however, the scope of duties and tasks performed, differed.

12.3.11 During the period from World War II to the Vietnam conflict, the FA relied heavily on its organic air observer capability to augment ground observers in the attack of targets. From the early days of World War II, light observation aircraft and FA-trained pilots, organized at the battalion level, provided observation support. With the austerity moves following the Korean conflict, these fixed-wing aircraft were removed from the battalions, consolidated at division artillery and replaced with helicopters, as technology and equipment improved.

12.3.12 Reports from World War II, Korea, and Vietnam indicate that aerial observation made significant contributions, not only in a FA role, but also as a reconnaissance and surveillance agency. The capability of the air observer to see much of the battlefield, move relatively quickly around the battlefield, bring vast amounts of firepower (FA, naval gunfire and CAS) on targets and provide real time surveillance information was extensively exercised. The need for this aerial observation capability still exists today, especially in view of the extremely wide frontages of deployed forces. Timely, accurate acquisition and engagement of targets is still paramount. The air observer provides a unique capability to perform this mission.

12.3.13 Historical data from World War II indicates that, during the Battle of the Bulge, over 90% of observed missions and all registrations fired by the 94th Armored Field Artillery Battalion (Supporting General Abrams, 37th Tank Battalion) were conducted by the two organic battalion air observers, flying their own observation planes. This is but one of many such reports of how air observers assisted in the battle. The status of aircraft has changed significantly, however, in recent years. Only the modern day air assault division artillery still retains aircraft under its immediate control. All other divisions provide aircraft for command and control and aerial observation from divisional aviation assets.

12.3.14 The FA air observers are still assigned to the headquarters and headquarters battery of the division artilleries except in the air assault division, where aerial observation assets are provided by the aviation platoon of the target acquisition battery.

12.3.15 In the mid 1970's, the Fire Support Team (FIST) concept was developed and fielded. It consolidated the traditional enlisted FO's, both maneuver and FA, under a centralized MOS (13F), placed these observers, along with FSO's, in the headquarters and headquarters batteries of both the DS and GS battalions of a divisional artillery, and, task organized the team structure to the supported maneuver force, i.e., infantry or armor. This overall transformation process resulted in development of a centralized resident training program at the USAFAS. Commissioned officers of the combat arms branches (infantry and armor) receive some formal resident instruction in forward

observation procedures during conduct of their respective branch courses, but the bulk of this type training is conducted for FA officers and fire support personnel (MOS 13F) during resident instruction at Fort Sill. Appendix G, Annex B lists the program of instruction conducted during this resident training. Resident training is further amplified by extensive unit training of these fire support personnel (MOS 13F) and the commissioned officer (FIST Chief) and FSO. They support the training of the habitually associated maneuver unit and the parent field FA battalion during live and dry fire exercises.

12.3.16 For the Army of the future, an analysis of the replacement/logistical system and the capability of FA units to provide the timely replacement of personnel and/or equipment lost in battle must be conducted. The current paucity of manpower and material resources indicates a redundancy or depth must be developed within an organization (i.e., FIST) in order for it to be combat effective and provide the potential for winning the first and subsequent battles of the next war. The expected pace and intensity of the next war dictate that sole reliance can not be placed on the replacement system for personnel and/or equipment to provide for the consistency of effective combat operations. Real time replacement of fire support casualties is critical to the success of the maneuver forces. The tempo of the battle does not permit delay in replacement of critical positions/equipment to achieve success. Fire support must be responsive in order to achieve success.

12.4 FIRE SUPPORT ORGANIZATION

12.4.1 Duty Position. Prior to commencing the analysis of R^3, an understanding of the duties and functions of the various fire support members must be developed. Appendix G, this report lists the fire support tasks associated with the FIST and fire support sections.

a. The FIST chief (a lieutenant) is the company/troop fire support coordinator (FSCOORD). He advises the company/troop commander on all fire support assets, including their capabilities, limitations, and availability. He also makes recommendations on employment, targets, priorities within the company sector and methods of planning and execution of operations. He attacks targets with the most suitable fire support means available. He coordinates the operations of all his observers, insuring control of their fires. He also may locate targets, request and adjust indirect fires (mortars and FA), may direct other forms of fire support, such as naval gunfire or close air support as required. The FIST chief, or his fire support sergeant, normally assists an air force forward air controller (FAC) in locating, identifying and marking targets. In emergency situations, the FIST chief or his fire support sergeant has the responsibility of directing CAS.

b. The fire support sergeant (SSG E-6) is the FIST chief's primary assistant. He must understand the FIST chief's duties and functions, and assists him in the supervision of the activities of the FIST. He must be able to perform the FIST chief's duties when required. He is the senior enlisted member of the team and provides necessary leadership and supervision for the junior enlisted men.

c. The fire support specialist (SP4/E4) is responsible for processing all types of fire requests and adjusting indirect fires. He must be capable of performing all the duties and functions of an FO and understand the fundamentals of fire support coordination.

d. The FO (SGT E-5) must locate, call for and adjust indirect fire onto targets. There are several secondary responsibilities that amplify his primary responsibility. These responsibilities are knowing the terrain in his area of responsibility and maintaining surveillance of that area, knowing the tactical situation, understanding the enemy, using communications effectively and maintaining security (camouflage, cover, concealment) for the FO party.

e. The radio telephone operator (PFC E-3) is also a trained observer who is capable of locating targets and requesting and adjusting indirect fires. His primary responsibility is the operation of the radio equipment; however, he may also act as an FO.

f. The fire support officer (CPT) and his section provide fire support planning and coordination at the appropriate maneuver battalion/task force level. His specific responsibilities are to act as the FSCOORD for the maneuver battalion task force and supervise the FIST's supporting the unit. He is the battalion task force commander's principal adviser on fire support matters. He recommends allocation of fire support, prepares fire support plans, assigns target numbers, and eliminates duplicate targets. He monitors requests for fire support and coordinates requests for fire. The FSO reports changes in the status of fire units and fire support requirements to maneuver and fire support commanders, insures maximum effectiveness of available fire support and supervises the operation of the FSE.

g. The fire support sergeant (SFC E-7) and specialist (SP4 E4) working in a battalion FSE must be capable of performing the fire support coordination and planning activities of the FSO during his absence, as well as being qualified in the skills of the fire support personnel assigned to the FIST. The battalion FSE is a focal point for planning and coordinating fire support, particularly as it pertains to coordination measures and fires across boundaries.

h. The brigade FSO (major) serves as the full time representative for the brigade fire support coordinator (DS, FA battalion commander) at the maneuver brigade command post. He and his section supervise the activities of the battalion FSO's and accomplish fundamentally the same advisory, planning and coordinating tasks as described for the battalion FSO.

12.4.2 Team/Section Composition.

a. Armor FIST - 5 personnel.

(1) FIST Chief (LT).

(2) Fire Support Sergeant (SSG).

(3) Fire Support Specialist (SP4).

(4) Two (2) Radio Telephone Operators (PFC).

b. Mechanized Infantry/Infantry/Airborne/Air Assault FIST - 9 personnel.

(1) FIST Chief (LT).

(2) Fire Support Sergeant (SSG).

(3) Fire Support Specialist (SP4).

(4) Three (3) Forward Observers (SGT).

(5) Three (3) Radio Telephone Operators (PFC).

c. Fire Support Sections - Battalion & Brigade - 4 personnel.

(1) Fire Support Officer (MAJ) at Brigade (CPT) at Battalion.

(2) Fire Support Sergeant (SFC).

(3) Two (2) Fire Support Specialists (SP4).

d. Fire Support Element - Division - 15 personnel.

12.4.3 Summary. Tables 12-1 and 12-2 provide a summary of total fire support personnel required in the current type divisions, armored cavalry regiments and separate brigades.

Table 12-1. Number of Fire Support Personnel in Type Army Divisions.

	TYPE DIVISION									
	ARMOR*		MECH*		INF		AIRBORNE		AIR ASSAULT	
FIST: (Number of FIST's indicated in parenthesis)										
MECH INF	(18)	162	(21)	189						
ARMOR	(21)	105	(18)	90	(3)	15	(3)	15		
INF					(27)	243	(27)	243	(27)	243
FIRE SUPPORT SECTIONS:										
MVR BN		44		44		44		44		36
MVR BDE		12		12		12		12		12
DIV FSE		15		15		15		10		11
TOTAL		338		350		329		324		302

*BASED ON USAREUR DIVISIONS

Table 12-2. Number of Fire Support Personnel in ACR and Separate Brigades.

	TYPE ELEMENT				
	ACR	ACCB	MECH INF BDE	ARMD BDE	INF-LT INF ABN-BDE
FIST		NONE			
MECH INF			(6) 54	(3) 27	
ARMOR	(12) 60		(4) 20	(7) 35	(1) 5
INF					(9) 81
FIRE SUPPORT SECTIONS:					
BN/SQDN	18	4	12	12	12
ATK HEL		8			
BDE/REGT	7	6	4	4	4
TOTAL	85	18	90	78	102

12.4.4 The above discussion provides a comprehensive total of authorized fire support personnel within a division/separate brigade structure. The replacement of these personnel and the associated equipment during the conduct of battle is of major concern.

12.5 ANALYSIS

12.5.1 Methodology.

a. The study group conducted a literature search for data concerning loss/attrition factors for personnel and equipment. Analytical data from the WARF (Wartime Replacement Factor) Study, the DIVWAG model (CACDA) and the CARMONETTE model was used. Attrition analysis of fire support organizations was then conducted to determine the total number of fire support casualties that would occur during the first day of battle. Further analysis was then conducted to determine where those casualties would occur.

b. Data obtained from the survivability study task force on ground laser designators (SSTF) and the COPPERHEAD COEA was then analyzed to determine the number of ground laser designators that would be lost in a division on the first day of battle. A sub-analysis considered the significance of hand held laser designators losses.

c. A comparison of personnel versus equipment losses (GLLD) was made to determine if significant trends in people or equipment losses prevailed.

d. A redundancy analysis, using the ADMINCEN model was conducted for fire support personnel to determine which fire support positions required redundancy.

e. An analysis of alternatives to achieve this required redundancy was then conducted. Initially, alternatives were limited to the use of internal fire support assets and, finally, external alternatives were reviewed to determine applicability to redundancy requirements.

12.5.2 Attrition Analysis.

a. Personnel.

(1) Analysis of loss data from previous wars (FM 101-10-1), the increased lethality of weapons, and the use of technology on the modern day battlefield strongly indicate that a significant number of battlefield casualties can be expected. The development of a loss or attrition factor which could be used to estimate the personnel losses was undertaken. In developing this data, additional factors applicable to today's modern battlefield were examined. The sophisticated weapons and munitions now being employed and the threat tactics and doctrine were among the factors considered.,

(2) Establishing the number of expected fire support personnel casualties is difficult. They are deployed with maneuver elements and, thus, take the appearance, for attrition analysis purposes, of infantry or armor personnel. Arriving at an attrition factor that reflects the current enemy threat capability was not easy. Statistical analysis that provides the projected personnel losses per se, FIST, within a maneuver force for a given operation is not readily available. The study group initially adopted a .035 personnel loss factor based on equating today's covering force/main battle area battle to historical data in FM 101-10-1. This factor (percentage) represents expected personnel losses for a divisional unit conducting a defense of a sector during the first day of battle under World War II/Korea conditions. However, upon closer inspections of the .035 percentage, it was found that it did not actually depict the firepower the current threat forces are capable of producing. In comparison to World War II/Korea, the current threat has a superiority in numbers and quality of weapons systems. Threat doctrine attempts to achieve between a 5 to 1 and 10 to 1 ratio in firepower available at the point of decision. Considering this in respect to the actual sophistication of the equipment available, and equating the lethality of damage incurred, i.e., a hit on a threat or friendly would result in the same destruction, the massive amount of readily available firepower the threat can bring to bear is awesome. Also, U.S. doctrine has changed from the traditional "two up one back" concept of employment for maneuver forces. All maneuver forces are committed in the defense with a small reserve. Emphasis is placed on understanding the enemy, seeing the battlefield, concentrating forces at the critical times and places, fighting as a combined arms team and exploiting the advantages that a defender possesses. Successful application of these fundamentals does not

insure success but does allow for minimizing vulnerabilities and maximizing capabilities.

(3) As a result of the above analysis, a factor of X5 was applied to the previously developed World War II loss factor of .035. The resulting attrition factor of .18 (18%) appears to be a reasonable percentage for first day casualties. (In an independent analysis, CACDA, Ft Leavenworth, in its DIVWAG DRE base case game (H series armored division in the defense) found that first day battle losses for an armored division were 23.6%. The majority of these casualties occurred in the covering force portion of the battle. The CSSG II attrition rate may, therefore, be conservative.)

(4) The .18 attrition rate was then applied to the fire support personnel authorized in the AIM divisions in order to determine the total number of fire support casualties that a division could expect to sustain during the first day of combat. This calculation is shown at table 12-3. Losses were also calculated for the CACDA rate of .236 for comparison purposes (The CACDA rate was not used elsewhere in the study).

Table 12-3. Fire Support Casualties

	TOTAL FIRE SUPPORT PERSONNEL AVAILABLE	ATTRITION FACTOR	CSSG II CASUALTIES	CACDA CASUALTIES (@ .236)
Mech Inf Div	350	.18	63	(83)
Armored Div	338	.18	60.84	(80)
Infantry Div	329	.18	59.22	(78)

(5) The probability of fire support casualties occurring in the battalion FSS's was then considered. The analysis indicated that, disregarding a catastrophic kill (the entire section), the number of casualties in fire support sections can be expected to be low in comparison to FIST casualties. All fire support casualties were, therefore, considered to occur in the FIST's.

(6) It was determined, based on date from FM 101-10-1, that approximately 87.4% of infantry (maneuver) casualties will occur in engaged units (thse units engaged with the enemy in heavy combat); thus, the same percentage of FIST casualties can be expected to occur in these same units. The remainder of the fire support casualties will occur in committed but not heavily engaged units. Assuming that 50% of the division will be engaged in combat during the first day, the number of engaged FIST's can be computed as shown in table 12-4.

Table 12-4. Engaged Fire Support Team (FIST) Personnel Engaged in Combat

TYPE DIVISION	FIST's AVAILABLE	FIST's ENGAGED	TYPE	# PERSONNEL
Mech Inf	39	19	10 Mech	90
			9 Armor	45
				135
Armored	39	19	5 Mech	45
			14 Armor	70
				115
Infantry	30	15	12 Inf	108
			3 Armor	15
				123

Notes.

a. Air Assault/Airborne Divisions were not considered in this role.

b. Maneuver Battalion/Brigade FSE personnel and Division FSE personnel were not considered in the above totals on the basis that expected losses are not significant in these sections.

(7) The weighting factor of 87.4% was then applied to the total fire support casualty figure (table 12-3) to determine the number of losses in engaged and committed units.

Table 12-5. Fire Support Casualties, Engaged & Committed in Mechanized Infantry, Armored & Infantry Divisions.

	TOTAL FS CASUALTIES	X	WEIGHTING FACTOR	=	ENGAGED CASUALTIES	COMMITTED CASUALTIES
Mech Inf Div	63		.874		55	8
Armored	60.84		.874		53	8
Infantry	59.22		.874		52	8

(8) It was assumed that there is a 50-50 probability of the casualties occurring in the armor or mechanized infantry FIST. Table 12-6 below summarizes the casualties by division and type of FIST and the personnel remaining at the end of the first day of combat.

The infantry division casualties are based on employment of the division in a position defense. The majority of FIST casualties would occur in the infantry battalion, versus the tank battalion which fights to assist in the disengagement of the infantry units. The study group therefore, adopted a

90/10 ratio for the infantry/armor FIST to determine the number of casualties among the engaged FIST.

Table 12-6. FIST Casualties in Engaged Units for Mechanized Infantry, Armored or Infantry Divisions.

ENGAGED FIST	TOTAL PERSONNEL	50% CASUALTY PROBABILITY	FIST PERSONNEL REMAINING AT END DAY 1
MECHANIZED INFANTRY DIVISION			
10 Mech Inf	(90)	28	62
9 Armor	(45)	27	18
		55	
ARMORED DIVISION			
5 Mech Inf	(45)	26	19
14 Armor	(70)	27	43
		53	
INFANTRY DIVISION			
12 Infantry	(108)	47	61
3 Armor	(15)	5	10
		52	

(2) The divisional fire support personnel status at the end of the first day of combat is shown at table 12-7.

Table 12-7. Fire Support Personnel Status, End Day 1 in Mechanized Infantry, Armored and Infantry Divisions.

	TOTAL ASSIGNED	CASUALTIES ENGAGED	CASUALTIES COMMITTED	LOSSES	PERSONNEL REMAINING
Mech Inf	350	55	8	63	287
Armored	338	53	8	61	277
Infantry	329	52	8	60	269

(10) The study group concluded that a large percentage of engaged FIST personnel (40%) would be casualties at the end of the first day of battle. An attempt to further identify casualties by grade level and position was not successful. It was therefore assumed that fire support casualties would be equally distributed among all members of the team. The data in Table 12-7 indicates a need for R^3 to be present, in order to provide fire support for the succeeding days of battle.

b. Equipment.

(1) The above analysis pertains to the personnel losses expected and did not address losses to equipment, such as ground laser designators, digital message devices, radios and vehicles. The study group assumed the employment of the ground laser designator within the FIST, whether hand-held or ground mounted to determine what the impact would be on the FIST members' survivability.

(2) Initial efforts were made by the study group to identify a loss attrition factor for ground laser devices, which could be applied against the total number of GLLD found within the division. The wartime replacement factor (WARF) study provided the study group a basis to help identify a reasonable attrition factor for ground laser designators during the first day of battle. Realizing the scope of the WARF study (Theater level) and the methodology used in deriving its factors, the study group derived an attrition factor of .20 (overall ground laser designator losses). Applying this attrition factor against the ground laser designators (GLLD) within a division, including the eight (8) found in the Target Acquisition Battery, indicated the following losses as listed in table 12-8:

Table 12-8. Ground Laser Designator Losses.

	TOTAL GLLDS	X ATTRITION FACTOR	= 1ST DAY GLLD LOSSES (DIV)
Mechanized Inf	47	.2	10
Armored	47	.2	10
Infantry	38	.2	8

(3) With total expected GLLD losses, the study group following the same methodology as for personnel attempted to identify the number of GLLD's lost by the engaged FIST. The other GLLD losses were assumed to be in the target acquisition battery or remaining committed FIST.

(4) The survivability study task force on Ground Laser Designators (SSTF), conducted by Harry Diamond Laboratories (HDL), concluded that the introduction of ground laser designators within the FIST did not significantly reduce the survivability of the FIST. An examination of the methodology used by the SSTF indicates that the study focused on laser designator survivability as opposed to personnel survivability. CSSG II reexamined the data

generated by the SSTF to determine if a base line could be drawn concerning the survivability of a ground laser designator. It appeared that the ground laser designator usually retained at least a .75 survivability factor under most employment options. The exception to this existed when the ground laser designator was totally exposed to enemy FA fires.

(5) This analysis indicated that the threat FA fire was a significant factor in determining laser designator survivability. It was also interesting to note that the effectiveness of the ground laser designator was reduced when exposed to the massive threat suppressive smoke and fires. Even though the laser designator was not killed, it was effectively neutralized during periods of suppressive fires (high explosive or smoke) generated by the threat.

(6) The CSSG II study group compared the survivability data developed from the survivability study task force (SSTF) on ground laser designators with data provided from the CARMONETTE runs in support of GLLD mixes for the COPPERHEAD COEA. This data indicated that heavily engaged maneuver forces (company size) could expect to lose, on the average, one of four engaged GLLD's to enemy direct and indirect fires. Personnel losses were not specifically addressed; however, loss of the GLLD implied loss of all personnel associated with its function. After evaluating both studies, the CSSG determined that a loss factor of .25 was appropriate for designators in engaged FIST's. Designator losses for engaged FIST's based on the current BOIP of one GLLD per FIST HQ and one hand-held designator per platoon FO are summarized at Table 12-9.

Table 12-9. Designator Losses in Engaged FIST's.

TYPE DIVISION	TOTAL NUMBER OF FIST	BOIP QUANTITY GLLD	BOIP QUANTITY HAND HELD	LOSSES GLLD	LOSSES HAND HELD
MECH INF	10 MECH INF	10	30	3	8
	9 ARMOR	9	9	2	2
ARMORED	5 MECH INF	5	15	1	4
	14 ARMOR	14	14	4	4
INFANTRY	12 INF	12	36	3	9
	3 ARMOR	3	3	1	1

(7) The BOIP for designators has been addressed in Phase III of the CSSG II study. This review resulted in the deletion of the hand-held designator from the armor FIST and a reduction from three to one in the mechanized infantry FIST. Only one designator, hand-held, was retained for

the infantry FIST. GLLD's were also placed in separate observation/lasing teams. In view of this information the hand-held designator losses were considered insignificant and were dropped from further consideration.

(8) GLLD losses and personnel casualties are summarized at Table 12-10. The personnel loss ratio for each type FIST was determined by dividing the number of casualties in the engaged FIST's by the total number of authorized personnel; e.g., Mech Inf FIST 28/90 = .31. Totals may not agree due to rounding.

(9) In summary, the study group concluded that laser designator (hand-held, vehicle or ground mounted) losses did not increase the attrition factor for FIST members as originally presumed. Consideration must be given to the R^3 of the organization in order to provide a capability to reconstitute itself in light of the personnel and equipment losses sustained in battle. The FIST's loss of both personnel and key items of equipment, such as vehicles and laser designators, will require immediate replacement in order to retain the same level of combat effectiveness.

(10) An analysis of the R^3 of the organization was then conducted to determine alternatives for meeting personnel and equipment losses.

Table 12-10. Summary of Personnel and Designator Losses.

FIST	NO FIST	PER LOSS RATIO	FIST CH	FS SGT	FS SP	PLT FO	RTO	TOTAL	GLLD LOSSES	HAND HELD DESIGNATOR LOSSES
MECH INF										
Mech Inf	10	.31	3	3	3	9	9	28*	3	8
Armor	9	.60	6	5	5	5	5	27*	2	2
ARMORED										
Mech Inf	5	.60	3	3	3	9	8	26	1	4
Armor	14	.37	6	5	5	5	5	27*	4	4
INFANTRY										
Infantry	12	.43	5	5	5	16	16	47	3	9
Armor	3	.33	1	1	1	1	1	5	1	1

Note: *Totals may not agree due to round off.

12.5.3 Redundancy Analysis.

a. General.

(1) Initially, independent analysis of each variable, redundancy, resiliency and robustness, was considered; however, it became obvious that even though each variable is independent, there is considerable interdependence and interoperability between the three. When the three variables are evaluated, it appears that the organization having depth, or redundancy, in its structure, will be able to continue to operate and thus accomplish the mission. The variable of redundancy was therefore chosen as the base case in analyzing whether sufficient R^3 was available within the organization.

(2) The model used in the analysis was developed by ADMINCEN for the Division 86 study to determine whether a duty position requires redundancy, and alternative methods of achieving this redundancy.

b. Phase I Analysis (Candidate Positions).

(1) A logic tree (figure 12-1) and redundancy tables (tables 12-11 and 12-12) were used in conjunction with the following questions to determine FIST and FSS positions that are candidates for redundancy.

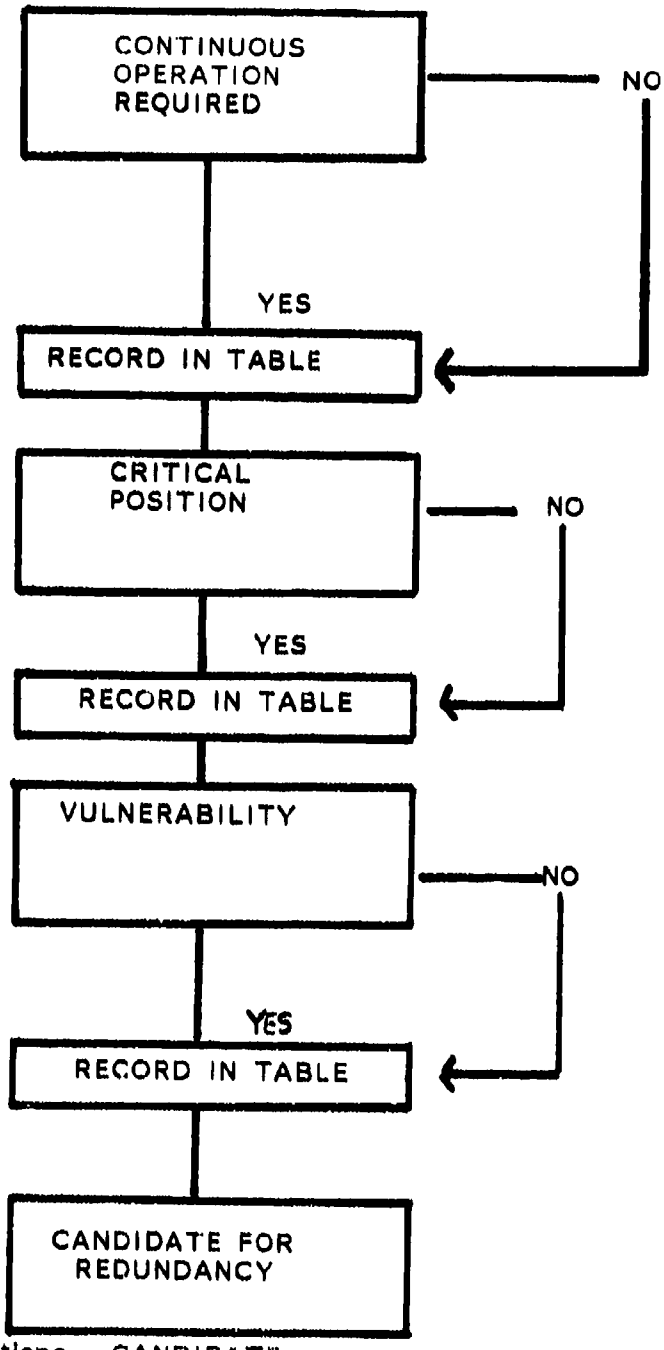
(a) Do the functions performed by the position require continuous operation during combat? That is, does the position require manning throughout a 24-hour period for the mission to be accomplished? Answering the initial question, yes, indicated to the study group the possibility that the position may require redundancy.

(b) Is the position critical? That is, if the occupant of the position became a casualty, would it threaten the capability of performing the mission? Again, if the answer to this question was yes, the study group considered the position as a candidate for redundancy.

(c) Is the occupant of the position just as likely or more likely to become a casualty during combat operations as other members of the unit? In respect to the members of the FIST, the analytical data indicated that they are as susceptible to becoming casualties as the supported maneuver force. Answering the question, yes, then indicated to the study group a possible candidate for redundancy.

(2) The study group concluded that if all questions were answered yes, the fire support position was a strong candidate for redundancy. The key question seemed to involve the criticality of the position or the function of the position. When the answer to this question was no, the position was not a candidate for redundancy. For example, the Fire Support Sergeant ...

(3) The Fire Support Sergeant position was as an important position from the leadership and also fire support aspects, but not determined to be critical as defined within by the study group. Absence of the duty position would not degrade overall fire support mission accomplishment.



(1) If yes, to all questions - CANDIDATE.
(2) If no, to any question - Not a CANDIDATE.

Figure 12-1. Logic Tree.

Table 12-11. Redundancy Table - FIST.

	CONTINUOUS OPERATION	CRITICAL POSITION	VULNERABILITY	CANDIDATE FOR REDUNDANCY (ALL MUST BE YES)
FIST CHIEF	Y	Y	Y	(X)
FIRE SUPPORT SERGEANT	N	N	Y	
FIRE SUPPORT SPECIALIST	Y	N	Y	
PLATOON FO	Y	Y	Y	(X)
RTO	N	N	Y	

Table 12-12. Redundancy Table - Fire Support Section

FIRE SUPPORT OFFICER	Y	Y	Y	(X)
FIRE SUPPORT SERGEANT	N	N	N	
FIRE SUPPORT SPECIALIST	Y	N	N	

(4) In summary, the conclusions reached by the study group from this analysis indicated that the FIST chief, Platoon FO, and the FSO positions were candidate positions requiring some type of redundancy in order to accomplish the fire mission. Identifying the need for redundancy in personnel also identified the need for a redundancy of equipment to support them.

c. Phase II (Alternatives for Redundancy). Once candidate positions for redundancy were identified, a second phase of analysis was conducted to determine alternatives for achieving a degree of redundancy. In other words, how could the organization provide for a measure of depth within its structure and still accomplish the mission when faced with the loss of critical personnel and equipment? There are four basic alternatives which can be applied to a candidate position in order to achieve redundancy: Replaceability; Quality; Cross Training; Capability. A combination of these alternatives provides for additional alternatives.

(1) Replaceability. The replaceability alternative involves an actual position being added to the force structure. The study group asked the question, "Can the candidate position be filled from within the unit (from a non-critical position) without degrading the combat effectiveness of the unit or requiring additional training?" If the answer was yes, redundancy is already built into the organization. An example of this within the fire support structure is the capability of FSS's at the battalion and brigade level to assume the duties and functions of lower echelons. These sections have personnel with the same skills/MOS necessary to perform the required fire support functions. This alternative may also be accomplished by having personnel with the same grade/speciality skill identification (SSI/MOS) within the unit performing other duties or having personnel in other grades and related SSI/MOS in the unit capable of performing the critical tasks. Members of the separate observation/lasing teams, and target acquisition personnel such as surveyors are examples of assets available to meet this alternative. If the basic question is answered no, an additional space is required to accomplish the task.

(2) Quality.

(a) The quality alternative is based on the depth of critical skills within a unit. Redundancy of position can be achieved by increasing the grade/skill level in currently existing force structure spaces or by adding additional critical tasks to an existing MOS. This provides a depth of skill knowledge within the unit. The study group considered all the critical tasks that should be performed by the FIST, then asked the question, "Could the candidate position for redundancy be filled by another authorized unit position, if it were reclassified by an increase in grade and/or skill level?" If the answer was yes, then the redundancy alternative of quality applied. An example of this would be an E-7 who possesses the capability of performing seven critical tasks. The goal is to provide depth in the unit so that others are capable of performing these same seven tasks. An E-5 within the unit may currently be capable of performing four of the seven critical tasks. An increase in his grade and skill level to E-6 may provide the mastery of two of the additional critical tasks. This does build depth in the organization at the

cost of an increase in grade structure. Consideration must be given to this increase in grade structure not only from the cost effectiveness viewpoint, but also from the impact that might occur within the organizational structure of the unit and how well it may be able to continue its mission. In certain instances, an increase in the grade requirement of a position, creates a void for a lower skill which also may be required for mission accomplishment. An example of this would be the creation of an E-6 platoon FO who possesses the same grade and skill of the fire support sergeant who is also a member of the FIST. This may create as indicated, organizational problems, such as an overskilled FO.

(b) An additional question can be asked which may assist in resolving this dilemma and also meeting the requirement for depth. From the example, the seventh critical task could be made part of the MOS at the lower (E-6) level. This change to the MOS for the E-6 is an example of increase in quality by adding to an existing MOS. The question that needs to be asked is, "Could the candidate position for redundancy be filled by another unit position, if identified critical tasks were added to the MOS?" If the answer was yes, then the redundancy alternative of quality applies. A combination of alternatives have been applied in the above example.

(c) Another consideration is that under the current Army skill qualification program, soldiers are required to take the Skill Qualification Test (SQT) of the next higher level within their MOS. This requires them to be aware of the increased tasks and responsibilities of the increased skill level. Actually, identifying and placing these critical tasks into the skill qualification test program provides an alternative for achieving redundancy.

(3) Cross Training. The cross training alternative is based on the robustness of a unit. Essentially, individual training is capable of accomplishing this form of redundancy. If the basic question, "Can the critical tasks of the candidate position be performed by another individual filling a non-critical position with a reasonable amount of cross training?" be answered yes, an alternative to redundancy has been developed. In order to answer this question, all tasks that can be performed by all positions in the unit must be considered. In this respect, additional factors must be considered, among them:

(a) The specification of the task. (What must be accomplished.)

(b) The complexity of the critical tasks.

(c) The predictability of the conditions under which the tasks being considered for cross training must be performed.

(d) The prerequisites required to accomplish the tasks being considered for cross training. This involved the identification of those measurable skills, both mental and motor, which must be present in order to complete the tasks of the candidate position.

the unit.

(e) The facility support required to effectively cross train in

(f) The variety of critical tasks of the candidate position. If the position is capable of being cross trained, then a redundancy alternative of cross training applies.

(4) Capability. The capability alternative is based on improving the protection of the candidate position. The basic question is, "Can the protection of the candidate position be improved to decrease its vulnerability?" This includes better protective equipment, enhanced vehicle protection and optimizing position location for safety on the battlefield. If the answer is "yes," the redundancy alternative of capability applies.

(5) Combination of Alternatives.

(a) Consideration must also be given to a combination of alternatives. As previously mentioned in the quality alternative discussion, there exists the possibility to combine various alternatives and achieve a degree of redundancy. For example, an increase in the grade/skill of a position may include three critical tasks for the candidate position which actually requires five critical tasks. The difference between three and five critical tasks can be accomplished through cross training. Thus, a combination of alternatives resulted in redundancy for a candidate position.

(b) The above alternatives were applied to the candidate positions for redundancy, i.e., FIST chief, FSO, and Platoon FO. Additional analysis was conducted to determine the degree of redundancy currently found within the other FIST and FSS's positions. A logic tree, figure 12-2 and table 12-13, Alternatives for Redundancy, were used within the analysis to determine and record the results. For example, the FIST chief under the redundancy alternative of quality, could be replaced by the fire support sergeant. The fire support sergeant possesses the same level of skill as the FIST chief and his MOS tasks include the various critical fire support tasks of the FIST chief.

(c) The platoon FO could, based on the combination of quality and cross training alternatives, be replaced by the RTO. He could also be replaced by a fire support specialist working at the FIST HQ or FSS, since skills required of this specialist include the fire support tasks of the platoon FO. He could also be replaced, if necessary, from the reconstituted assets of separate observation/lasing team members.

(d) The FSO could be replaced by the fire support sergeant from the battalion/brigade FSS because his task skills include the basic required skills (quality) to perform the FSO tasks. With some additional cross training and familiarization, the FIST chief could function as a FSO at the battalion level. The maneuver battalion's heavy mortar platoon leader could, with additional skill and cross level training, function as a FSO.

(e) Upon internal replacement of personnel for the identified critical positions, the domino effect may occur, that is, there is a current, limited, built-in redundancy for fire support operations; however, the loss and subsequent internal replacement of one critical position significantly reduces this built-in redundancy. A search of maneuver or external FA assets must be conducted in order to provide additional alternatives to reconstitute fire support organizations when this occurs.

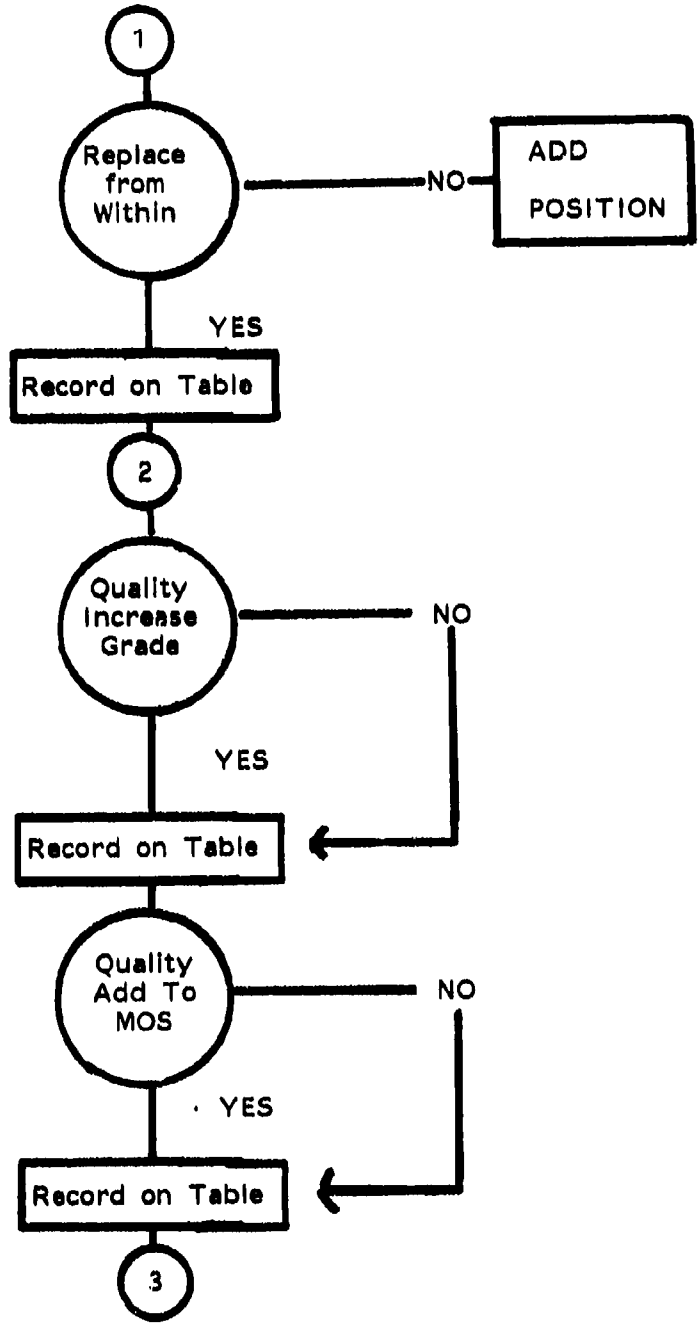


Figure 12-2. Logic Tree.

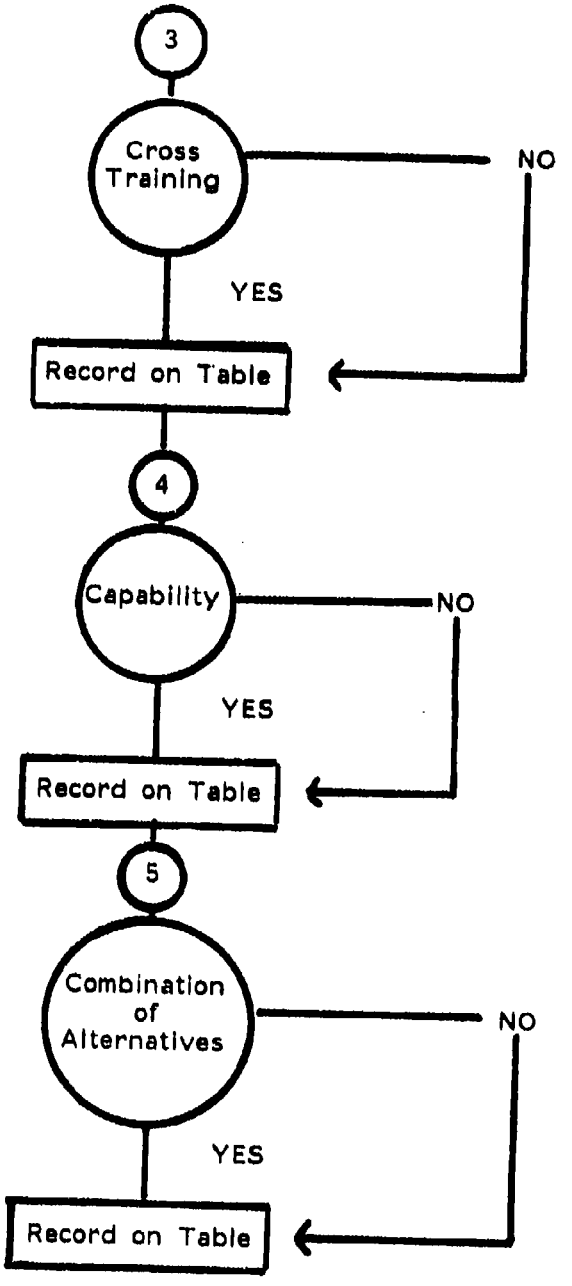


Figure 12-2 (cont).

Table 12-13. Alternatives for Redundancy.

CANDIDATE POSITIONS FOR REDUNDANCY	REPLACE-ABILITY	QUALITY	CROSS TRAINING	CAPABILITY
FIST CHIEF	Yes, from within.	Yes	Yes	No
PLATOON FORWARD OBSERVER	Yes, from within.	Yes	Yes	No
FIRE SUPPORT OFFICER	Yes, from within.	Yes	No	No
NON-CANDIDATES FOR REDUNDANCY				
FIRE SUPPORT SGT	Yes, with Quality & Cross training	Yes	Yes	No
FIRE SUPPORT SPEC	Yes, Maneuver	Yes	Yes Plt FO & RTO	No
RADIO TELEPHONE OPERATOR	Yes, Maneuver	No	Yes, Maneuver	No
FIRE SUPPORT ELEMENT				
FIRE SUPPORT SGT	Yes	Yes FIST FS SGT	Yes Fire Support Spec	No
FIRE SUPPORT SPEC	Yes	Yes FIST FS Spec	Yes	No

12.5.4 Additional Redundancy Alternatives.

a. General. Searching within an organization for various alternatives to create redundancy or depth was studied. As previously indicated, the FIST and FSS's have only a limited degree of redundancy. The study group asked the question, "How can additional redundancy be created for the organization?" Initially, it seemed that there was a vast pool of resources from which to draw personnel and/or equipment to meet fire support mission requirements. Not only FA assets but also maneuver assets were explored to provide the necessary immediate fire support required. Considering the future addition of laser designator and digital communications equipment within a FIST compounded the search problem. Specifically skilled individuals capable of operating this sophisticated equipment had to be identified. They must also be trained and qualified to perform the most basic fire support tasks. This training and qualification will be extremely difficult during fast moving combat operations.

b. Reconstitution Plans.

(1) This led the study group to consider the needs of each organization for personnel and equipment assets to reconstitute itself for operation. These reconstitution plans have to be well developed, starting at the lowest level (platoon) and provide a degree of flexibility for implementation. Personnel and equipment assets (filling non-critical positions) may be earmarked to immediately fill the void or vacancy created by the loss of critical positions requiring redundancy. Examples include cross-trained battalion surveyors or target acquisition battery, sound and flash operators filling fire support positions such as platoon observer; maneuver skilled soldiers acting as RTO's within a FIST HQ or FSE working under the supervision of a trained fire support specialist; using the FA battalion assistant S-3 (FIRE DIRECTION OFFICER) as a FSO or FIST chief as required. These plus contingency plans for reconstitution of equipment assets can be developed well in advance of actual combat. Reconstitution plan should consist as a minimum:

(a) Specific identification of key personnel and/or equipment which must be replaced.

(b) A definitive list of alternative solutions identifying specific person and/or equipment replacement.

1. Example 1. FIST Chief, replaced by Fire Support Sergeant, then by senior fire support specialist, then by senior FO.

2. Example 2. FIST vehicle will be replaced by:

a. Moving FIST Chief and part of party to commander's vehicle; remainder ride in first sergeant's/platoon leaders vehicle.

b. Utilizing weapons platoon headquarters vehicle with AN/VRC-64 as FIST HQ only.

(c) A definitive implementation schedule of the reconstitution plan. It should state length of time to retain equipment/personnel. This will normally be upon determination of the unit commander based on anticipated replacements.

(d) Ancillary training requirements for personnel and impact of equipment displacements have on remainder of unit. (short range)

(e) Additional alternative plans covering a secondary loss of non-critical positions/equipment. What is the impact of these losses on the organization? (long range)

(2) These are just a few examples of what could be included in a reconstitution plan. All that is included must be well thought out for simple execution plus flexible enough to change in a fluid situation. Instruction or reconstitution must be presented not only in service school POI but also as an integral part of unit training. Again, reconstitution plans will not always provide the overall depth that would be required or desired within an organization. The vulnerability analysis conducted by the study group indicated a definite need for immediate fire support replacements, especially at the FIST level. Once the built-in redundancy of the FIST and FSS's has been exhausted and the initial reconstitution plans have been implemented, trained fire support personnel are stretched to the maximum. Additional personnel/equipment losses would result in the loss of the combat effectiveness. To overcome this shortfall, separate observation/lasing teams equipped in a manner similar to a FIST and having similar skills/MOS, should be created.

c. Separate Observation/Lasing Teams.

(1) General. The vulnerability analysis indicated that at the conclusion of the first day of battle, a division would need at least 8-10 ground laser designators, with crews and vehicles, as a minimum, to fill the void created by combat losses. Separate observation/lasing teams not only meet the requirements to fill this void but also provide an additional observation capability for the division. The requirement for 18 separate observation/lasing teams was previously identified in PHASE III of CSSG II and the COPPERHEAD COEA. Using the personnel and equipment assets that these teams provide a division, a redundancy of fire support personnel/equipment is created to sustain combat operations.

(a) Fire support casualties will occur regardless of the use of a laser designator. The question is, "How many people and how much equipment is required to support redundancy?" The study group reviewed the number of expected fire support casualties (Table 12-10) with respect to the critical positions requiring redundancy in the FIST. This resulted in a redundancy requirement depicted in table 12-14.

Table 12-14. Fire Support Losses, Critical Position.

	Critical Position	Engaged FIST Expected Losses	
		Personnel	GLLD
MECHANIZED INFANTRY DIVISION			
Mechanized Infantry FIST -	FIST Chief	3	3
	Plt Obs	9	
Armor FIST -	FIST Chief	6	2
	Plt Obs	5	
		23	5
ARMORED DIVISION			
Mechanized Infantry FIST -	FIST Chief	3	1
	Plt Obs	9	
Armor FIST -	FIST Chief	6	4
	Plt Obs	5	
		23	5
INFANTRY DIVISION			
Infantry FIST -	FIST Chief	5	3
	Plt Obs	16	
Armor FIST -	FIST Chief	1	1
	Plt Obs	1	
		23	4

(b) Consideration was also given to other losses (non-critical position in engaged FIST, and committed but not engaged FIST). Table 12-14 previously discussed, helped determine the minimum number of personnel and equipment necessary to reconstitute FIST assets, but did not address these other losses.

(c) Previous analysis indicated that there would be at least eight (8) casualties and five (5) GLLD lost among the committed but not engaged FIST and Target Acquisition Battery in the armored and mechanized infantry Division. Subjective analysis was applied against these losses to worst-case the situation to assist in determining redundancy requirements. If 90% of these eight personnel casualties were filling critical positions, then the redundancy requirement would increase to 30 personnel. If all five (5) GLLD were lost from the committed but not engaged FIST, then the redundancy requirement would be ten (10) GLLD. Similar subjective analysis was applied in the infantry division.

(d) The study group concluded from this analysis that a redundancy requirement (not to be confused with total losses expected (see table 12-4) existed for:

- 30 fire support personnel and 10 GLLD in the mechanized infantry and armored division.

- 30 fire support personnel and 8 GLLD in the infantry division.

Creation of at least ten (10) separate observation/lasing teams within the division provides the personnel and equipment redundancy necessary to sustain combat effectiveness and also provides an additional personnel pool to replace critical position casualties that may be created among other fire support personnel.

(2) Composition of Separate Observation/Lasing Team.

(a) Refinement of the grade/skill composition of the separate observation/lasing team may provide a greater degree of overall depth within the organization as a whole. The members of the separate observation/lasing team should be of grades and skill level that provide the greatest degree of flexibility to the organization, yet let the team retain distinct identity of individual member's skills. This was translated as:

(1) The senior member of the observation/lasing team should have the grade/skill level/SSI/MOS equivalence to perform as a FIST fire support sergeant.

(2) Additional members of the team should have sufficient skill level to perform duties of a FIST fire support specialist.

(b) As for rank and skill level this equated to:

(1) NCO, minimum grade of E-5, skill level 2 MOS 13F with additional tasks involving fire support coordination, planning and employment of CAS added to the MOS skill level.

(2) Enlisted men, E-1 to E-4, skill level 1 MOS 13F.

(c) Using this rationale a dual redundancy was accomplished. The NCO team chief could function as the FIST fire support sergeant or platoon FO, if necessary. The additional members of the observation/lasing team could function as platoon FO, radio telephone operators or FIST fire support specialists as required.

d. Fire Support Personnel/Equipment - Non-divisional Field Artillery.

(1) General. If the fire support assets of separate observation/lasing teams are not available, another contingency to create redundancy exists by providing FIST, fire support sections and/or separate observation/lasing teams to corps (non-divisional) FA units. This replaceability alternative for redundancy provides a ready pool of trained personnel and equipment resources to man/replace depleted fire support assets. They also provide an increased observation/lasing capability for corps field artillery units deployed in support of the corps or divisional forces. This stems from the German concept of employment of FO parties directly under the control of FA organization. In a peace time environment, these teams could train with the parent FA organization and provide maneuver units fire support personnel for integrated training when the habitually associated fire support personnel are not available due to ARTEP's, SQT, IG, and other related activities.

(2) Organization. The composition of these FIST, FSS's and separate observation/lasing teams should be comparable to those previously discussed.

(a) Each headquarters and headquarters battery of these field FA battalions could have as a minimum:

- 3 - Observation/Lasing Team HQ consisting of:

  1 Fire Support Sergeant (SGT, E-5)
  1 Fire Support Specialist (SP4, E-4)
  1 Fire Support Specialist (PFC, E-3)

- 1 - Fire Support Section consisting of:

  1 Fire Support Officer (CPT)
  1 Fire Support Sergeant (SFC, E-7)
  2 Fire Support Specialists (E-3/E-4)

(b) Figures equating this to the active Army's force structure are shown in table 12-15.

Table 12-15. Fire Support Personnel & Equipment - Non-Divisional.

Personnel:			
	Officers	28	
	Enlisted	336	
		364	
Equipment:	Radios:		
	AN/VRC-46		84
	AN/VRC-47		28
	AN/VRC-49		28
	AN/GRC-160		84
			224
	Vehicles:		
	Truck Utility, ¼ton w/trailer		28
	Carrier Pers Full Tracked		84
	Carrier CP Light Track		28
			140
	Laser Designators:		
	AN/TVQ-2		84

e. Field Artillery Air Observers.

(1) Consideration was also given to the air observers found in the division artillery and FA brigade. Currently these commissioned officers possess the capability to rapidly move across the battlefield to points of critical decision and influence the battle by providing responsive target acquisition and engagement. They received the fundamental training required of a FIST chief in fire support coordination and planning. The option exists, even though not likely to be used, for these air observers to serve as ground FIST chiefs, if required. With the FA background and training received, including the use of laser designators and digital communications, these FAAO's are equipped to accomplish the fire support tasks required. The necessary interface with the maneuver force commander would require additional time. Establishing the rapport and understanding, the "how" maneuver force operates can't be learned or developed immediately. Employment of the air observers in a ground role detracts from their primary purpose and mission. It also reduces the commander's flexibility to influence the action or provide heavily engaged maneuver forces with additional observation resources for fire support. Air observers will have laser designation capability and can provide the maneuver forces the "back-up" laser designation

and observation required, especially during periods of reconstitution or reestablishment of the ground FIST and its assets.

(2) FAAO's have historically played a significant role in influencing the battle; they can provide a significant impact on the first battle of the next war. The BATTLE game conducted by the study group demonstrated the importance of aerial observation in the engagement of targets with conventional, improved conventional and laser guided munitions.

(3) Subjective analysis by the study group concluded that a requirement exists for ten (10) air observers within the armored mechanized infantry, infantry and air assault divisions and eight (8) air observers within the airborne idvision. This not only maximizes the combat effectiveness of the divisions but provides a degree of robustness and redundancy for the fire support system. Air observers provide the maneuver commander with an expeditious means of providing fire support within an augmentation role as a temporary fill-in while a FIST is being reconstituted.

f. RPV Platoons. Another source of fire support personnel could be members of the RPV (remotely piloted vehicle) platoons. The RPV section chief and his assistant are capable of requesting FA fires. With additional cross training they could develop an increased depth of knowledge and skill proficiency required to perform fire support tasks.

g. Reserve/National Guard Pool. A personnel/equipment solution is the creation of a reserve/national guard pool of fire support personnel independent of those found in FA units which could be developed at the outset of hostilities as immediate team replacements. This requires an extensive training program both in the classroom and under field conditions to develop the proficiency of skills required for completion of fire support tasks. The availability of required assets, both personnel and equipment, to support these teams is cost prohibitive but does provide a level of depth within the force structure.

h. Review. A review of the additional alternatives to create a redundancy in fire support personnel and equipment can be summarized as follows:

(1) Maximum use of reconstitution plans within the organization.

(2) The organization of separate observation/lasing teams within the division, equipped in a manner similar to the FIST and with the same skills.

(3) The addition of fire support sections and observation/lasing teams within the non-divisional FA organization.

(4) The employment of FA air observers in an aerial or ground role to support maneuver forces.

(5) The use of RPV section personnel to replace fire support personnel, as required.

(6) Development of a pool of reserve/national guard fire support personnel, independent of FA organizations, to be deployed at the outbreak of hostilities.

12.6 FINDINGS

12.6.1 General. The study group's effort was to determine if a need existed for redundancy of personnel and equipment within maneuver fire support organizations, specifically the FIST, and if a need did exist from where these personnel and equipment assets could be drawn. In an effort to develop answers to these questions, a detailed review of the evolution of the FO and liaison sections into the modern day FIST and fire support sections revealed a striking change in manpower and equipment requirements. Fire support personnel of today have been identified by a single MOS (13F) and require a separate training program to gain the fundamentals of what their fire support job entails. Sophisticated equipment is being introduced into the inventory, such as laser designators and the digital communications of TACFIRE. This equipment requires specialized training and no longer permits the selection of just any soldier for fire support duties. The previous manpower resources of FA batteries has been cut to the bone providing little, if any, excess in the FA organization.

12.6.2 Specific Findings. The study group found that:

a. A requirement for redundancy (R3) existed with the fire support organizations at the maneuver levels, especially at the platoon, company, and battalion levels.

b. That the fire support positions of FIST Chief, platoon FO, and FSO required a redundancy capability.

c. Fire support losses during the first day of a defensive battle would be significant. These losses would impact on combat effectiveness unless immediate replacements were available.

d. A mix of separate observation/lasing teams and FA air observers

- 10 ground teams with equipment
- 10 FA air observers

provides the necessary redundancy required for continued fire support during the battle.

e. Immediate fire support replacements could be made available if redundancy existed in the organization. This redundancy could be accomplished by:

(1) Increasing the grade/or skill requirements of personnel having the same MOS (e.g., FIST Fire Support Sergeant becoming Bn FSO Fire Support Sergeant).

(2) Cross training personnel with non-critical positions into the fire support positions (e.g., MOS 82D, Surveyor as MOS 13F, forward observer).

(3) Having additional personnel within the organization with the same skills but performing other duties (e.g., MOS 13F working in liaison sections or other sections).

(4) Adding additional fire support personnel and equipment to the organization, such as:

- Fire support teams/sections.
- Liaison sections.
- Drawing on other FA assets, such as:
  - Target Acquisition Battery (TAB).
  - Remotely Piloted Vehicle (RPV) platoon.
- Drawing on maneuver assets to fill non-critical positions.

f. There is a requirement for reconstitution plans to be developed from the platoon through divisional level. Training and education in the preparation and execution of these plans must be initiated both at the service school and unit level. These plans must be flexible, well thought out and capable of simple execution.

CHAPTER 13

DISCUSSION

13.1 CURRENT ORGANIZATIONS

Experience with the FIST organization has proven the validity of the concept. Exposure of the concept to organizations throughout the Army and a mature understanding of its relationship with the total fire support system and the supported maneuver forces permitted the CSSG II to undertake the thorough analysis necessary to develop the fine tuning required for fire support organizations. All facets of the concept, from basic fire support tasks to the specific requirements of each type organization were examined. In subsequent paragraphs changes required in fire support doctrine are presented. These are followed by discussions of the equipment and personnel fixes necessary to optimize current resources. A summary of the required changes is provided at the end of the chapter.

13.1.1 General. While the basic doctrine and organization for FIST and fire support sections are sound, CSSG II concluded that several changes in personnel and equipment are necessary to fine tune FIST operations. Reductions in the size of FIST were found possible in some organizations while, in others, increases are required. Many communication discrepancies were uncovered, such as excessive radio nets, mismatch of radios, and excessive wire. Doctrinal shortfalls were found in fire support for aerial maneuver units and in employment of the FA air observers. The following are the significant conclusions of the Phase I (fine tuning of present FIST).

13.1.2 Organizational Structure. The study group conducted an in-depth analysis of the present FIST organizations stressing three elements: (1) the requirement for platoon FO's; (2) the number of personnel required for the FIST HQ; (3) a requirement for fire support representatives in the aerial maneuver units (air cavalry troop/attack helicopter company). The first two sub-elements reflect on the size of the FIST organization, while the third element is a new look at fire support requirements for aerial maneuver units.

a. Platoon Observers. Current FIST Organizations provide platoon FO's for all infantry organizations. In the case of a mechanized infantry, the CSSG II verified this need. However, in armor and armored cavalry organizations, only a 5-man team, consisting of a -man headquarters and one FO party, is available. The requirement for responsive fire support for maneuver organizations implies a need for observers in every platoon. The need is, however, tempered by branch differences in tactics, organizations, and equipment. For example, the tank company fighting element consists of tanks only and no space is available in the tank for personnel other than crew members--thus an FO would have to perform dual functions, i.e., loader and observer. An FO party with a separate vehicle cannot be justified on the basis of cost effectiveness, and the signature effect is too risky. CSSG II determined it is desirable to provide an FO for the tank platoon but could find no practical way of employing him. These factors have previously led to reliance on

observer training for tank platoon leaders and platoon sergeant and recognition that some platoon FO's will be habitually available through task organization of mechanized infantry and tank companies.

(1) In armored cavalry platoons, space for an FO is not a problem, however, the tactics of the organization favor highly decentralized operations with emphasis on the role of the four scout teams as the initial contact point with enemy forces. In view of manpower constraints and MOS qualifications, it is not practical to provide fire support personnel with each scout team. CSSG I attempted to solve the problem by providing a capability to deploy a 2-man FO team from the FIST HQ in the armor/armored cavalry FIST. Feedback from field units indicate that this capability is not being utilized and USAARMS has stated that the capability is not required.

(2) CSSG II concluded that platoon FO's are not required in armor and armored cavalry FIST's.

b. FIST HQ. The required manning level for the FIST HQ has been the subject of many comments from the field. Presently, the HQ for all FISTs consists of three personnel (LT, E6, E4). The study group, after considering field comments, available analytical data, and military judgment, concluded that a 4-man headquarters was required. Significant points which led to this conclusion are summarized below.

(1) In mounted FIST's (armor/armored cavalry/mechanized infantry) the HQ must supervise platoon FO's and/or receive fire requests from platoon leaders/sergeants, operate in four radio nets, operate and maintain a track vehicle, provide a capability for the FIST chief to move to the company/troop/team commander's vehicle and, in the mechanized infantry, have sufficient personnel to operate dismounted when required.

(2) In the dismounted organizations, infantry, airborne, and air assault FIST's, the HQ requirements are similar to those described above. Other driving considerations are--sufficient personnel to carry required equipment and the need to provide personnel to effect FIST vehicle linkup.

(3) These changes in FIST organization produce a personnel savings in the armored division and a requirement for additional spaces in the mechanized infantry, infantry, airborne, and air assault division. Table 13-1 lists the total number of current FISTs by type (infantry, mechanized infantry, armor, armored cavalry) for the five Army divisions and the net personnel savings (-) or cost (+) for each division.

Table 13-1. Phase I FIST Personnel Summary

Division	Number of FIST by Type Inf Mech	Inf Armd	A/C	(-)	Spaces (+)	Net
Armor	15	18	3	21	15	-6
Mech Inf	18	12	3	15	18	+3
Infantry	24 3	3		3	27	+24
Airborne	27	3		3	27	+24
Air Assault	27				27	+27

c. Armored Cavalry FIST Identification. CSSG I identified the FIST's for tank companies and armored cavalry troops under the generic title Armor/Cavalry FIST, apparently under the assumption that both type units and, thus both type FIST's, would operate in a similar manner. This generic identification was not used in subsequent TOE documentation. In fact, FIST's for armored cavalry troops are currently identified as "Tank Company/Cavalry Troop FIST Team (TOE 6-37) and Tank Company FIST (TOE 6-396)."

(1) CSSG II found that equipment requirements for FIST's supporting armored cavalry troops differ from those supporting the tank company. Since the squadron does not have squadron mortars, the FIST radio requirements are less and, while some FIST's supporting troops require a track vehicle, those supporting the airborne and air assault divisions require wheeled vehicles.

(2) CSSG II concluded that all FIST's supporting armored cavalry troops should be identified as "armored cavalry FIST's."

d. Armored Cavalry FIST Shortages. The CSSG II review of FIST organizations disclosed that FIST organizations have not been provided for the ground troop of the air cavalry squadron in the infantry, airborne, and air assault divisions. Since the CSSG I study report makes no mention of the requirement for these FIST's, it was assumed that they were omitted through administrative oversight. In view of the approved FIST doctrine, which states that a FIST should be provided for these organizations. (It should be noted, however, that the ground troop in the airborne division has not been implemented by MTOE.) These four-man FIST's should be added to the TOE of the general support battalion in the infantry and air assault division artilleries and to HHB, division artillery, in the airborne division.

13.1.3 Fire Support for Aerial Maneuver Units. Aerial maneuver units are defined as air cavalry squadrons and attack helicopter battalions. The extensive review of fire support for aerial maneuver units revealed four shortcomings in current doctrine: (1) the lack of air cavalry squadron fire support sections in air assault divisions; (2) inadequate doctrine on how to provide fire support for aerial maneuver units; (3) a need for additional fire support

representation in these units; and (4) a requirement for doctrine describing the employment of FA air observers in support of aerial maneuver units.

a. Air Cavalry Squadron Fire Support Sections. The aerial maneuver task force study group report (Chapter 8) found that fire support sections (FSS's) have been provided for all air cavalry squadrons except for the air assault division. Further review in the analysis phase of the study determined that FSS's for the air cavalry squadrons of the infantry divisions are provided by a DS battalion TOE (Ninth maneuver battalion FS section). The airborne division has a FSS for the air cavalry squadron on the HHB, Division Artillery TOE. There is no FSS provided in the GS battalion TOE of the air assault division for the air cavalry squadron. Fire support doctrine requires that each battalion/squadron be provided a FSS, therefore, CSSG II determined that a standard 4-man FSS should be added to the TOE of the GS battalion of the air assault division artillery.

b. Fire Support Doctrine. CSSG II's aerial maneuver task force's review of fire support and aerial maneuver doctrinal publications disclosed that FA responsibilities in regard to provision of fire support for these units has not been adequately addressed. For example, in most cases, illustrative organizations for combat fail to include fire support units, even though the need for suppression of enemy air defenses (SEAD) is well accepted. These fire support deficiencies cause a lack of awareness on how to utilize fire support by both the field artilleryman and the air unit commander and, if not corrected, will result in unnecessary loss of air assets.

Fire support doctrine for aerial maneuver units is based on the same tenants used for support of ground maneuver units. Doctrine should be expanded to state that when aerial maneuver units are committed under the operational control of a maneuver force, the senior field artilleryman with the force is responsible for providing adequate fire support to the air maneuver units. This responsibility includes not only consideration in the organization of fire support for combat, but a requirement to provide sufficient FA air observer (FAAO) teams to provide continuous observation of the air unit's zone of action. (Requirements for FAAO teams are further addressed at paragraph 13.1.4.)

c. Fire Support Representation. With the exception of the previous discrepancy noted in air cavalry squadrons, fire support representatives are provided at battalion/squadron level in aerial maneuver units. These fire support personnel serve in the traditional role, that is, actively injecting fire support into the commander's estimates, decisions, and concepts. The normal method of employment for the squadrons/battalions, however, is to place an attack helicopter company or air cavalry troop under the operational control (OPCON) of a ground maneuver brigade commander, who integrates them completely into the ground scheme of maneuver and provides them with responsive fire support.

(1) The air cavalry troop and attack helicopter company ARTEP's currently describe the tasks those units must accomplish in order to obtain responsive fire support. A problem exists, however, in that many items that

appear as standards in these ARTEP's are in themselves distinct tasks, with associated conditions and standards. An example is the air cavalry troop task "occupy an assembly area." A standard for this task is "troop establishes indirect fire support plan." The establishment of the plan is itself a major task containing numerous sub-tasks and requiring extensive coordination.

(2) Since no fire support personnel are presently available to the company/troop level, the study group addressed the capability of unit members to perform fire support tasks. Individuals who perform these tasks in aerial maneuver units cannot be as proficient as those who perform the same tasks for ground units because they do not have the time or training to do so. The individual charged by doctrine and air maneuver ARTEP's with performing FSCOORD responsibilities is the unit commander. The nature of his job is such that it is doubtful that he, like the ground maneuver commander, will have the time required to accomplish details of fire support employment. Some type of fire support representation is thus required in the company/ troop in order to provide and manage effective fire support for the unit.

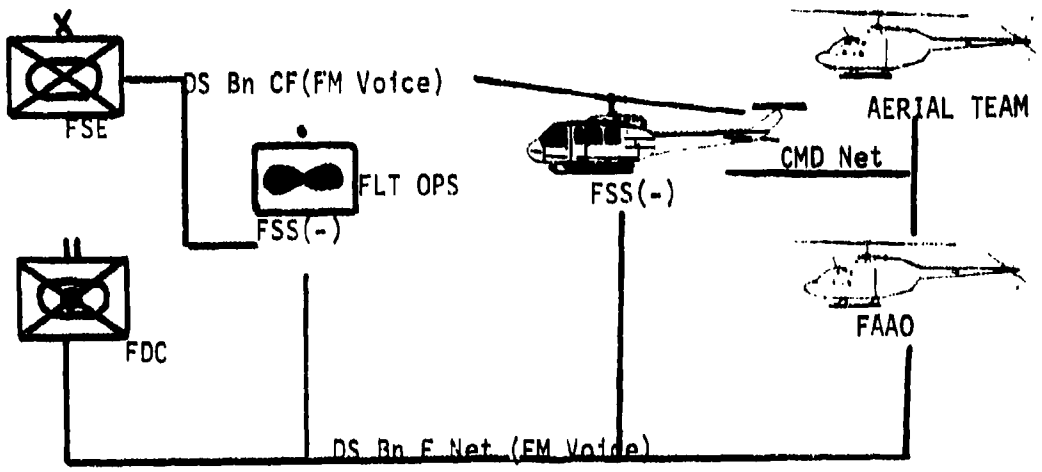
(3) Two approaches to providing this representation were addressed. The first, the substitution of fire support qualified personnel for crew members, was not considered feasible on the basis that nap-of-the-earth techniques and the tactical mission require a fully qualified 2-man crew for navigation and control of the aircraft. The second approach considered additional personnel at both the company/troop and platoon/team levels. An acceptable solution at the platoon/team level was found in the use of FA air observers, currently organic to division artillery in all divisions except the air assault division. An aerial observation team consists of a scout helicopter, pilot, and commissioned FAAO .

(4) At the company/troop level, the study group determined that a 3-man FSS (CPT, E7, E4) with ground transportation and suitable radio equipment is required. The primary duties of this section should be to advise the company/troop commander on the employment of fire support; coordinate fire support requirements with the brigade FSO; and coordinate the activities of the FAAO's employed in support of the company/ troop.

(5) Within the current active force structure, there are 28 air cavalry troops and 19 attack helicopter companies, resulting in an immediate requirement for 47 Captains, E7's, and E3/4 spaces to support the air maneuver units. When the ARCSA III aviation force structure is fully implemented, the total force structure will contain approximately 86 air cavalry troops and attack helicopter companies (78 active, 8 reserve/national guard). In the long term, 39 Captains, E7's, and E3/4's will be required in addition to those needed for the current force structure.

(6) The attack helicopter battalion requires an FA staff officer (FSO) to function as the commander's full time fire support advisor, to plan and coordinate fire support requirements, and to establish and supervise the attack helicopter FSE when constituted.

d. Operational Concept for Aerial Maneuver Fire Support. CSSG II envisions that FAAO's and aerial maneuver FSS's will operate as illustrated at figure 13-1. It is assumed that the air unit will deploy an air command post and a ground element, the flight operations section, in the brigade area.



FSE - Fire Support Element
FSS - Fire Support Section

Figure 13-1. Fire Support Concept for Aerial Maneuver Platoon/Team.

(1) The FSS will operate full-time in two radio nets. The direct support battalion FD net links the FSS with FAAO's at team level and with the FDC. The second net, the direct support battalion CF net, links the troop or company FSS with higher and adjacent FSE's for fire planning and fire support coordination purposes.

(2) The three-man FSS deploys in a 1/4-ton vehicle equipped with an AN/VRC-49 radio to permit automatic retransmission when required. The FSO, accompanying the unit commander or operations officer in the airborne command and control aircraft, require a minimum of one dedicated FM radio. This representative, usually the FSO, monitors the FD net and coordinates FAAO fire requests. The FSO switches to the command FD net, when required.

(3) If the air unit commander elects to operate two airborne command posts, the FSO and the FS sergeant accompany command post elements. If two FM radios can be made available, each monitors the FD and CF nets. If only one FM radio is available, both elements operate in the FD net and the one man remaining in the section monitors the CF net from a ground location, relaying messages as appropriate.

13.1.4 Field Artillery Air Observers (FAAO). An examination of current fire support doctrine reveals little discussion of requirements for FAAO's or their employment. Previous mention has been made of the capability of these observers to provide valuable fire support for aerial maneuver units. Later on, in the laser phase of the study, these observers were found to be a valuable asset for the employment of COPPERHEAD, when the scout aircraft is equipped with a laser designator. These findings led the CSSG II to conclude that a doctrinal requirement for two FAAO teams (scout helicopter, pilot, and FAAO) per divisional cannon battalion and two per division artillery headquarters should be established. A comparison of the current authorizations and CSSG II recommendations is at table 13-2. These findings result in an additional two FAAO teams in all divisions except the air assault division, which is increased from 0 to 10 teams.

Table 13-2. Field Artillery Air Observer Requirements.

Division	Current Auth	CSSG II Recommendation	Increase in Spaces
Armored	8	10	2
Infantry	8	10	2
Mechanized Infantry	8	10	2
Airborne	6	8	2
Air Assault	0	10	10

13.1.5 Divisional FIST Command Relationships. FISTs are organic to the TOE of divisional direct and general support battalions and to the howitzer battery of the armored cavalry squadron. Doctrine states that these teams will join the supported maneuver unit at the onset of hostilities and remain with the unit regardless of subsequent organization for combat. In practice, FA units attempt to habitually associate a FIST to operate with a supported element to foster the FIST-maneuver commander relationship.

a. When a FIST "joins" a maneuver unit there is no definitive command relationship established. That is, there are no guidelines to establish what support the maneuver unit will provide to the FIST. In the past an FO remained with maneuver units in his DS FA battalion zone of responsibility. Under the FIST concept he remains with the supported maneuver company and could be employed in a different brigade apart from his parent DS FA Bn.

Under these conditions, FIST personnel actions and maintenance problems could become major problems. Personnel actions, such as pay, promotion, mail, etc., become acute when the FIST is located anywhere in the division sector and the parent DS FA battalion is unable to perform personnel services for the team members. This led the CSSG II to conclude that FIST's and FSS's should be attached to the supported maneuver unit upon the onset of hostilities. Attachment is an official command status and permits the supported unit to provide the required administrative and maintenance functions for the FIST.

b. This attached status should also be recognized in the positioning of POMCUS stocks in USAREUR. Experience with REFORGER exercises has shown that FIST's and FSS's experience considerable delay in joining their supported units because equipment is prepositioned with their organic FA battalion rather than with the supported unit.

13.1.6 Battalion Heavy Mortar Platoon Leader. The draft doctrine, published in TC-6-20-10 FIST, which established the additional duty of assistant FSCOORD for this officer has not been validated by field experience. While the platoon leader is available in emergency situations, his duties as the mortar platoon leader require his full attention. The deletion of this requirement does not degrade FSE duties from a personnel standpoint. The absence of the platoon leader's radio to monitor the battalion heavy mortar FD net, does, however, require a reconfiguration of FSS radios in order to replace the lost capability.

13.1.7 Communications. The study group determined that the FM radio net structure for the current mechanized infantry FIST organizations can be simplified by combining the company fire control and company mortar FD nets. A review of SCORES mission profile data on target sensings and fire missions for mortars and FA indicated that both the mortar FD and the FIST fire control functions can be conducted on this net, which would be titled Company Fire Control/Troop Fire Control (CFC/TFC) net. Tank companies, despite the absence of company mortars, would use this net to request fires. It is applicable to armored cavalry organizations because the troop mortars may be utilized in a centralized mode. When so utilized, the TFC net may also be used for a heavy mortar FD net.

a. The study group also found that an additional AM net is required in the ACR for communications between squadron and regimental FSEs. The only net currently available is the regimental command net (FM). The utilization of this net for fire support purposes is unacceptable because of net loading. The AM radio equipment is currently available within the FSEs for establishment of a regimental fire support net.

b. It was found that a FM net is also required in the ACR for communications between squadron and regimental FSE/maneuver brigade FSE, when operating within FM radio range or as a part of another maneuver force.

c. The study group verified the doctrinal requirement for operation of retransmission stations by squadron/battalion FSS's. The utilization of these

stations is, however, currently being degraded because of an inadequate explanation of their use in field manuals and a lack of flexibility in current radio configurations. The number of retransmission frequencies should also be increased to reduce usage conflicts. The proper use of retransmission facilities offers promise of significant improvement in communications capabilities for FIST observers, particularly in USAREUR, where reports from units indicate considerable problems in FIST to FDC communications.

13.1.8 Equipment Shortcomings. The study group's extensive review of current fire support organization's capabilities to support current doctrine disclosed a need for numerous equipment changes to correct quantities or type equipment initially issued to FIST's and FSS's during implementation of the FIST concept. For ease of explanation, the changes are summarized into various categories described in subsequent paragraphs.

a. Under Armor Communications. The current radio, AN/PRC-77 authorized for the mechanized infantry platoon FO does not provide a capability to communicate with fire support agencies when the M113A1 vehicle is buttoned up. This problem can be corrected by the addition of an appropriate radio mount and antenna to the mechanized infantry company TOE (platoon leader track).

b. FIST Radio Configuration. The CSSG II radio configuration for each type FIST resulted from a review of the number of nets required, radio range requirements, net loading, and type tactical operation to be supported, i.e., mounted/dismounted. Reports from field units have indicated dissatisfaction with current radio configurations because of insufficient radio-transmitters and dismountable radios. After reviewing FIST communication requirements in each type organization, the study group determined that two radio nets can be combined (See paragraph 13.1.7) and radio configurations should be changed to satisfy doctrinal requirements, as well as answering some of the field comments noted above. The changes required are summarized at table 13-3.

Table 13-3. FIST Radio Configurations.

	Radios							
	AN/VRC-46		AN/VRC-47		AN/GRC-160		AN/PRC-77	
Type FIST	Now	CSSG II	Now	CSSG II	Now	CSSG II	Now	CSSG II
Armor	0	1	1	0	2	3	1	0
Armored Cavalry	0	1	1	0	2	2	1	0
Mechanized Infantry	0	1	1	0	2	6*	3	0
Infantry	0	0	1	0	2	1	3	5
Air Assault	0	0	1	0	1	1	4	5
Airborne	0	0	0	0	3	1	3	5

*Mount for platoon FO party (AN/GRC-160) is installed in mechanized infantry platoon leader's track vehicle.

c. Vehicle Requirement/Armor FIST, Airborne Division. The M561, Gamma Goat, is the currently authorized vehicle for the tank company FIST in the airborne division. The supported force, a light tank company, equipped with the M551, armored reconnaissance/airborne assault vehicle, operates as an armored force. The M561 vehicle does not possess the mobility and survivability necessary for the supporting FIST to operate in an armored environment.

(1) The tank company is currently providing a M551 for FIST use during operations, however, when the company needs the vehicle for its primary mission due to breakdowns, the FIST is dispersed and placed among other vehicles. In some cases FIST personnel are required to ride on the outside of the M551's. These solutions do not provide satisfactory transportation for the team and the effect is degradation of fire support available to the company.

(2) CSSG II determined that the FIST should be equipped with the M113A1 vehicle and other equipment currently authorized for other armor FIST's. Authorization of the M113A1 for the FIST, organic to HHB, division artillery, presents a logistics problem in that they would be the only track vehicles in the division artillery. At least one additional mechanic and parts inventory would be required for the HHB. A logical solution to the problem appears to be the assignment of the vehicles to HHC of the armor battalion for use by the FIST's. This company is authorized three M577A1 command post carriers, a M113A1 derivative vehicle, and should have the capability to support the three additional M113A1's with no increase in personnel.

d. Maneuver Battalion/Squadron Fire Support Section. The CSSG II review of maneuver battalion FSS's operations disclosed a need to reconfigure many of the currently authorized radios and vehicles to meet tactical operating requirements. These changes are required to provide a radio for operation on the battalion heavy mortar FD net, provide a vehicle and radio for the FSO when employed with the maneuver battalion/squadron mobile command post and to free the AN/VRC-49 for its intended use as a retransmission station.

(1) Retransmission Requirements. All battalion/squadron FSS's, less those in the airborne division, are currently authorized the AN/VRC-49 radio. Doctrine requires that the airborne section also operate a retransmission station. CSSG II's review of this requirement and coordination with the 82d Airborne Division Artillery S3 led to the conclusion that FSS's in the airborne division should be authorized this equipment.

In the implementation of the retransmission station in other divisions it has been assumed that one of the two receivers/transmitters is available for use on the CF net. However, experience in REFORGER and other field exercises has shown that extensive use of the retransmission facilities (both receiver/transmitters) are required for FIST observers. This apparent conflict in doctrine confuses fire support personnel and degrades both FIST and FSE communications. CSSG II determined that a separate radio is required for operation on the CF net.

(2) Heavy Mortar Fire Direction Net. The deletion of assistant FSCOORD duties from the heavy mortar platoon leader's duties causes a shortfall in FSS's radios (the platoon leader's radio was used to monitor the heavy mortar FD net). The section must be authorized a radio to permit monitoring, and thus, coordination of fires on the battalion heavy mortar FD net. This requirement can be filled in the armored and mechanized infantry division by a change in the vehicle mounting of the currently authorized AN/VRC-47 radio into the M577. However, in the infantry division, a radio is not currently available. The optimal requirement would be a receiver-transmitter (AN/VRC-46) per radio net monitored.

(3) FSO Operations with the Command Group. The FSO must operate with the mobile command group in all maneuver battalions/squadrons. While a radio communications requirement is recognized in current FSS's TOE's, most radio configurations require a change to meet tactical operating requirements.

(4) Radio and Vehicle Configurations. CSSG II determined what the radio and vehicle configurations should be for maneuver battalion/squadron fire support sections. They are depicted in tables 13-4 through 13-7. These configurations provide two vehicles per section; one for use in the FSE at the maneuver battalion TOC, the second for use by the FSO when separated from the FSE. Sufficient radios are provided to operate the retransmission station, to operate or monitor required nets in the FSE and communications for the FSO when operating separately.

(a) In armor, mechanized infantry, and armored cavalry squadrons, the maneuver unit provides a vehicle for use by the FSO in the command group. CSSG II determined that the radio mounts of these vehicles should be altered, if necessary, to accommodate the above radio configurations.

Table 13-4. Summary of Armor and Mechanized Infantry Battalion Fire Support Section Equipment Requirements.

Item	Current TOE	CSSG II	Change
Command Post Carrier, M577	1	1	0
Radio Set: AN/VRC-47 mtd truck, 1/4 ton	1	0	-1
Radio Set: AN/VRC-47* mtd in Carrier, Command Post	0	1	+1
Radio Set: AN/VRC-49 mtd in Carrier, Command Post	1	1	0
Radio Set: AN/GRC-160* mtd in truck, 1/4 ton	0	1	+1

Note: *With appropriate speech secure equipment

Table 13-5. Summary of Maneuver Battalion Fire Support Section Equipment Requirements for Infantry, Airborne, and Air Assault Divisions.

Item	Inf Div TOE	Inf Div CSSG II ±		ABN Div TOE	ABN Div CSSG II ±		AA Div TOE	AA Div CSSG II ±	
Radio Set: AN/VRC-49 mtd in 1-1/4 ton truck	0	1	+1	0	1	+1	0	1	+1
Radio Set: AN/VRC-49 mtd in 1/4 ton truck	1	0	-1	0	0	0	1	0	-1
Radio Set: AN/VRC-46* mtd in 1 1/4 ton truck	0	2	+2	0	2	+2	0	2	+2
Radio Set: AN/GRC-160* mtd in 1/4 ton truck	0	1	+1	0	1	+1	0	1	+1
Radio Set: AN/GRC-160 mtd in 1 1/4 ton truck	0	0	0	2	0	-2	0	0	0
Radio Set: AN/PRC-77	1	0	-1	0	0	0	1	0	-1
Truck, 1/4 ton w/trl	1	1	0	0	1	+1	1	1	0
Truck, 1 1/4 ton	0	1	+1	1	1	0	0	1	+1

Note: *With appropriate speech secure equipment (one AN/VRC-46 requires this equipment)

Table 13-6. Summary of Radio Requirements for Squadron Fire Support Sections.

Unit	Radio Equipment AN/GRC-106			AN/VRC 49			AN/VRC-47			AN/GRC-160			AN/VRC-46		
	TOE	CSSG II	±	TOE	CSSG II	±	TOE	CSSG II	±	TOE	CSSG II	±	TOE	CSSG II	±
Air Cavalry Squadron															
Infantry Division	NA			1	1	0	1	0	-1	0	1	+1	0	1	+1
Airborne Division	NA			0	1	+1	0	0	0	2	1	-1	1	1	0
Armored Cavalry Squadron *															
Armored Division	NA			1	1	0	1	0	-1	0	1	+1*	0	1	+1
Mechanized Infantry Division	NA			1	1	0	1	0	-1	0	1	+1*	0	1	+1
Armored Cavalry Squadron ACR	1	1	0	1	1	0	0	1	+1	0	0	0	0	1	+1

*Requires an additional mount for the AN/GRC-160 in HHT, ACS, M113A1, used for command group.

NOTE: Secure speech devices are required for the AN/VRC-47, ANGRC-160, AN/VRC-46.

Table 13-7. Summary of Vehicle Requirements for Squadron Fire Support Sections.

Unit	Vehicles M577 TOE	M577 CSSG II	M577 ±	1 1/4-Ton TOE	1 1/4-Ton CSSG II	1 1/4-Ton ±	1/4-ton TOE	1/4-ton CSSG II	1/4-ton ±
Air Cavalry Squadron									
Infantry Division	0	0	0	0	1	+1	1	1	0
Airborne Division	0	0	0	1	1	0	0	1	+1
Air Assault Division	0	0	0	0	1	+1	1	1	0
Armored Cavalry Squadron									
Armored Division	1	1	0		NA		1	1	0
Mechanized Infantry Division	1	1	0		NA		1	1	0
Armored Cavalry Squadron ACR	1	1	0		NA		1	1	0

(b) Table 13-6 depicts the radio requirements of the armored/air cavalry squadrons of the various type divisions and the ACR.

(c) Radio configurations for the ACR's FSS's are changed. The regimental squadron received an AN/VRC-46 for communications in the regimental fire support net (FM). The regimental FSO's AN/VRC-47 was replaced by an AN/VRC-46 for operation on the regimental fire support net (FM). Both squadron and regimental FSO receive an AN/VRC-47 for mounting in the M151A1.

(d) In armor units, where the tank is provided for command post use, CSSG II noted that the FSO must replace a tank crew member. This solution does not permit the FSO to concentrate on fire support duties. Since the new family of combat vehicles, IFV/CFV, provide mobility and protection nearly equivalent to the XM-1 tank, it appears that USAARMS should consider replacement of the command group tank with the IFV or CFV in the out years.

e. Maneuver Brigade Fire Support Section. CSSG II's review of the brigade FSS's organization disclosed two problems in vehicle and radio configurations. Current doctrine requires the brigade section to operate a retransmission station and the section is equipped with an AN/VRC-49 radio for this purpose. CSSG II could not validate this requirement with current doctrine and found that a less expensive radio configuration (two AN/VRC-46 radios) can be used in this FSE.

(1) The brigade FSO is similar to the maneuver battalion FSO in that he must also operate with a maneuver mobile command group. This requirement is currently recognized only in the armored and mechanized infantry divisions.

(2) CSSG II determined that the brigade radios and vehicles should be reconfigured into a standard arrangement depicted at figure 13-2. This configuration requires the addition of a 1/4-ton vehicle and AN/VRC-47 radio in the infantry, airborne, and air assault divisions. The figure also illustrates a requirement for additional speech secure equipment. Only one KY-38 is currently authorized in all sections.

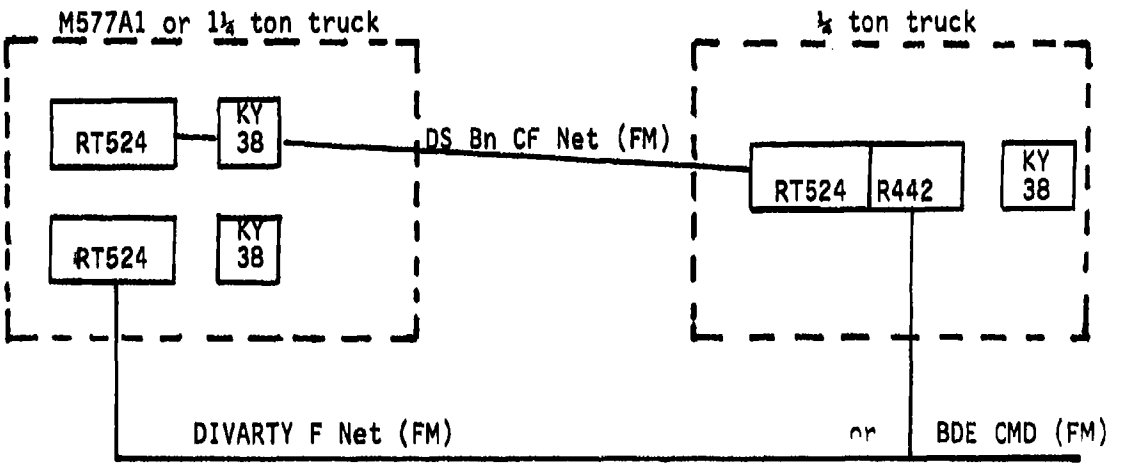


Figure 13-2. Radio/Vehicle Configurations, Maneuver Brigade Fire Support Sections.

13.1.9 Equipment Adjustments. CSSG II review of TOE equipment authorizations resulted in a finding that some equipment reductions were appropriate or candidates for trade-off for less expensive equipment. In most FIST's, for example, the quantity of wire equipment can be reduced and the TA-1/PT telephone can be substituted for the heavier and more expensive TA-312/PT. Reductions in grenade launchers and generators can also be made in FIST organizations. In the infantry FIST, one of the two 1/4-ton vehicles, currently authorized, can be deleted.

Conversely, additional RC-292 radio antennas and speech secure equipment is required for FSS's.

13.1.10 Summary of Personnel and Equipment Changes.

a. A summary of spaces required for implementation of Phase I findings (current organizations) per type division, armored cavalry regiment (ACR), corps aviation battalion, and air cavalry combat brigade (ACCB) is at table 13-8. The number of FSS's required in aerial maneuver units is based upon the DA approved ARCSA III organization described below:

Type Unit	Air Cav Troop	Attack Helicopter Company
Armor and Mechanized Infantry Divisions	1	2
Infantry and Airborne Divisions	3	1
Air Assault Division	3	3
ACR	1	1
Corps Aviation Battalion	0	3
ACCB	3	6

b. Table 13-9 provides a summary of spaces required for a 16 division force TOE. The number of each type unit is shown in parenthesis.

c. A summary of the vehicle and radio changes required to implement Phase I findings pertaining to the FIST is at table 13-10. Similar data for maneuver battalion/squadron/brigade and aerial maneuver unit FSS's is at tables 13-11 and 13-12.

Table 13-8. Summary of Spaces Required for Phase I Implementation for Type Divisions, Armored Cavalry Regiment, and Aerial Maneuver Units.

	Change	Armor	Mech Inf	Inf	ABN	AA	ACR	Corps Avn	ACCB
1.	Decrease size of armor/ armored cavalry FIST's	-21	-15	-3	-3	0	-12		
2.	Increase size of all infantry FIST's	+15	+18	+27	+27	+27	0		
3.	Add FIST for ground troop, air cavalry sqdn	0	0	+4	+4	+4	0		
4.	Add FSS for air cavalry sqdn	0	0	0	0	+4	0		
5.	Add FSS, attack helicopter company/ air cavalry troop, FA Staff Officer	+9	+9	+12	+12	+19	+6	+10	+21
6.	Increase number of field artillery air observers	+2	+2	+2	+2	+10	0		
Net Personnel Savings (-)/ Increase (+)		+5	+14	+42	+42	+64	-6	+10	+21

Table 13-9. Summary of Phase I Personnel Impact for 16 Division Active Force (Type Divisions, ACR, XVIII Airborne Corps Arty, ACCB)

Unit	Savings (-)/Increase (+)
Armor Division (4)	+20
Mechanized Infantry Division (5)	+70
Infantry Division (5)	+210
Airborne Division (1)	+42
Air Assault Division (1)	+64
Armored Cavalry Regiment (3)	-18
Corps Avn Bn (2)	+20
ACCB (1)	+21
Net Increase	+429

Table 13-10. Summary of Phase I FIST Vehicle and Radio Changes per Type Division/Armored Cavalry Regiment.

Type Change/Division	M113	M561	M151	GRC 160	PRC 77	VRC 46	VRC 47	KY 38/57
1. Equipment reconfiguration within FIST's								
- Armored Div (4)				+312	-264	+144	-144	
- Mech Inf (5)				+420	-345	+165	-165	
- Infantry (5)			-120	-45	+180	+30	-150	
- Airborne (1)		-27	+27	-51	+51	+3		
- Air Assault (1)					+27		-27	
- ACR (3)					-36	+36	-36	
2. Equipment addition for ground troop, air cavalry squadron								
- Infantry Div (5)	+5			+10		+5		+5
- Airborne (1)			+1	+2		+1		+1
- Air Assault (1)			+1	+2		+1		+1
3. Equipment Change Armor FIST, Abn Div	+3	-3						
Net Change (±)	+8	-30	-91	+650	-387	+385	-522	+7

Table 13-11. Summary of Phase I Maneuver Battalion/Squadron Fire Support Section Vehicle and Radio Changes for Type Divisions/Armored Cavalry Regiment

Type Change/Division	M561	M151	GRC 160	PRC 77	VRC 46	VRC 47	VRC 49	KY 38/57
1. Equipment Reconfiguration								
- Armored Div (4)			+44					
- Mech Inf Div (5)			+55					
- Inf Div (5)	+50		+50	-50	+100			+50
- Airborne Div (1)		+11	-11		+11		+11	+11
- Air Assault (1)	+9		+9	-9	+18			
- Armored Cav Regt (3)					+9	+9		+ 9
2. Addition of Fire Support Section for Air Cavalry Squadron								
- Air Assault (1)	+1	+1	+1		+2		+1	+ 2

Table 13-11 (continued)

Type Change/Division	M561	M151	GRC 160	PRC 77	VRC 46	VRC 47	VRC 49	KY 38/57
3. Addition of Fire Support Section for Aerial Maneuver Elements								
- Armored (4)		+12					+12	+12
- Mech Inf (5)		+15					+15	+15
- Infantry (5)		+20					+20	+20
- Airborne (1)		+ 4					+ 4	+ 4
- Air Assault (1)		+ 6					+ 6	+ 6
- ACR (3)		+ 6					+ 6	+ 6
- ACCB		+ 9					+ 9	+ 9
- Combat Avn Bn (2)		+ 6					+ 6	+ 6
Net Change (±)	+60	+90	+148	-59	+140	+9	+90	+150

Table 13-12. Summary of Phase I Brigade Fire Support Section Vehicle and Radio Changes for Type Divisions.

Division	M561	M151	GRC 160	PRC 77	VRC 46	VRC 47	VRC 49	KY 38/57
Armor (4)					+24		-12	+12
Mech Inf (5)					+30		-15	+15
Inf (5)	+15			-15	+30	+15	-15	+30
Airborne (1)		+ 3	- 6		+ 3	+ 3		+ 3
Air Assault (1)	+ 3			- 6	+ 6	+ 3	-3	+3
Armored Cavalry (3)					+ 3			+ 3
NET CHANGE (±)	+18	+3	-6	-21	+96	+21	-45	+66

13.2 DIGITAL OPERATIONS

The fielding of TACFIRE introduced the era of digital communications to fire support systems. The initial fielding of TACFIRE at the FA battalion will be followed closely by the Battery Computer System (BCS) in FA batteries and, thereafter, by the Mortar Fire Control Calculator (MFCC) in light and heavy mortar units. The operational concept for all this equipment indicates no change in fire support doctrine for FIST's and FSS's. A comparison of fire support doctrine and the capabilities of the new equipment indicates, however, that significant improvements in equipment are required to fully implement doctrine and to permit further optimization of the fire support system within the maneuver brigade. These required improvements and concepts for optimization are discussed in subsequent paragraphs.

13.2.1 Forward Observer Input/Output Equipment. The current TACFIRE input/output device for use at the company/troop level is the Digital Message Device (DMD). This device was developed prior to implementation of the FIST concept and was optimized for use by the former FA company FO. The capabilities of the device are limited in that a message can be transmitted to only one address on a single frequency. The current basis of issue provides one DMD per platoon FO and one per FIST HQ. Given the characteristics of the DMD and the doctrinal requirement for the FIST HQ to coordinate platoon FO fire requests, the FO should not send his digital request to the fire direction center without first clearing the request with the FIST HQ by voice on the CFC net.

a. In addition, full implementation of digital concepts would require that the FIST HQ operate a DMD on each digital net, i.e., FA, light, and battalion heavy mortar FD nets. These limitations negate the advantages of

digital equipment and led the study group to conclude that an improved device is required for use at the FIST HQ. This improved equipment should permit the FIST HQ to receive fire requests from subordinate elements and review, edit, and retransmit them to the appropriate fire support agency, e.g., company/battalion mortars or FA. In some cases, such as the mechanized infantry company FIST, an additional DMD is required for use by the FIST chief in dismounted operations or when required to operate separated from his headquarters. This DMD becomes a subscr[illegible] FIST HQ DMD.

b. An advanced development model of an improved 4 ch[illegible]el DMD with characteristics similar to those described above was tested dur[illegible] HELBAT VII at Fort Sill in March-April, 1979. A product improvement program for a four channel DMD (called the FIST DMD) has been initiated by USAFAS and is expected to be fielded in 1983.

c. The TACFIRE IOC occurred in April 1979 and fielding will occur in most divisions prior to the availability of the FIST DMD. Since DMD's will be issued in the quantities prescribed by the original basis of issue described earlier, and the MFCC will not be fielded until the 1983 time frame, mortar fire requests should continue to be in voice mode until the FIST DMD and MFCC are available.

13.2.2 Battalion Fire Support Element (FSE) Digital Equipment. The Variable Format Message Entry Device (VFMED) is the TACFIRE input/output device for the FSE. Fire support coordination requirements for FA are accomplished through a "message of interest" routine at the battalion TACFIRE computer. When so initialized, the computer will automatically transmit a copy of FA fire requests (for the FSE sector only) to the FSE VFMED. This processing is not accomplished, however, until the FA battalion fire direction officer (FDO) takes action on a request of interest to a particular FSE. In effect, the current system places responsibility for determination of priorities of fire within a maneuver battalion on the FA FDO, rather than the FSO at the battalion FSE.

a. In the current time frame the battalion FSE coordinates heavy mortar fires through voice monitoring of the mortar FD net. However, when the MFCC is fielded, the FSE will be in the situation where a digital mortar request addressed from an observer to the FDC cannot be monitored by the FSE. The mortar fires cannot be coordinated, then, without resorting to cumbersome procedures.

b. The problems described above make it obvious that improved digital equipment is required for the FSE. The short-term solution appears to be the addition of the FIST DMD to each FSE. This would permit the FSE to receive all requests for fire from the FIST's, review, edit, prioritize, and retransmit the the request, either to the heavy mortar platoon as a fire order, or to the FA FDC as a fire request. The present VFMED would be retained to conduct currently required functions, i.e., fire planning. This concept should be examined during developmental testing of the FIST DMD.

c. The long term solution should combine the functions of the FIST DMD and VFMED into one new item of equipment. Both solutions are advantageous in that they permit the FSE to coordinate fire requests prior to arrival at the FDC and they reduce the number of subscribers on the FA FD nets. Both require, however, changes in the TACFIRE system software.

d. Under current TACFIRE operational concepts and equipment basis of issue, the FSO operating with the mobile command group does not have a capability to interface digitally with the TACFIRE computer or the VFMED at the maneuver TOC. The CSSG II envisions that the FSO will be required to conduct fire missions when deployed with the mobile command group and will need a capability to send plain text messages to other digital subscribers, such as FIST's and FSS's. The CSSG II determined that one DMD should be authorized for the maneuver battalion/squadron fire support section. Initially, the DMD can be operated as a subscriber to the TACFIRE computer. When the FIST DMD is fielded, the DMD would become a subscriber to the FIST DMD.

13.2.3 Brigade FSE Digital Equipment. The study group's review of brigade FSE fire support requirements and the capabilities of the VFMED resulted in the determination that the present equipment is adequate for FSE use. The brigade FSE influences fire support priorities by providing maneuver commander's priorities to subordinate commanders and fire support agencies rather than through a review of individual fire requests.

13.2.4 Communications.

a. Fire Support Communications System. The optimum fire support communications system for divisional FIST and FSE is illustrated at Figure 13-3. At the FIST level, phase I radio recommendations are used with the FIST DMD, permitting platoon FOs to operate on the CFC net. The FIST would review, edit and retransmit these requests to the company mortars (CFC) or to the battalion FSE over the FA FD net or the battalion heavy mortar FD net.

At the battalion FSE, the radios have been reconfigured to reflect the introduction of the FIST DMD or improved VFMED. A receiver transmitter is provided for each required net. These changes plus the improved VFMED or FIST DMD permit the FSE to review, edit, prioritize and retransmit fire orders to the battalion heavy mortar FDC and fire requests to the field artillery FDC.

(1) The projected relay capabilities of the FIST DMD or improved VFMED also permits replacement of the AN/VRC-49 radio in the maneuver battalion FSS with two AN/VRC-46 radios, a less expensive configuration. The relay capability of the FIST DMD replaces the requirement for operation of a retransmission station at the maneuver battalion FSE.

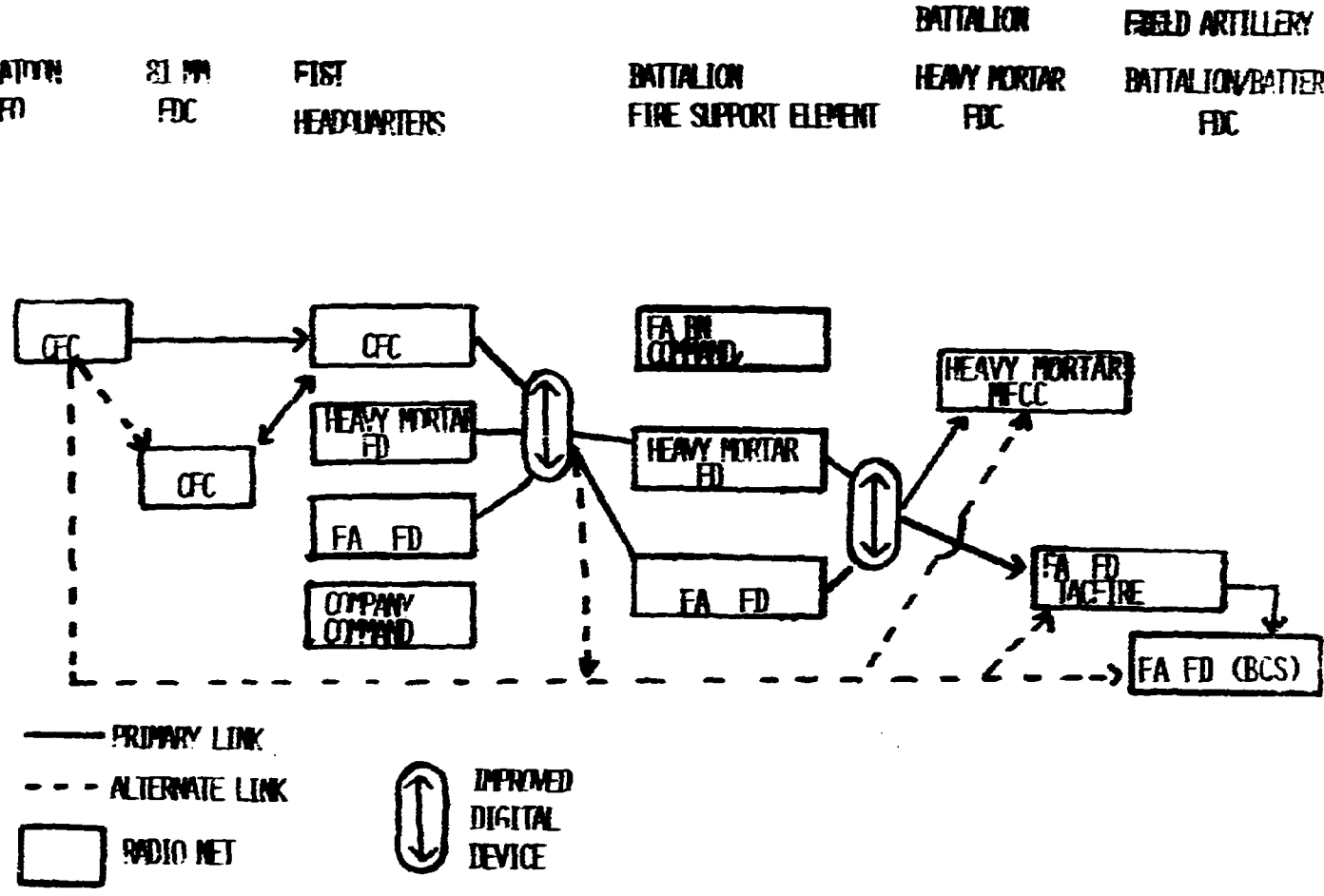


Figure 13-3. Fire Support Communications System

(2) The concept also recognizes the need for alternate fire request channels in the event of malfunction or loss of the FIST DMD at the FIST HQ or the improved VFMED (FIST DMD) at the FSE. In other words, an observer could continue to become a subscriber to the TACFIRE computer and communicate directly with the battalion or battery computer.

b. Army Data Distribution System. The study group examined the PLRS/JTIDS Hybrid System, a candidate for fielding as the Army Distribution Data System in the 1986 time frame. The system provides real time, secure, data communications, and position location to each user. When combined with required FM equipment, the combined system offers increased flexibility in communications channels for fire support operations.

13.2.5 Personnel Requirements. The addition of digital devices to equipment loads is significant in the infantry, airborne, and air assault FIST's where it is necessary to physically carry all required equipment on most operations. In Phase I of the study, it was determined necessary to add a tenth man to the FIST of these light maneuver units in order to provide sufficient equipment portability in the FIST HQ and to man the FIST vehicle. When the DMD is added to the FIST HQ and platoon FO parties, each team member must carry approximately 80 pounds.

13.2.6 Tactical Fire Control for Heavy Mortars. Fire support for the maneuver force may be improved by the integration of tactical fire control for battalion heavy mortars into the direct support battalion's TACFIRE system. The benefits of automating this process includes the capability to integrate mortars and FA into a single schedule of fire or to schedule mortars independently, to mass mortars and FA on a single target and to employ heavy mortars against mortars acquired by the AN/TPQ-36 countermortar radar. This process may also result in the additional utilization of heavy mortars of battalions not in contact. TACFIRE software changes are required to insure that one maneuver battalions' mortar section does not expend its basic load of ammunition while firing for (supporting) another battalion and that the battalion FSO can monitor and override, if necessary, request for the battalion's mortar fires. While the capability appears to exist to implement this concept, the extent and cost of software modifications require further study.

13.2.7 Aerial Maneuver Units. The TACFIRE basis of issue plan includes provisions for DMD's for FAAO's. A connecting cable provides the required interface between the DMD and aircraft FM radios and the air observer can initially utilize the DMD in the same manner as a ground observer.

a. The study group previously determined a need for a three-man FSS in each air cavalry troop and attack helicopter company. The section operates in a manner similar to maneuver battalion FSS's.

b. In this case, however, FAAO's deployed in support of the air maneuver unit, would correspond to the FIST's of the ground maneuver battalion. CSSG II envisions that the FAAO's will rotate on station in order to provide continuous coverage of the sector and that the ground element of

the FSS (normally deployed with flight operations) will assume the coordination functions of the section element with the air command post during refueling. (See figure 13-4.) Fire requests, initiated by FAAO's, will be transmitted to the FSS, where they will be reviewed, coordinated, if necessary, and retransmitted to the FA fire direction center (TACFIRE). Voice requests, originating from pilots/enlisted observers, will be placed in digital format by either the FAAO or the FSS. Digital traffic for the brigade FSE will normally be routed through, or originate at the FSS in flight operations.

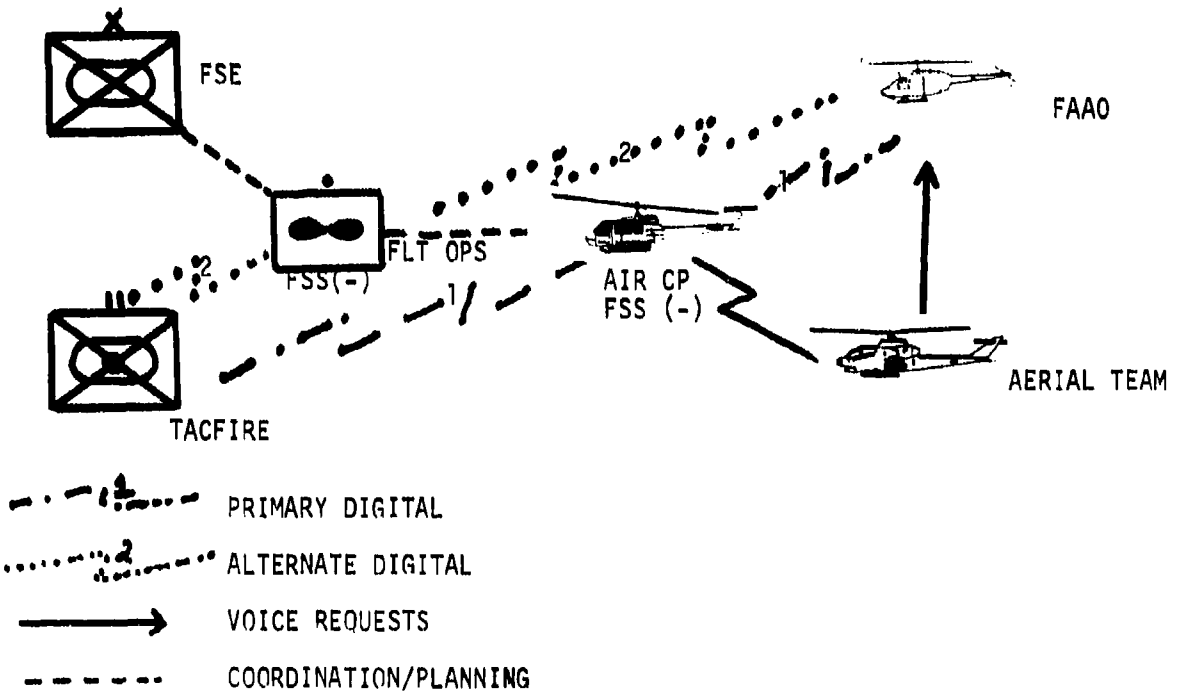


Figure 13-4. Aerial Maneuver Fire Support Operations with Digital Equipment.

c. The study group considered the digital equipment of the FAAO's and FSS's and determined that the current DMD is adequate for the FAAO's. Two FIST DMDs are required for FSS use, one each in the air command post and flight operations locations. A VFMED is not required for the FSE because the limited fire planning requirements of the FSE can be accommodated through the FIST DMD and/or on-site coordination with the supporting FA unit at the maneuver brigade FSE.

13.2.8 Summary of Personnel and Equipment Changes.

a. The Phase II (digital) analysis found no basis for any increase in personnel.

b. The radio and digital equipment changes required to implement Phase II findings in the FIST are summarized per type division and armored cavalry regiment at table 13-13. Similar data for maneuver brigade/battalion/squadron and aerial maneuver unit FSS's is at table 13-14.

Table 13-13. Summary of Phase II Fist Equipment Changes for Type Divisions and Armored Cavalry Regiment.

Division	DMD	FIST DMD
Armored (4)	- 84	+144
Mech Inf (5)	- 75	+165
Inf (5)	-135	+150
Airborne (1)	- 30	+ 30
Assault (1)	- 27	+ 27
ACR (3)	- 36	+ 36
Ground Troop, Air Cavalry Sqdn		
Infantry Div (5)	+ 5	+ 5
Airborne Div (1)	+ 1	+ 1
Air Assault Div (1)	+ 1	+ 1
Net Change (±)	-380	+559

Table 13-14. Summary of Phase II Maneuver Brigade/Battalion/Squadron Equipment Changes for Type Divisions, Armored Cavalry Regiment, Aerial Maneuver Units.

Type Change/Unit	DMD	FIST DMD	VFMED	IMP* VFMED	VRC 46	VRC 47	VRC 49
1. Battalion Fire Support Sections:							
Armored Div (4)	+44	+44	-44	+44	+132	-44	-44
Mech Div (5)	+55	+55	-55	+55	+165	-55	-55
Infantry Div (5)	+55	+55	-55	+55	+55		-55
Airborne Div (1)	+11	+11	-11	+11	+11		-11
Air Assault Div (1)	+9	+9	-9	+9	+9		-9
ACR (3)	+9	+9					
2. Digital Equipment for Air Cav Sqdn Fire Support Section:							
Air Assault Div (1)	+1	+1	-1	+1	+1		-1
3. Equipment Improvement Brigade FSO's			-48	+48			
4. FAAO (40)	+40						
5. Aerial Maneuver FSS (78)		+156					
Net Change (±)	+224	+340	-223	+223	+373	-99	-175

*Replaces FIST DMD and VFMED.

13.3 LASER OPERATIONS

Laser acquisition systems and precision guided munitions offer significant improvements in fire support capabilities. These new capabilities, however, introduce new responsibilities and employment tactics, particularly to the FIST. The study group drew upon the past and current efforts of the Army community in determining study issues and maintained a close working relationship with the COPPERHEAD COEA Study Group, TRANSANA, and selected

service schools. In addition, first-hand insight into laser employment was gained through the BATTLE war game in arriving at solutions to these issues. The discussion first outlines the current basis of issue for designators. The employment tactics developed by CSSG II are then discussed, followed by a review of the capability of FIST organizations to employ the Ground Laser Locator Designator (GLLD) and requirements for additional observation/lasing teams. The requirement for handheld designators is then addressed, followed by discussions of aerial designation, the AN/GVS-5 laser infrared observation set/device and communications.

13.3.1 Designator Basis of Issue Plans (BOIP). The basis of discussion for designator employment was the current USAFAS basis of issue for designators. The basis of issue is summarized at table 13-15. The BOIP for the handheld designator in the infantry scout section was not addressed by CSSG II.

Table 13-15. Designator Basis of Issue.

Element	Designator GLLD	Designator Handheld
Armor FIST	1	1
Armored Cavalry FIST	1	1
Mechanized Infantry FIST	1	3
Infantry, Airborne, Air Assault FIST	1	3
Sound/Flash Observation Section	1	

13.3.2 Principles of Designator Employment. War-gaming and computer simulations conducted by the COPPERHEAD COEA for the mechanized infantry FIST have shown that at least two GLLD designators are required to be deployed in a company area that are decisively engaged in order to achieve significant effectiveness with the COPPERHEAD system. BATTLE gaming by the CSSG II confirmed the COEA findings and, in addition, highlighted the importance of designator employment tactics. The significant points are:

a. Military judgment based on terrain analysis can be used to identify the areas of greatest threat which is also the area where the ability to concentrate GLLDs is required.

b. Designators, like all fire support, must be integrated into all phases of maneuver operations. In this respect, it more demanding because positions for the GLLD must be planned in much the same manner as direct fire weapons, such as TOW.

c. The full effectiveness of the COPPERHEAD system will be realized when GLLD's are employed through the battle, from the initial contact in the security area to the last fight in the battle positions. The use of successive

or leap-frog positions permits continuous use of COPPERHEAD fires until targets are within range of the bulk of the maneuver's direct fire weapons. Designators are then re-positioned to repeat the process.

d. Airborne designators are highly effective because of their mobility and ability to get above battlefield obscuration.

13.3.3 Mechanized Infantry GLLD Employment. Initial draft doctrine for the COPPERHEAD system was centered on the mechanized infantry FIST and visualized the employment of the GLLD in the same position as the FIST Hq. This doctrine failed to fully recognize designator positioning requirements and the need for flexibility in employment of designator assets. CSSG II determined that the necessary flexibility in employment in mechanized infantry could be accomplished by adopting the following employment options:

a. Option one - FIST Hq operates as one element. Both GLLD positioning requirements and FIST Hq command and control and coordination requirements can be satisfied from one position.

b. Option two - FIST Chief displaces to the company/team commander's vehicle with one radio and a DMD. The FIST Hq (-) positions the GLLD in an appropriate vantage point within the company area.

c. Option three - The FIST chief and a fire support specialist displace to the company/team commander's vehicle with two radios and the FIRST. The FIST vehicle with the GLLD could then be employed outside the company sector as a separate observation/lasing team.

d. Option three requires the FIST chief task organize his team, i.e., utilize one or more personnel from platoon FO teams to augment the FIST Hq. Options two and three require radio mounts for FIST radios in maneuver vehicles.

13.3.4 Armor FIST GLLD Employment. The employment options, described above, were also considered for the armor company FIST. The limited space available in the commander's vehicle indicates that it will be difficult to accomplish all required fire support tasks, particularly in option three, when the FIST vehicle is deployed outside the company sector. Exercise of option three would be the exception rather than the general rule. Option one would be the most preferred.

13.3.5 Armor Cavalry FIST GLLD Employment. The GLLD is also projected for use in FISTs assigned to the armored cavalry squadrons of the division and ACR. In the divisional squadron, 155mm support is provided by division artillery organization for combat, while in the ACR, each squadron has an organic 155mm howitzer battery. The GLLD employment options can be utilized in the ACR FISTs because the troop commander utilizes a M113A1 track for troop headquarters. This statement also applies to the divisional squadron FISTs in armor and mechanized infantry and infantry divisions, however, in airborne and air assault troops the commanders utilize a 1/4-ton truck and no space is available for the FIST chief to ride.

13.3.6 Infantry and Air Assault FIST GLLD Employment. Employment of the GLLD and COPPERHEAD in infantry and air assault organizations poses two problems. First, the availability of 155mm tubes and second, the additional load carrying requirement imposed by the GLLD system. The infantry and air assault divisions are currently equipped with the 105mm howitzer as the direct support weapon but they are expected to receive the M198 (155mm) howitzer in the mid 80s.

It is desirable, therefore, to utilize the GLLD in the infantry and air assault FIST, provided designator mobility requirements can be satisfied. Designator employment tactics for these divisions are not expected to differ significantly from those described in paragraphs 13.3.2 and 13.3.3. CSSG II concluded that a two-man designator team equipped with a 1/4-ton vehicle or high mobility multipurpose wheeled vehicle and suitable radios/digital equipment is required to employ the GLLD system.

13.3.7 Airborne FIST GLLD. The present basis of issue of one GLLD in each FIST of the airborne was considered inappropriate inasmuch as the normal DS weapon of the division is not capable of firing COPPERHEAD. The study group determined that a COPPERHEAD capability can best be provided through the use of separate observation/lasing teams, which are discussed in a subsequent paragraph (paragraph 13.3.8).

13.3.8 Additional Observation/Designator Support. During the course of analyzing employment procedures for the laser equipped FIST, it became evident that there was a need for a laser designating capability beyond that provided in the basis of issue plan for GLLD. CSSG II analysis and war gaming (BATTLE) revealed that although the GLLD could, in many instances, be effectively employed by the FIST, the full effectiveness was realized when the GLLD was employed forward of the company position, and when GLLDs were concentrated in those areas most conducive to the employment of precision munitions. The following discussion examines the requirement for additional observation/lasing teams, using the mechanized infantry/armor divisions as the base case. The requirements of other type divisions and the armored cavalry regiment are then discussed.

a. Armored/Mechanized Infantry Divisions. The employment options discussed in paragraph 13.3.3 and 13.3.4 provide the commander with the option of positioning designator assets for maximum effectiveness by separating the armor and mechanized infantry FIST Hq fire planning and coordination functions from the laser associated functions.

(1) The factors of METT (mission, enemy, tactics, and terrain) will, however, limit the capability to exercise this option. CSSG II conducted an analysis, with the SCORES tactical deployments as a framework, to determine the maximum requirement for designators. The analysis was based on deploying one GLLD per two KM of frontage in the covering force area and two in support of each company involved in major engagements. The requirement, allowing for an attrition rate of approximately 25%, was for eighteen additional designators.

(2) Further analysis was conducted to refine this requirement. During the BATTLE gaming it was assumed that an advanced scout helicopter with a target acquisition and designation system was available for use of the FAAO. The effectiveness of the aerial designator was significant. The FAAO's can respond rapidly to threatened areas and the aircraft can be maneuvered to avoid smoke and other battlefield obscurants which may restrict a ground observer's capability. Unfortunately, it appears that this means of designation will not be available for several years.

(3) Consideration was also given to requirements for battlefield personnel and equipment replacements after the first day of battle. An R^3 analysis determined that the minimum requirement is 30 MOS 13F personnel and 10 GLLD's. When organized into teams and equipped in a manner similar to FIST's, these teams provide a source of immediate replacements for FIST battle losses.

(4) In view of the above discussion CSSG II determined that eighteen separate observation/lasing teams are required to support fielding of COPPERHEAD.

(5) These separate observation/lasing teams could be assigned to either the division artillery target acquisition battery (TAB) or the direct support battalions. The teams can be task organized at either level of assignment, however, assignment to the direct support battalion enhances training and this alternative was chosen by CSSG II.

(6) The equipment required for the team includes the M113A1 carrier initially, followed by the FIST Vehicle Kit (FISTV), when fielded. Although only two radios are required for team operations, an AN/VRC-46 and AN/GRC-160, the vehicle should be configured to accept the mechanized infantry FIST four-radio configuration in order that it can be used as an immediate replacement for FIST vehicle battle losses.

(7) Consideration was also given to the utilization of the eight sound and flash (S/F) observation sections in the division artillery TAB to satisfy part of the eighteen team requirement. This alternative has been previously identified in the COPPERHEAD organizational and operational concept. Assuming that the battery will operate its two sound bases, only four of the eight sections are available for employment as observation/lasing teams. CSSG II took note that the S/F personnel hold MOS 17C and receive only limited fire support training, i.e., conduct adjustment of indirect FA fires. This training is not adequate to permit their use as immediate MOS 13F replacements. In addition, the observation/lasing teams are required on a full-time basis, thus it would be preferrable to convert the S/F personnel to MOS 13F and reorganize the four-man section into three-man observation/lasing teams.

(8) Based on the above discussion, CSSG II concluded that a portion of the spaces and equipment for the eighteen separate observation/

lasing teams could be obtained through a trade-off of four of the eight currently authorized S/F observations sections. The impact of this trade-off is illustrated at Table 13-17, Summary of Phase III Impact for 16 Division Force.

(9) The study group also examined the requirement for GLLD's in the four remaining observation sections which would be used for the sound ranging function. The sound ranging function does not specifically require either a range finding or designating capability. A range finding capability is required for the observer's MOS task of locating targets and adjusting indirect fires, however, the requirement can be satisfied by a tripod-mounted AN/GVS-5 laser infrared observation set/device at far less cost than the GLLD.

(10) In summary, CSSG II concluded that a requirement exists for eighteen separate observation/lasing teams in each armored/mechanized infantry division. Some of the spaces required for these teams can be obtained through a trade-off of four S/F observations sections from the division artillery TAB.

b. Infantry and Air Assault Division. The study group assumed that the M198, 155mm howitzer would be issued to the infantry and air assault division in the mid-80's for use as the direct support weapon, replacing the current 105mm howitzer. The group also assumed that the current general support battalion would be replaced by a pure 8-inch battalion.

(1) As in the armored and mechanized infantry divisions, the employment options discussed in paragraph 13.3.3 and 13.3.4 provide the commander with the option of positioning designator assets organic to the FIST for maximum effectiveness. Again, however, the factors of METT will limit the capability to exercise this option. In the absence of any analytical data to support GLLD requirements for an infantry division CSSG II conducted an analysis to determine the maximum requirement for designators in the infantry division.

(2) The CSSG II envisioned scenario indicated a requirement for one or two additional designators for the covering force and for up to eight additional GLLD's for use with infantry companies heavily engaged in the main battle area. The total number of GLLD's being used for COPPERHEAD missions at any one time was visualized as 27. This includes five in the covering force, sixteen with infantry companies/battalions, and six in use by the divisional tank and mechanized infantry battalions, which constitute the reserve, or quick reaction force.

(3) A COPPERHEAD delivery unit consists of two howitzers, thus the three direct support battalions could provide a maximum of 27 delivery units.

(4) Based on the above discussion CSSG II concluded that each infantry and air assault division should be provided with nine separate observation/lasing teams. These two-man teams should be organized on the basis of three per direct support battalion to provide the brigade commander the capability of concentrating designators where required. The division commander

could also task organize the teams between brigades when required by the tactical situation. The teams should be equipped with the 1/4-ton truck and trailer and two radios: AN/VRC-46 and AN/PRC-77 in the infantry division; and the AN/GRC-160 and AN/PRC-77 in the air assault division. Other equipment requirements are listed at Table 13-26, TOE Equipment Requirements, Separate Observation/ Lasing Teams.

(5) The study group considered the use of S/F observation sections to meet the above requirement. The group determined that the analysis in the preceeding paragraph is also applicable to the infantry division and that four of the observation sections (16 spaces) could be traded-off against the requirement for 18 spaces for the separate observation/lasing teams. See table 13-17 for personnel recap.

(6) In summary, CSSG II concluded that a requirement exists for nine separate observation/lasing teams in each infantry and air assault division in addition to the ten designator equipped scout aircraft previously identified as required for field artillery use. The draft doctrine which identified the use of S/F observation sections as observation/lasing teams is not valid and the GLLD's and some personnel spaces should be traded-off to meet the requirement for ten separate ground observation/lasing teams.

c. Airborne Division. The airborne forces present a unique case regarding laser designators. Although the employment considerations are basically the same as for the infantry and air assault divisions, they do not have, nor are they programmed to receive, a COPPERHEAD capable direct support weapon system. The COPPERHEAD delivery capability for this specialized division is usually provided by the four 155mm general support battalions assigned to XVIII Airborne Corps Artillery.

(1) Since there is no organic close support COPPERHEAD delivery capability, the study group concluded that no requirement exists for issuance of a GLLD on the basis of one per FIST, but rather that this capability should be provided to maneuver units on an as required basis. The study groups analysis indicated that GLLDs for airborne forces should be provided through the task organization of separate observation/lasing teams assigned to each 155mm battalion associated with these forces. Nine two-man teams per battalion would provide the necessary GLLD capability, and these teams, like the teams in the other divisions could provide a degree of redundancy for fire support personnel. Implementation of this concept requires development of a TOE variation for TOE 6-425, FA battalion, 155mm (M198) towed.

(2) The envisioned employment of the airborne forces point to a requirement for an aerial designation capability. In this specialized division, aerial designators could provide a rapidly deployable designating capability, and could be employed pending deployability of ground designators. CSSG II analysis of requirements for FA air observers (Chapter 8) resulted in a requirement for eight laser designator equipped scout helicopters, pilots and observers in the airborne division.

(3) Both the airborne and air assault divisions are authorized four S/F observation sections in the division artillery TAB. The study group concluded that the preceeding analysis of these sections (paragraph 13.3.8) for the infantry, armored and mechanized infantry divisions is also applicable to the airborne and air assault divisions. Two of the four S/F observation sections can be traded off against the requirements for separate observation/lasing teams. See table 13-17 for personnel recapitulation.

d. Armored Cavalry Regiments (ACR). In the ACR, it was determined that separate observation/lasing teams were required based on the same rationale used for the other type forces. However, a lesser number of designators are required based on the assumption that additional assets can be provided from a division when the regiment is employed in support of the division, and that independent operations, would not require the density of designators associated with the active defense. Considering the nonavailability of organic, dedicated FA air observers, the study group determined that the ACR should be provided with three additional observation/lasing teams, assigned to the regimental headquarters troop. These teams should be equipped with the M113A1 followed by the FISTV.

13.3.9 Handheld Designators. Both the COPPERHEAD COEA's and CSSG II's experience with BATTLE indicate that the handheld designator, either the LTD or MULE are of limited effectiveness when designating for COPPERHEAD. The study group did, however, recognize the value of a handheld device for target handoff when a GLLD or FAC (each battalion FAC is scheduled to have a target handoff device) is not available. The study group concluded that one handheld designator per infantry, mechanized infantry, airborne, and air assault FIST is adequate to meet such requirements. No additional personnel, other than those previously identified, are required to field this equipment. The requirement for handheld designators for infantry scouts has been deferred to USAIS.

13.3.10 Aerial Designators. CSSG II's experience with the BATTLE game indicated a high degree of effectiveness of aerial designators and the absence of this capability was considered a serious operational deficiency. This capability is tied to the availability of the scout helicopter.

13.3.11 Laser Rangefinder. The AN/GVS-5 Laser Infrared Observation Set/Device has been type classified and is currently being produced. It will be fielded on the basis of four per infantry, mechanized infantry, airborne, and air assault FIST and two per armor and armored cavalry FIST in early 1980. Current plans are to withdraw the AN/GVS-5 from the FIST HQ when the GLLD is fielded. In view of CSSG II's proposed options for employment of the GLLD (FIST chief and FIST Hq (-) in split locations), the AN/GVS-5 should be retained in all FIST Hq when the GLLD is fielded.

The current basis of issue for the rangefinder retains the currently authorized binoculars in all organizations. CSSG II envisions that the rangefinder will become the primary means of observation in lieu of binoculars. (Rangefinder optics are not affected by a malfunction in the ranging function.)

Retention of the current binoculars, except for one set per FIST cannot be justified.

13.3.12 Communications. The study group examined communications requirements for employment of COPPERHEAD. The fire support communications system, as modified by CSSG II, is considered adequate.

13.3.13 Summary of Personnel and Equipment Changes.

a. A summary of spaces required for implementation of Phase III (laser) findings, listed by type division, ACR, and XVIII Airborne Corps, is at table 13-16. A summary of the personnel impact on a 16 division force is illustrated in figure 13-17. The trade-off column indicates the number spaces gained by trade-off of two of four S/F observation sections in each S/F platoon, and TAB. Both the armored, mechanized infantry, and infantry divisions have two S/F platoons in the TAB; airborne and air assault divisions have one.

b. The changes in vehicles, radios and laser designators required to implement Phase III findings for a 16 division force are at table 13-18.

Table 13-16. Summary of Spaces Required for Phase III Implementation for Type Divisions, Armored Cavalry Regiment and XVIII Airborne Corps.

Change	ARMOR	MECH INF	INF	ABN	AA	ACR	XVIII ABN CORPS
Add two personnel to INF FIST for GLLD deployment			48		54		
Separate Obsn/Lasing Teams							
18 per division	54	54					
9 per division			18		18		
9 per 155mm Bn XVIII AB Corps							72
3 per ACR						9	
Totals	54	54	66	0	72	9	72

Table 13-17. Summary of Phase III Personnel Impact for 16 Division Active Force.

Division/Regiment	Increase	Trade-Off	NET Increase/Decrease
Armored (4)	216	64	+152
Mechanized Infantry (5)	270	80	+190
Infantry (5)	330	80	+250
Airborne (1)	0	8	-8
Air Assault (1)	72	8	+64
ACR	27	NA	+27
XVIII ABN Corps (4-155mm Bn)	72	NA	+72
Totals	987	240	+747

Table 13-18. Summary of Phase III Designator, FIST Vehicle, and Radio Changes for 16 Division Active Force. (Type Divisions, Armored Cavalry Regiment, XVIII Airborne Corps)

Division/Corps	GLLD	Hand Held Designator	M113	GRC M151	GRC 160	PRC 77	VRC 46	DMD
Armored (4)	+40	-204	+72		+72		+72	+ 64
Mech Inf (5)	+50	-255	+90		+90		+90	+ 70
Infantry (5)	+5	-285		+165	+120	+165	+45	+145
Airborne (1)	-34	-57						- 2
Air Assault (1)	+5	-54		+36	+36	+36		+ 34
ACR (3)	+9	-36	+9		+9		+9	+ 9
XVIII ABN Corps	+36			+36	+36	+36		+ 36
Ground Troop, ACS, Infantry Div, (New Requirement) Air Assault Div	+6							
Net Change	+117	-891	+171	+237	+363	+237	+216	+356

13.4 GLLD UNDER ARMOR

The FIST Vehicle (FISTV) Kit is currently being developed by USAFAS for use in armor, armored cavalry, and mechanized infantry FIST's. The design approach is to place the GLLD, night sight, and other optics in the Improved TOW Vehicle articulating head and to remote the equipment controls to the operator's position in the M27 cupola, under armor. The vehicle will be further modified to provide interfaces for FIST radios, digital equipment, and position location equipment, when available. This section discusses CSSG II's review of FISTV physical characteristics and the quantity of FISTV's required ROC changes needed as a result of CSSG II findings, and the impact of the new family of combat vehicles on the FIST vehicle program.

13.4.1 FISTV Requirements. CSSG II reviewed the FISTV ROC in view of the laser employment tactics developed by the study group, changes in FIST organizational structure and radio configurations. CSSG II determined that the ROC requirement is sound but that some minor changes will be required to accommodate the reduction in size of the armor/armored cavalry FIST, in radio configurations, replacement of the DMD with the FIRST, and the change of issue for the handheld designator.

Additional FISTVs will be required for the 18 separate observation/lasing teams in the armored/mechanized infantry divisions and the ACR. The vehicles provide the mobility and survivability required for the support of the supported force and are required to provide replacements for FIST battle losses. Assuming that the vehicle is fielded in the active divisions and the ACR's the additional requirement is for 171 vehicles.

13.4.2 FIST Employment Options. In the laser phase of the study, three options for employment of the FIST HQ were developed. Two of these options provided for the FIST chief and one or two additional personnel to move to the company/team commander's vehicle in order to free the FIST vehicle, with the GLLD, to be positioned in vantage points either within or outside of the company/team sector. CSSG II reviewed this concept for application to the FISTV and the new family of vehicles to be fielded in maneuver units beginning in the early 80's. CSSG II's interface with the TSM for the IFV/CFV and the USAIS resulted in the determination that the concept is viable for the Infantry Fighting Vehicle, the company commander's vehicle, but that USAFAS must provide input into USAIS requirements for a command, control and communications package for the vehicle.

13.4.3 New Family of Combat Vehicles. The new family of combat vehicles (XM 2/3, IFV/CFV) offers significant improvements in mobility and survivability. The vehicles will be fielded in maneuver units starting in 1981, however, the nonavailability of chassis precludes its fielding in FA units until the early 1990's. CSSG II determined, based on a review of present vehicle characteristics, that the Cavalry Fighting Vehicle (CFV) is the desired vehicle for FIST use and that USAFAS should begin a development program in the mid-80's to adapt this vehicle for FIST use. This vehicle should replace the FISTV in the mid-90's. The strategy for fielding of vehicles in the armor, armored

cavalry, and mechanized infantry FIST's, then, is the M113A1 with pintle-mounted GLLD, FISTV with GLLD (M113A2) under armor, followed by a FIST kit for the Cavalry Fighting Vehicle.

13.4.4 High Mobility Multipurpose Wheeled Vehicle. A requirements document for a high mobility multipurpose wheeled vehicle is currently being staffed by the USAIS. This wheeled vehicle is expected to replace the 1/4-ton vehicle in TOW sections and FIST's in the infantry, airborne, and air assault division. This vehicle is also required for the separate observation/lasing teams in, or supporting, these same divisions.

13.5 DIVISION 86

13.5.1 Fire Support Personnel. A review of fire support requirements for the Division 86 force indicated no change in the study group's recommendation concerning FISTs and FSS's. A four man armor, armored cavalry FIST, a ten man mechanized infantry FIST and/four man battalion/ brigade FSS is required. Force structure analysis was not conducted to determine the impact of the personnel changes required to support the additional maneuver companies/ battalions.

13.5.2 ACAB/ACAS Fire Support Requirements. Fire support for the Division 86 aerial maneuver units, the Air Cavalry Attack Brigade (ACAB) and Air Cavalry Attack Squadron (ACAS) are provided by an FA staff officer (FSO) at the ACAB level and a three man FSS at each ACAS. This staffing results in a net savings of 43 personnel, as compared to CSSG II recommendations for current aerial maneuver units. (See table 13-19) Operational fire support concepts developed by CSSG II remain valid for these sections.

Table 13-19 ACAB/ACAS Personnel Requirements

	Space Requirements			
	Fire Support Section		FA Staff Officer	
	CSSG II	DIV 86	CSSG II	DIV 86
1. Divisional Requirements-				
Armor/Mechanized Infantry	9	6	0	1
Infantry	12	6	0	1
2. Force Structure				
Armor Divisions (4)	36	24	0	4
Mechanized Infantry (5)	45	30	0	5
Infantry (5)	60	30	0	5
TOTAL	141	84	0	14
3. Net Reduction = 141 - (84 + 14) = 43				

13.5.3 Communications. The fire support communications required for the additional maneuver elements in the Division 86 organization impose a time delay penalty on digital message transmissions in the current TACFIRE system. This message delay reduces the responsiveness of FA fires and may reduce COPPERHEAD effectiveness. The conversion to a digital communications system is required to reduce message delays to an insignificant level and significantly improve the responsiveness of FA fires available to the maneuver units. Pending availability of a digital system, the study group determined that emphasis must be placed on the acquisition of equipment, such as the FIST DMD or improved VFMED to permit the routing of fire requests from the FIST to the battalion FSE, thus providing a filter and reducing message traffic to the FA/FDC or battalion heavy mortar. Training emphasis must also be placed on utilization of "F" nets and procedures for the rapid transition of subscribers from one net to another.

13.6 CLOSE AIR SUPPORT

The Study group analyzed the procedures for employment of close air support, and in particular with the "Army proponent" aspects of the joint air ground operations system. The results of this analysis served to identify procedures for the requesting of close air support, to include digital communications channels and personnel involvement. The study group's analysis indicated that any final recommendations for revision of current procedures should come as a result of a joint Army/Air Force working group.

13.7 SUMMARY OF PHASE I-IV PERSONNEL AND EQUIPMENT REQUIREMENTS

13.7.1 Personnel. A summary of space savings/increase for Phases I-IV, listed by type division and other major units, is at table 13-20. The overall net increase in personnel spaces required is 1176.

13.7.2 Equipment. A recap of major equipment changes required for implementation of Phases I-III is at table 13-21. The only Phase IV equipment requirement is for an increase of 179 FISTV Kits, a one-for-one replacement for the additional M113A1 carriers, which resulted from Phases I-III of the study.

A recap of all proposed equipment changes for each type organization, listed by study phase, is at the following tables:

- Table 13-22. Summary of FIST Equipment Changes.
- Table 13-23. TOE Equipment Changes, Armor FIST, Airborne Division.
- Table 13-24. Summary of Maneuver Battalion/Squadron Equipment Changes.
- Table 13-25. Summary of TOE Equipment Changes for Fire Support Sections Organic to Division Artillery General Support Battalion/HHB, Airborne Division Artillery.
- Table 13-26. Summary of Maneuver Brigade Equipment Changes.
- Table 13-27. TOE Equipment Requirements, Separate Observation/Lasing Teams.
- Table 13-28. TOE Equipment Requirements, Fire Support Sections, Aerial Maneuver Units.

Table 13-20. Personnel Summary, Phases I-IV*, Type Divisions, Armored Cavalry Regiment, and XVIII Airborne Corps.

Unit	I	III	Net Change
Armor Division (4)	+20	+152	+172
Mech Infantry Division (5)	+70	+190	+260
Infantry Division (5)	+210	+250	+460
Airborne Division (1)	+42	-8	+34
Air Assault Division (1)	+64	+64	+128
ACR (3)	-18	+27	+9
XVIII Airborne Corps	0	+72	+72
Corps Aviation Battalion (2)	+20	0	+20
ACCB	+21	0	+21
NET CHANGE	+429	+747	+1176

*Phase II & IV have no personnel impacts.

Table 13-21. Recap of Major Equipment Changes, Phases I-III, for 16 Division Active Force.

Equipment	I	II	III	Total
Vehicles:				
Carrier, M113A1	+8		+171	+179
Truck, 1/4-ton, M151	+2		+237	+239
Truck, 1-1/4-ton, M561	+48			+48
Radios:				
AN/PRC-77	-467		+237	-230
AN/GRC-160	+792		+363	+1155
AN/VRC-46	+621	+373	+216	+1210
AN/VRC-47	-492	-99		-591
AN/VRC-49	+45	-175		-130
Secure Devices	+223			+223
Digital:				
DMD		-156	+356	+200
FIST DMD		+899		+899
VFMED		-223		-223
Improved VFMED		+223		+223
Designators:				
GLLD			+117	+117
Handheld			-891	-891

Table 13-22. Summary of FIST Equipment C

	Armor Phases					Mechanized Infantry Phases					Armored Cavalr Phases				
	Current	I	II	III	IV Total	Current	I	II	III	IV Total	Curr	I	II	III	IV
A01876 Accessory Kit: MK1265	2	+2			4	2	+4[1]			6	2	+1			
A01877 Accessory Kit: MK1266	1	-1			0	1	-1			0	1	-1			
A71712 Antenna: AT/984-G	1				1	1				1	1				
A72260 Antenna: RC-292	1				1	1				1	1				
B49272 Bayonet-Knife	5	-1			4	9	+1			10	5	-1			
B67766 Binoculars: 7x50	3	-2			1	5	-1		-3	1	3	-2			
Z37677 AN/GVS-5				+1	1				+4	4					+1
C68719 Cable Telephone: DR-8	4				4	12	-4			8	4				
C68993 Cable Telephone: MX306															
C89145 Camouflage Screen System	2				2	2				2	2				
C89213 Camouflage Screen System	2				2	2				2	2				
D12087 Carrier, Full Tracked	1				1	1				1	1				
E63728 Compass, Magnetic	2	-1			1	1	+3			4	2	-1			
J44055 Generator Set, 1.5 KW	1				1	1				1	1				
K87243 Installation Kit: MK1234															
K87254 Installation Kit: MK1246															
K87269 Installation Kit: MK1306															

Changes.

Infantry							Airborne							Air Assault						
Tot	Curr	I	II	III	IV	Tot	Curr	I	II	III	IV	Tot		Curr	I	II	III	IV	Tot	
3																				
0																				
1	1	+3		+1		5	1	+3				4		1	+3				4	
1	1					1	1					1		1					1	
4	9	+1		+2		12	9	+1				10		9	+1		+2		2	
1	5		-1	-3		1	5		-1	-3		1		5		-1	-3		1	
1				+4		4					+4	4					+4		4	
4	12	-10		+3		5	12	-10				2		12	-10		+3		5	
		+6				6		+6				6			+6				6	
2	2	-1		+1		2	2	-1				1		2	-1		+1		2	
2	2	-1		+1		2	2	-1				1		2	-1		+1		2	
1																				
1	5	-1		+1		5	5	-1				4		5	-1		+1		5	
1	1	-1				0	1	-1				0		1	-1				0	
	2	-1		+1		2		+1				1		1			+1		2	
							3	-3				0								
	1	-1				0								1	-1				0	

Table 13-22. Summary of FIST Equipment Changes (Con

	Armor						Mechanized Infantry						Armored Cavalry					
		Phases						Phases						Phases				
	Current	I	II	III	IV	Total	Current	I	II	III	IV	Total	Curr	I	II	III	IV	Tot
K87389 Installation Kit: MK1512																		
K87392 Installation Kit: MK1554																		
K87415 Installation Kit: MK1626	1					1	1					1	1					1
L44595 Launcher, Grenade 40mm	1	-1				0	1	-1				0	1	-1				0
L91838 Machine gun: 50 cal	1					1	1					1	1					1
M10936 Mask, Protective Tank	3					3	3					3	3					3
M11895 Mask, Protective Field	2	-1				1	6	+1				7	2	-1				1
M75577 Mount Tripod: 50 cal	1					1	1						1					1
N04456 Night Vision Goggles: AN/PVS-5	1					1	1					1	1					1
N04596 Night Vision Sight: AN/TVS-5	1					1	1					1	1					1
N96741 Pistol: 45 cal		+1				1		+1				1		+1				1
P43177 Power Supply: Z-ACD	1					1	1					1	1					1
X____ Handheld Designator										+1		1						
Q34308 Radio Set: AN/GRC-160	2	+1				3	2	+4[1]				6	2					2
Q38299 Radio Set: AN/PRC-77	1	-1				0	3	-3				0	1	-1				0

(ued)

Infantry Phases					Airborne Phases						Air Assault Phases					
I	II	III	IV	Tot	Curr	I	II	III	IV	Tot	Curr	I	II	III	IV	Tot
	+1			1		+1				1		+1				1
	-1			0							1	-1				0
-1	+1			1	1	-1				0	1	-1		+1		1
+1	+2			12	9	+1				10	9	+1		+2		12
	+1			2	1					1	1			+1		2
				1	1					1	1					1
+2				2		+2				2		+2				2
				1	1					1	1					1
	+1			1			+1			1				+1		1
-1	+1			2	3	-2				1	1			+1		2
+2	+1			6	3	+2				5	4	+1		+1		6

Table 13-22. Summary of FIST Equipment Chan

		Armor Phases					Mechanized Infantry Phases					Armored Cava Phases				
		Current	I	II	III	IV Total	Current	I	II	III	IV Total	Curr	I	II	III	IV
Q53001	Radio Set: AN/VRC-46		+1			1		+1			1		+1			
Q54174	Radio Set: AN/VRC-47	1	-1			0	1	-1			0	1	-1			
Q78282	Radio Set Control Group: AN/GRA-39	2	-1			1	2	-1			1	2	-1			
R12989	Rangefinder, Fire Control: AN/GVS-3	1	-1			0	2	-2			0	1	-1			
R59160	Reeling Machine: RL39	3	-1			2	6	-1			5	3	-1			
R94977	Rifle: 5.56mm	5	-2			3	9				9	5	-2			
U01305	Speech Security Equip: KY-38	1				1	1				1	1				
U82529	Switchboard: SB-993						1				1					
VJ0252	Telephone Set:TA-1							+3			3					
V31211	Telephone Set: TA-312/PT	2				2	5	-3			2	2				
W95400	Trailer, Cargo: 1/4-ton															
X39940	Truck, Cargo: 1-1/4-ton															
X60833	Truck, Utility: 1/4-ton															
N04982	Night Sight Thermal: AN/TAS-4			+1		1			+1		1				+1	
Z27623	FIST V: Forward Observer Artillery				+1[3]	1				+1[3]	1					
Z32103	Electro Optical Target Designator: AN-TVQ-2			+1		1			+1		1				+1	
Z42448 (M52650)	DMD	2		-1[2]		1	4				4	2		-1[2]		

(Continued)

	Infantry Phases					Airborne Phases					Air Assault Phases				
	Core	I	II	III	IV	Tot	Core	I	II	III	IV	Tot	Core	I	II	III	IV	Tot
1																		
0	1	-1				0							1	-1				0
1	2	-1		+1		2	2	-1				1	2	-1		+1		2
0	2	-2				0	2	-2				0	2	-2				0
2	5	-3		+2		4	5	-3				2	5	-3		+2		4
3	9	-1		+2		10	9		-1			8	9	-1		+2		10
1	1					1	1					1	1					1
	1					1	1					1	1					1
		+1				1		+1				1		+1				1
2	5	-1		+1		7	5	-1				2	5	-1		+1		7
	2	-1		+1		2		+1				1	1			+1		2
								-1	-1			0						
	2	-1		+1		2		+1				1	1			+1		2
1				+1		1										+1		1
1				+1		1										+1		1
1	4		1	+2		4	4		1			1	4		1	+2		4

1

Table 13-22. Summary of FIST Equipment Changes (

	Armor Phases					Mechanized Infantry Phases					Armored Cavalry Phases				
	Current	I	II	III	IV	Total	Current	I	II	III	IV	Total	Curr	I	II	III	IV	Tot
X____ FIST DMD		+1				1		+1[2]				1		+1				1

Note 1 : 3 each AN/GRC-160 with installation kits are mounted in track vehicle of maneuver platoon leader.

2 : Contingent on issue of the FIST DMD on a one-for-one basis. Without issue of the FIST DMD two additional DMDs would be required per FIST.

3 : Issue of the FISTV deletes requirement for LIN# D12087, Carrier, Full Tracked.

(Continued)

Infantry Phases						Airborne Phases						Air Assault Phases					
Curr	I	II	III	IV	Tot	Curr	I	II	III	IV	Tot	Curr	I	II	III	IV	Tot
	+1				1		+1				1		+1				1

Table 13-23. TOE and Equipment Changes Armor Fist, Airborne Division

		Current	Phase I	II	III	IV	Total
A01876	Accessory Kit: MK1265		+4				4
A71712	Antenna: AT-984/G	1					1
A72260	Antenna: RC-292	1					1
B49272	Bayonet-Knife	5	-1				4
B67766	Binoculars: 7x50	3	-2				1
Z37677	AN/GVS-5				+1		1
C68719	Cable Telephone: DR-8	4					4
C89145	Camouflage Screen System	2					2
C89213	Camouflage Screen Support System	2					2
D12087	Carrier Full-Tracked		+1				1
E63728	Compass, Magnetic	2	-1				1
J44055	Generator Set, 1.5KW	1	-1				0
K87254	Installation Kit: MK1246	2	-2				0
K87261	Installation Kit: MK1253	1	-1				0
K87397	Installation Kit: MK1663	1	-1				0
L44595	Launcher, Grenade 40mm	1	-1				0
L91838	Machine Gun: 50 cal		+1				1
M10936	Mask, Protective Tank	3					3
M11895	Mask, Protective Field	2	-1				1
M75577	Mount Tripod: 50 cal		+1				1
N04456	Night Vision Goggles: AN/PVS-5	1					1
N04596	Night Vision Sight: AN/TVS-5	1					1
N96741	Pistol: 45 cal		+1				1

Table 13-23. TOE and Equipment Changes Armor FIST, Airborne Division (Continued)

		Current	Phase I	Phase II	Phase III	Phase IV	Total
P43177	Power Supply: Z-ACD	1					1
Q34308	Radio Set: AN/GRC-160	2	+1				3
Q38299	Radio Set: AN/PRC-77	1	-1				0
Q53001	Radio Set: AN/VRC-46		+1				1
Q54174	Radio Set: AN/VRC-47	1	-1				0
Q78282	Radio Set Control Group: AN/GRA-39	2	-1				1
R12989	Rangefinder, Fire Control	1	-1				0
R59160	Reeling Machine: RL-39	3	-1				2
R94977	Rifle: 5.56mm	5	-2				3
U01305	Speech Secure Equip: KY-38	1					1
V31211	Telephone Set: TA-312/PT		2				2
X39940	Truck, Cargo: 1-1/4-ton	1	-1				0
N04982	Night Sight Thermal: AN/TAS-4				+1		1
Z27623	FIST V: Forward Observer Artillery[2]					+1	1
Z32103	Electro Optical Tgt Designator: AN/TVQ-2				+1		1
Z42448 (M52650)	DMD	2		-1[1]			1
X____	FIST DMD			+1			1

Note: 1. Contingent on issue of FIST DMD on a one-for-one basis.

2. Replaces LIN D12087 on a one for one basis, when available.

Table 13-24. Summary of Battalion/Squadron Fire
Equipment Adjustments for Sections
Direct Support Battalions.

	Armored Phases					Mechanized Infantry Phases					Infantry Phases				
	Current	I	II	III	IV Total	Current	I	II	III	IV Total	Curr	I	II	III	IV
A01908 Accessory Kit: MK1320		+1	-1		0		+1	-1		0					
A01909 Accessory Kit: MK1321	1		-1		0	1		-1		0					
A01910 Accessory Kit: MK1323			+3		3			+3		3					
A71712 Antenna: AT-984/G	1				1	1				1	1				
A72260 Antenna: RC-292	1	+1			2	1	+1			2	1	+1			
B49272 Bayonet-Knife	3				3	3				3	3				
B67766 Binocular: 7x50mm	2				2	2				2	2				
C68719 Cable Telephone: DR-8	4				4	4				4	4				
C89145 Camouflage Screen System	4				4	4				4	2	+1			
C89213 Camouflage Screen Support System	4				4	4				4	2	+1			
D11538 Carrier, Command Post	1				1	1				1					
D99875 Charger, Battery: GVS-3	1	-1			0	1	-1			0	1	-1			
E63782 Compass, Magnetic	2	-1			1	2	-1			1	2	-1			
J44055 Gen Set Gas Eng: 1.5 KW											1				

Support Section
Organic to

Airborne Infantry Phases						Air Assault Infantry Phases						Armored Cavalry Regiment Squadron Phases					
Tot	Curr	I	II	III	IV Tot	Curr	I	II	III	IV Tot		Curr	I	II	III	IV	Tot
												1					1
													+1				1
1	1				1	1				1							
2	2				2	1	+1			2		1	+1				2
3	3				3	3				3		6					6
2	2				2	2				2			+2				2
4	4				4	4				4		2					2
3	2	+1			3	1	+2			3		5	-1				4
3	2	+1			3	1	+2			3		5	-1				4
												1					1
0	1	-1			0	1	-1			0							
1	2	-1			1	2	-1			1		1					1
1	1				1	1				1							

Table 13-24. Summary of Battalion/Squadron Fire S
Equipment Adjustments for Sections
Direct Support Battalions (Continue

	Armored Phases						Mechanized Infantry Phases						Infantry Phases					
	Current	I	II	III	IV	Total	Current	I	II	III	IV	Total	Curr	I	II	III	IV	T
K87233 Installation Kit: MK1224																		
K87243 Installation Kit: MK1234		+1				1		+1				1	1	-1				
K87254 Installation Kit: MK1246														+1				
K87262 Installation Kit: MK1254														+2	+1			
K87269 Installation Kit: MK1306	1	-1				0	1	-1				0		+1	-1			
K87389 Installation Kit: MK1512		+1				1		+1				1						
K87390 Installation Kit: MK1552														+1				
K87392 Installation Kit: MK1554	1	-1				0	1	-1				0	1	-1				0
K87394 Installation Kit: MK1646													1	-1				0
K87397 Installation Kit: MK1663														+1				1
K87398 Installation Kit: MK1665														+1	-1			0
K87408 Installation Kit: MK1680	1	-1				0	1	-1				0						
K87427 Installation Kit: MK1644	1					1	1					1						
L44595 Launcher, Grenade 40mm	1	-1				0	1	-1				0	1	-1				0

rt Section
c to

Airborne Infantry Phases					Air Assault Infantry Phases					Armored Cavalry Regiment Squadron Phases				
urr	I	II	III	IV Tot	Curr	I	II	III	IV Tot	Curr	I	II	III	IV Tot
					1	-1			0					
	+1			1		+1			1					
2		+1		3		+2	+1		3					
	+1	-1		0		+1	-1		0		+1		1	
	+1			1		+1			1					
					1	-1			0		+1		1	
					1	-1			0					
1				1		+1			1					
	+1	-1		0		+1	-1		0					
1	-1			0	1	-1			0					

Table 13-24. Summary of Battalion/Squadron Fire
Equipment Adjustments for Sections
Direct Support Battalions (Continued

		Armored Phases					Mechanized Infantry Phases					Infantry Phases				
		Current	I	II	III	IV Total	Current	I	II	III	IV Total	Curr	I	II	III	IV T
M10936	Mask, Protective Tank	2				2	2				2					
M11895	Mask, Protective Field	1				1	1				1	3				
N96741	Pistol: 45 cal															
P43177	Power Supply: Z-ACD	2				2	2				2	1	+1			
P09818	Plotting Set: 25000 meters															
Q34308	Radio Set: AN/GRC-160		+1			1		+1			1		+1			
Q32756	Radio Set: AN/GRC-106															
Q38299	Radio Set: AN/PRC-77											1	-1			
Q53001	Radio Set: AN/VRC-46			+3		3			+3		3		+2	+1		
Q54174	Radio Set: AN/VRC-47	1		-1		0	1		-1		0					
Q55114	Radio Set: AN/VRC-49	1		-1		0	1		-1		0	1		-1		
Q78282	Radio Set Control Group: AN/GRA-39	2	+1			3	2	+1			3	2	+1			
R30662	Control Group: AN/GRA-6															
R59160	Reeling Machine: RL-39	2	+2			4	2	+2			4	2	+2			
R94977	Rifle: 5.56mm	3				3	3				3	3				

port Section
anic to

Airborne Infantry Phases						Air Assault Infantry Phases						Armored Cavalry Regiment Squadron Phases					
Curr	I	II	III	IV	Tot	Curr	I	II	III	IV	Tot	Curr	I	II	III	IV	Tot
												2					2
3					3	3					3	4					4
												1					1
1	+1				2	1	+1				2	1					1
												1					1
2	-1				1		+1				1						
												1					1
							1	-1			0						
1	+1	+1			3		+2	+1			3		+1				1
													+1				1
	+1	-1			0	1		-1			0	1					1
3					3	2	+1				3	1	+1				2
												1					1
2	+2				4	2	+2				4	1					1
3					3	3					3	5					5

2

Table 13-24. Summary of Battalion/Squadron Fire Sup
Equipment Adjustments for Sections Or
Direct Support Battalions (Continued).

	Armored						Mechanized Infantry						Infantry					
		Phases						Phases						Phases				
	Current	I	II	III	IV	Total	Current	I	II	III	IV	Total	Curr	I	II	III	IV	Tot
U01305 Speech Security Equip: TSEC/KY-38	2					2	2					2	1	+1				2
U82529 Switchboard: SB-993/GT	1					1	1					1	1					1
V08721 Tactical Repeater: HYL-3/TSEC	1		-1			0	1		-1			0	1		-1			0
V31211 Telephone Set: TA-312/PT	2					2	2					2	2					2
W95400 Trailer, Cargo: 1/4-ton	1					1	1					1	1					1
X39940 Truck, Cargo: 1-1/4-ton														+1				1
X60833 Truck, Utility: 1/4-ton	1					1	1					1	1					1
Y39027 Watch, Wrist																		
Z42448 DMD		+1				1			+1			1			+1			1
Z62714 VFMED (M52582)	1		-1			0	1		-1			0	1		-1			0
X____ Improved VFMED			+1			1			+1			1			+1			1

Note: 1 One DMD; one FIST DMD

rt Section
e to

Airborne Infantry						Air Assault Infantry						Armored Cavalry Regiment Squadron					
	Phases						Phases						Phases					
urr	I	II	III	IV	Tot	Curr	I	II	III	IV	Tot	Curr	I	II	III	IV	Tot
1	+1				2	1	+1				2	1		+1			2
1					1	1					1						
	+1	-1			0	1		-1			0	1					1
2					2	2					2	2					2
	+1				1	1					1	1					1
1					1		+1				1						
	+1				1	1					1	1					1
												2					2
		+1			1		+1				1			+2[1]			2
1		-1			0	1		-1			0						
		+1			1			+1			1						

Table 13-25. Summary of TOE Equipment Changes for Organic to Division Artillery General Su
Airborne Division Artillery (1)

		Armored/Mech Infantry						Infantry						Al	
		Phases						Phases							
		Current	I	II	III	IV	Total	Current	I	II	III	IV	Total	Current	I
A01908	Accessory Kit: MK1320		+1	-1			0								
A01909	Accessory Kit: MK1321	1		-1			0	1		-1			0		
A01910	Accessory Kit: MK1323			+3			3			+3			3		
A71712	Antenna: AT-984/G	1					1	1					1	1	
A72260	Antenna: RC-292	1	+1				2	1	+1				2	1	+1
B49272	Bayonet-Knife	3					3	3					3	4	
B67766	Binoculars: 7x50mm	2					2	2					2	2	
C68719	Cable Telephone: DR-8	4					4	4					4	4	
C89145	Camouflage Screen System	4					4	2	+2				4	2	+1
C89213	Camouflage Screen Support System	4					4	2	+2				4	2	+1
D11538	Carrier, Command Post	1					1	1					1		
D99875	Charger, Battery: AN/GVS-3	1	-1				0	1	-1				0	1	-1
E63728	Compass, Magnetic	2	-1				1	2	-1				1	2	-1
J44055	Generator Set, 1.5kw													1	
K87293	Installation Kit: MK 1234		+1				1		+1				1		+1
K87254	Installation Kit: MK1246													3	-1

r Fire Support Sections
upport Battalion/HHB,

Airborne Phases					Air Assault Phases				
II	III	IV	Total	Current	I	II	III	IV	Total
			1		+1				1
			2		+2				2
			4		+3				3
			2		+2				2
			4		+4				4
			3		+3				3
			3		+3				3
			0						
			1		+1				1
			1		+1				1
			1		+1				1
+1			3		+2	+1			3

Table 13-25. Summary of TOE Equipment Changes f
Organic to Division Artillery General
Airborne Division Artillery (Continue

		Armored/Mech Infantry Phases						Infantry Phases							
		Current	I	II	III	IV	Total	Current	I	II	III	IV	Total	Current	I
K87262	Installation Kit: MK1254														+1
K87269	Installation Kit: MK1306	1	-1				0	1	-1				0		
K87389	Installation Kit: MK1512		+1				1		+1				1		+1
K87390	Installation Kit: MK1552							1	-1				0		
K87392	Installation Kit: MK1554	1	-1				0								
K87397	Installation Kit: MK1663													1	
K87408	Installation Kit: MK1680	1		-1			0		+1	-1			0		
K87427	Installation Kit: MK1644	1					1	1					1		
L44515	Launcher, Grenade: 40mm	1	-1				0	1	-1				0	1	-1
M10936	Mask, Protective Tank	2					2		+2				2		
M11895	Mask, Protective Field	1					1	3	-2				1	4	
N04456	Night Vision Goggles: AN/PVS-5							1	-1				0		
N96741	Pistol: 45 Cal													1	
P43177	Power Supply: Z-ACD	2					2	2					2	1	+1
Q34308	Radio Set: AN/GRC-160		+1				1		+1				1	2	-1

e Support Sections
rt Battalion/HHb

orne ses III	IV	Total	Current	Air Assault Phases I	II	III	IV	Total
		0		+1	-1			0
		1		+1				1
		1		+1				1
		0						
		4		+3				3
		1						
		2		+2				2
		1		+1				1

Table 13-25. Summary of TOE Equipment Changes for Organic to Division Artillery General Sup Airborne Division Artillery (Continued).

		Armored/Mech Infantry Phases					Infantry Phases						
		Current	I	II	III	IV	Total	Current	I	II	III	IV	Total	Current	I
Q53001	Radio Set: AN/VRC-46			+3			3			+3			3	1	-1
Q54174	Radio Set: AN/VRC-47	1		-1			0	1		-1			0		+1
Q55114	Radio Set: AN/VRC-49	1		-1			0	1		-1			0		+1
Q78282	Radio Set Control Group: AN/GRA-39	2	+1				3	2	+1				3	2	+1
R59160	Reeling Machine: RL-39	2	+2				4	2	+2				4	2	+2
R94977	Rifle: 5.56mm	3					3	3					3	3	
U01305	Speech Security Equip: KY-38	2					2	2					2	1	+1
U82529	Switchboard: SB993	1					1	1					1		+1
V08721	Tactical Repeater: HYL-3	1		-1			0	1		-1			0		+1
V30752	Telephone Set: TA-312/PT	2					2	2					2	2	
W95400	Trailer, Cargo: 1/4-ton	1					1	1					1		+1
X39940	Truck, 1-1/4-ton:													1	
X60883	Truck, Utility: 1/4-ton	1					1	1					1		+1
Z42448	DMD (M52650)			+1			1			+1			1		
Z62714	VFMED (M52582)	1		-1			0	1		-1			0	1	
X____	Improved VFMED			+1			1			+1			1		

Footnote (1) Organization of the fire support sections reflect equipment requirements to support tank, mechanized infantry and infantry battalions. During Phase I, the fire support sections of the air cavalry/armored cavalry squadrons, require an AN/VRC-46 radio in lieu of the AN/VRC-47. However, the study group determined that a common radio configuration should be used in employment of these fire support sections.

Fire Support Sections
port Battalion/HHB,

Airborne Phases					Air Assault Phases				
I	III	IV	Total	Current	I	II	III	IV	Total
+3			3			+3			3
-1			0		+1	-1			0
-1			0		+1	-1			0
			3		+3				3
			4		+4				4
			3		+3				3
			2		+2				2
			1		+1				1
-1			0		+1	-1			0
			2		+2				2
			1		+1				1
			1		+1				1
			1		+1				1
+1			1			+1			1
-1			0	1		-1			0
+1			1			+1			1

Table 13-26. Summary of Brigade/Regiment Fire Sup
Section Equipment Adjustments.

	Armored Phases					Mechanized Infantry Phases					Infantry Phases					
	Current	I	II	III	IV	Total	Current	I	II	III	IV	Total	Curr	I	II	III	IV	Tot C
A01908 Accessory Kit: MK1320																		
A01909 Accessory Kit: MK1321	1	-1				0	1	-1				0						
A01910 Accessory Kit: MK1323		+2				2		+2				2						
A01920 Accessory Kit: MK1333																		
A71712 Antenna: AT/984-G	1	-1				0	1	-1				0	1	-1				0
A72260 Antenna: RC-292	1	+1				2	1	+1				2	1	+1				2
B49272 Bayonet-Knife	3					3	3					3	3					3
B67766 Binoculars: 7x50mm	2	-1				1	2	-1				1	2	-1				1
C68719 Cable Telephone: DR-8	4	-1				3	4	-1				3	4	-1				3
C39145 Camouflage Screen System	4					4	4					4	1	+2				3
C89213 Camouflage Screen Support System	4					4	4					4	1	+2				3
D11538 Carrier, Command Post	1					1	1					1						
E63728 Compass, Magnetic	2	-1				1	2	-1				1	2	-1				1
J44055 Generator Set: 1.5 KW													1					1
K87233 Installation Kit: MK1224													1	-1				0

orne Infantry Phases					Air Assault Infantry Phases						Armored Cavalry Regimental FSO Phases					
I	II	III	IV	Tot	Curr	I	II	III	IV	Tot	Curr	I	II	III	IV	Tot
											1	-1				0
											+1					1
											1					1
-1				0	1	-1				0						
+1				2	1	+1				2	2					2
				3	3					3	7					7
-1				1	2	-1				1		+1				1
-1				3	4	-1				3	2					2
+1				3	1	+2				3	3	+1				4
+1				3	1	+2				3	3	+1				4
											1					1
-1				1	2	-1				1	1					1
				1	1					1						
					1	-1				0						

Table 13-26. Summary of Brigade/Regiment Fir
Section Equipment Adjustments (C

	Armored Phases						Mechanized Infantry Phases						Infantry Phases					
	Current	I	II	III	IV	Total	Current	I	II	III	IV	Total	Curr	I	II	III	IV	T
K87254 Installation Kit: MK1246														+2				
K87269 Installation Kit: MK1306	1					1	1					1		+1				
K87390 Installation Kit: MK1552													1	-1				
K87392 Installation Kit: MK1554	1					1	1					1		+1				
K87394 Installation Kit: MK1646													1	-1				
K87397 Installation Kit: MK1663														+2				
K87408 Installation Kit: MK1680	1		-1			0	1		-1			0						
K87427 Installation Kit: MK1644	1					1	1					1						
L44595 Launcher, Grenade, 40mm	1	-1				0	1		-1			0	1	-1				
M10936 Mask, Protective Tank	2					2	2					2						
M11895 Mask, Protective Field	1					1	1					1	3					
M55843 FD Set Artillery, 25000 meters																		
N96741 Pistol: 45 cal																		
P43177 Power Supply: Z-ACD	2	+1				3	2	+1				3	1	+2				

Fire Support
(Continued).

Airborne Infantry						Air Assault Infantry						Armored Cavalry Regimental FSO					
	Phases						Phases						Phases					
Tot	Curr	I	II	III	IV	Tot	Curr	I	II	III	IV	Tot	Curr	I	II	III	IV	Tot
2	1	+1				2		+2				2						
1		+1				1		+1				1	+1					1
0							1	-1				0						
1		+1				1		+1				1	+1					1
0							1	-1				0						
2	1	+1				2		+2				2						
														+1				1
0	1	-1				0	1	-1				0						
													2					2
3	3					3	3					3	5					5
													1					1
													2					2
3	1	+2				3	1	+2				3	1					1

2

1

Table 13-26. Summary of Brigade/Regiment Fire S
Section Equipment Adjustments (Co

	Armored						Mechanized Infantry						Infantry					
		Phases						Phases						Phases				
	Current	I	II	III	IV	Total	Current	I	II	III	IV	Total	Curr	I	II	III	IV	Tot
P09818 Plotting Set 2500 meters																		
Q34308 Radio Set: AN/GRC-160																		
Q32756 Radio Set: AN/GRC-106																		
Q33299 Radio Set: AN/PRC-77													1	-1				0
Q53001 Radio Set: AN/VRC-46		+2				2		+2				2		+2				2
Q54174 Radio Set: AN/VRC-47	1					1	1					1		+1				1
Q55114 Radio Set: AN/VRC-49	1	-1				0	1	-1				0	1	-1				0
Q78282 Radio Set Control Group: AN/GRA-39	2					2	2					2	2					2
R30662 Control Group: AN/GRA-6																		
R59160 Reeling Machine: RL-39	2	+1				3	2	+1				3	2	+1				3
R94977 Rifle: 5.56mm	3					3	3					3	3					3
U01305 Speech Secure Equip: KY-38	2	+1				3	2	+1				3	1	+2				3
U82529 Switchboard: SB-993	1					1	1					1	1					1
V08721 Tactical Repeater: HYL-3/TSEC	1	-1				0	1	-1				0	1	-1				0
V31211 Telephone Set: TA-312/PT	2					2	2					2	2					2

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irborne Infantry Phases						Air Ass... ...fantry Phases						Armored Cavalry Regimental FSO Phases					
rr	I	II	III	IV	Tot	Curr	I	II	III	IV	Tot	Curr	I	II	III	IV	Tot
												1					1
2	-2				0												
												1					1
						2	-2				0						
1	+1				2		+2				2		+1				1
	+1				1		+1				1	1					1
						1	-1				0						
2					2	2					2	2					2
												1					1
2	+1				3	2	+1				3	1					1
3					3	3					3	5					5
1	+2				3	1	+2				3	1	+1				2
	+1				1	1					1						
						1	-1				0						
2					2	2					2	2					2

Table 13-26. Summary of Brigade/Regiment Fir
Section Equipment Adjustments (

	Armored Phases					Mechanized Infantry Phases					Infantry Phases				
	Current	I	II	III	IV Total	Current	I	II	III	IV Total	Curr	I	II	III	IV
W95400 Trailer, Cargo, 1/4-ton	1				1	1				1	1				
X39940 Truck, Cargo: 1-1/4-ton												+1			
X60833 Truck, Utility: 1/4-ton	1				1	1				1	1				
Y39027 Watch, Wrist															
Z62714 VFMED (M52582)	1	-1			0	1	-1			0	1	-1			
X____ Improved VFMED		+1			1		+1			1		+1			

Support
ntinued).

ot	Airborne Infantry Phases Curr	I	II	III	IV	Tot	Air Assault Infantry Phases Curr	I	II	III	IV	Tot	Armored Cavalry Regimental FSO Phases Curr	I	II	III	IV	Tot
1		+1				1	1					1	1					1
1	1					1		+1				1						
1		+1				1	1					1	1					1
													2					2
0	1		-1			0	1		-1			0						
1			+1			1			+1			1						

Table 13-27. TOE Equipment Requirements, Separate Observation/Lasing Teams.

		Infantry	Corps Arty Bn/ Air Assault	Mech Inf/ Armor
A01876	Accessory Kit: MK1265			2
A71712	Antenna AT: 984/G	1	1	
B49272	Bayonet-Knife	2	2	3
B67766	Binoculars: 7x50mm	1	1	1
C68719	Cable Telephone: WD-1/TT	3	3	2
C89145	Camouflage Screen System	1	1	2
C89213	Camouflage Screen Support System	1	1	2
D12087	Carrier, Full Tracked			1
E63728	Compass, Magnetic	1	1	1
K87243	Installation Kit: MK1234	1	1	
L44595	Launcher, Grenade: 40mm	1	1	
L91838	Machine Gun, 50 cal			1
M11895	Mask, Protective Field	2	2	3
M75577	Mount, Tripod, 50 cal			1
N04456	Night Vision Goggles: PVS-5	1	1	1
N04982	Night Vision Sight: AN/TAS-4	1	1	1
Q38299	Radio Set: AN/PRC-77	1	1	
Q34308	Radio Set: AN/GRC-160		1	1
Q53001	Radio Set: AN/VRC-46	1		1
Q78282	Radio Set Control Group: AN/GRA-39	1	1	1
R59160	Reeling Machine: RL-39	2	2	2
R94977	Rifle: 5.56mm	2	2	3
V31211	Telephone Set: TA-312/PT	1	1	1

Table 13-27. TOE Equipment Requirements, Separate Observation/Lasing Teams (Continued).

	Infantry	Corps Arty Bn/ Air Assault	Mech Inf/ Armor
W95400 Trailer, Cargo: 1/4-ton	1	1	
X60833 Truck, Utility: 1/4-ton	1	1	
Z27623 FISTV: Forward Observer Artillery*			1*
Z32103 Electro Optical Tgt Designator: AN/TVQ-2	1	1	1
Z42448 DMD: AN/PSG-2 (M52650)	1	1	1

*Replaces LIN D12087 on a one-for-one basis.

Table 13-28. Summary of Aerial Fire Support Section Equipment Requirements.

		Phase I	Phase II
A71712	Antenna: RC 292	2	2
B49272	Bayonet-Knife	2	2
B67766	Binocular: 7x50mm	2	2
C68719	Cable Telephone: DR-8	2	2
C89145	Camouflage Screen System	1	1
C89213	Camouflage Screen Support System	1	1
E63782	Compass, Magnetic	1	1
K87243	Installation Kit: MK1234 for VRC-46	0	2
K87262	Installation Kit: MK1254 for VRC-49	1	0
M11621	Mask, Protective Aircraft	2	2
M11895	Mask, Protective Field	1	1
N96741	Pistol: 45 cal	2	2
Q53001	Radio Set: AN/VRC46	0	2
Q55114	Radio Set: AN/VRC-49	1	0
Q78282	Radio Set Control Group: AN/GRA-39	2	1
R59160	Reeling Machine: RL-39	1	1
R94977	Rifle: 5.56mm	1	1
U01305	Speech Secure Equipment: TSEC/KY38	1	1
V31211	Telephone Set: TA-312/PT	1	1
W95400	Trailer, Cargo: 1/4-ton	1	1
X60833	Truck, Utility: 1/4-ton	1	1
X____	FIST DMD		2

Chapter 14

RECOMMENDATIONS

14.1 INTRODUCTION

Study group recommendations are presented for the four phases of the study. The Phase I recommendations are arranged in the sequence of the personnel, equipment and doctrinal changes required to fine tune the current FIST and fire support section organizations. In some cases reference is made to supporting tables in Chapter 13 for changes to non-major items of equipment.

All Phase I recommendations can be implemented in the 1980-82 time frame assuming that the additional personnel and equipment required are available. The United States Army Field Artillery School (USAFAS) is the proponent for the implementation of all recommendations unless otherwise stated in the text.

Phase II recommendations are presented in the sequence in which they can be implemented assuming that developmental equipment can be fielded in the following time frames: (TACFIRE IOC was April, 1979)

FIST DMD - 1983

Mortar Fire Control Calculator (MFCC) - 1983

Improved Variable Format Message Entry Device - 1990

The initial Phase III recommendations describe the increased personnel and equipment requirements for laser operations followed by personnel and laser designator equipment trade-offs. Advanced scout helicopter and laser rangefinder requirements are then discussed followed by the changes in doctrine required for laser operations. Assuming current COPPERHEAD development milestones, the Phase III recommendations must be implemented starting in calendar year 1980.

Phase IV recommendations are long lead time items. Subjects discussed include required changes to the FISTV ROC, FISTVs for separate observation/ lasing teams, the initiation of development action for a FISTV replacement in the 1990s and the need for a high mobility multipurposed wheeled vehicle.

14.2 PHASE I - CURRENT ORGANIZATIONS

14.2.1 Tank company and armored cavalry troop FISTs should be reduced from five to four personnel and organized as follows:

Title	Grade	MOS	Number Authorized
Fire Support Team (FIST) Chief	LT	13AOO	1
Fire Support Sergeant	E6	13F30	1
Fire Support Specialist	E4	13F10	1
Radio/Telephone Operator	E3	13F10	1

NOTE: The capability for an FO party will be deleted from current doctrine for these FISTs.

14.2.2 Infantry, mechanized infantry, airborne infantry, and air assault infantry company FISTs should be increased from nine to ten personnel and organized as follows:

Title	Grade	MOS	Number Authorized
Fire Support Team (FIST) Chief	LT	13A00	1
Fire Support Sergeant	E6	13F30	1
Fire Support Specialist	E4	13F10	1
Forward Observer	E5	13F20	3
Radio Telephone Operator	E3	13F10	4

14.2.3 An armored cavalry troop FIST should be provided for each ground troop of the air cavalry squadron in the infantry, air assault, and airborne divisions (total-twenty-eight spaces). The FIST organization is at paragraph

14.2.1. Equipment requirements are as listed in Phase I column, Table 13-22, Summary of FIST Equipment Changes, with the exception of vehicles, described below:

Division	Vehicle	FA TOE
Infantry	M113A1	TOE 6-166H, HHB, FA Bn, 155mm/8-inch, Infantry Division
Air Assault	Truck, 1/4 ton w/trailer	TOE 6-716H, HHB, 155mm, FA Bn, Air Assault Division
Airborne	Truck, 1/4 ton w/trailer	TOE 6-201H, HHB, Airborne Division Artillery

14.2.4 A standard four-man FSS for the divisional air cavalry squadron should be added to the TOE of the GS battalion of the air assault (TOE 6-716H) division artillery.

14.2.5 An aerial maneuver FSS, consisting of the following personnel:

- Fire Support Officer, CPT, MOS 13A00
- Fire Support Sergeant, E7, MOS 13F40
- Fire Support Specialist, E4, MOS 13F10

should be added to the following TOE:

- 17-58H - Air Cavalry Troop, Armored Cavalry Regiment
- 17-98H - Air Cavalry Troop, Air Assault Division
- 17-108H - Air Cavalry Troop, Armored/Mechanized Infantry Division
- 17-205H - Air Cavalry Troop, Infantry Division
- 17-278H - Air Cavalry Troop, Airborne Division
- 17-387H - Attack Helicopter Company, Armored/Mechanized Division, Air Cavalry Combat Brigade, and Attack Helicopter Battalion (Corps)

The equipment required is as stated in Table 13-26. (234 spaces required) (Proponent: USAARMS)

14.2.6 The following number of FAAO's should be authorized:

Division	Current	Required	Applicable TOE
Armored, Infantry, Mechanized Infantry	8	10	TOE 6-302H, HHB AIM Division Artillery
Airborne	6	8	TOE 6-201H, HHB, Airborne Division Artillery
Air Assault	0	10	TOE 6-701H, HHB, Air Assault Division Artillery

14.2.7 FIST radio authorizations should be changed as follows: (Proponents: USAFAS and USAIS)

RADIOS

	VRC-46		VRC-47		GRC-160		PRC-77	
Type FIST	Current	CSSGII	Current	CSSGII	Current	CSSGII	Current	CSSGII
Armor	0	1	1	0	2	3	1	0
Armored Cavalry	0	1	1	0	2	2	1	0
Mechanized Infantry	0	1	1	0	2	6*	3	0
Infantry	0	0	1	0	2	1	3	5
Air Assault	0	0	0	0	3	1	3	5

*Mount for platoon FO party's AN/GRC-160 is installed in mechanized infantry platoon leader's track vehicle.

14.2.8 The tank company FIST, airborne division, should be authorized the M113A1 carrier instead of the current M561, 1-1/4 ton truck. In view of the unique logistics support problems for track vehicles in the airborne division the vehicle should be organic to headquarters and headquarters company, tank battalion, airborne division (TOE 17-236H). (Proponency: USAARMS and USAFAS)

14.2.9 FIST equipment authorizations should be changed to reflect the quantities listed in Phase I column, Table 13-22, Summary of FIST Equipment. (Radio authorizations in this table are as described at paragraph 14.2.7.)

14.2.10 Thirty (30) additional FIST trained personnel per AIM Division are necessary to meet the R³ (Robustness, Resiliency, and Redundancy) requirements. This requirement should be met in part by the formation of the separate observation/lasing teams addressed at paragraph 13.3.2. These teams can augment the observation capabilities of the division artillery and are readily available as replacements for FIST casualties occupying critical positions.

14.2.11 Each maneuver battalion/squadron FSS, airborne division, should be authorized an AN/VRC-49 radio for operation of a re-transmission station.

14.2.12 Vehicle and radio authorization for FSS's supporting tank/mechanized infantry battalions should be changed as follows:

Item	Current TOE	CSSG II	Change
Radio Set: AN/VRC-47 mtd in truck, 1/4 ton	1	0	-1
Radio Set: AN/VRC-47* mtd in Carrier, Command Post	0	1	+1
Radio Set: AN/VRC-40 mtd in Carrier, Command Post	1	1	0
Radio Set: AN/GRC-160* mtd in truck, 1/4 ton	0	1	+1
Command Post Carrier, M577A1	1	1	0
Truck, 1/4 ton with trailer	1	1	0

NOTE: *With Speech Secure Equipment

14.2.13 Vehicle and radio authorizations for FSS's supporting armored/mechanized divisional cavalry squadrons should be changed as follows:

Item	Current TOE	CSSG II	Change
Radio Set: AN/VRC-47 mtd in truck, 1/4 ton	1	0	-1
Radio Set: AN/VRC-46* mtd in Carrier, Command Post	0	1	+1
Radio Set: AN/VRC-49 mtd in Carrier, Command Post	1	1	0
Radio Set: AN/GRC-160* mtd in truck, 1/4 ton	0	1	+1
Command Post Carrier, M577A1	1	1	0
Truck, 1/4 ton w/trailer	1	1	0

NOTE: *With Speech Secure Equipment

14.2.14 Vehicle and radio authorizations for FSS's supporting infantry battalions in an infantry division, should be changed as follows:

Item	Current TOE	CSSG II	CHANGE
Radio Set: AN/VRC-49 mtd in 1 1/4 ton truck	0	1	+1
Radio Set: AN/VRC-49 mtd in 1/4 ton truck	1	0	-1
Radio Set: AN/VRC-46* mtd in 1 1/4 ton truck	0	2	+2
Radio Set: AN/GRC-160* mtd in 1/4 ton truck	0	1	+1
Radio Set: AN/PRC-77	1	0	-1
Truck, 1/4 ton w/trailer	1	1	0
Truck, 1 1/4 ton	0	1	+1

NOTE: *With speech equipment (Required for one AN/VRC-46 and one AN/GRC-160)

14.2.15 Vehicle and radio authorizations for FSS's supporting an air cavalry squadron in an infantry division should be changed as follows:

Item	Current TOE	CSSG II	Change
Radio Set: AN/VRC-49 mtd in 1 1/4 ton truck	0	1	+1
Radio Set: AN/VRC-49 mtd in 1/4 ton truck	1	0	-1
Radio Set: AN/VRC-46* mtd in 1 1/4 ton truck	0	1	+1
Radio Set: AN/GRC-160* mtd in 1/4 ton truck	0	1	+1
Radio AN/PRC-77	1	0	-1
Truck: 1/4 ton w/trailer	1	1	0
Truck: 1 1/4 ton	0	1	+1

NOTE: *With speech secure equipment

14.2.16 Vehicle and radio authorizations for FSS's supporting infantry battalions, air assault division, should be changed as follows:

Item	TOE	Inf Div CSSG II	CHANGE
Radio Set: AN/VRC-49 mtd in 1 1/4 ton truck	0	1	+1
Radio Set: AN/VRC-49 mtd in 1/4 ton truck	1	0	-1
Radio Set: AN/VRC-46 mtd in 1 1/4 ton truck	0	2	+2
Radio Set: AN/GRC-160* mtd in 1/4 ton truck	0	1	+1
Radio Set: AN/PRC-77	1	0	-1
Truck, 1/4 ton w/trailer	1	1	0
Truck, 1 1/4 ton	0	1	+1

NOTE: *With speech secure equipment (Required for one AN/VRC-46 and one AN/GRC-160)

14.2.17 Vehicle and radio authorizations for FSS's supporting infantry battalions, airborne division, should be changed as follows:

Item	TOE	Inf Div CSSGII	CHANGE
Radio Set: AN/VRC-49 mtd in 1 1/4 ton truck	0	1	+1
Radio Set: AN/VRC-49 in 1/4 ton truck	0	0	0
Radio Set: AN/VRC-46* mtd in 1 1/4 ton truck	0	2	+2
Radio Set: AN/GRC-160* mtd in 1/4 ton truck	0	1	+1
Radio Set: AN/GRC-160 mtd in 1 1/4 ton truck	2	0	-2
Truck, 1/4 ton w/trailer	0	1	+1
Truck, 1 1/4 ton	1	1	0

NOTE: *With speech secure equipment (Required for one AN/VRC-46 and one AN/GRC-160)

14.2.18 Vehicle and radio authorizations for FSS's supporting air cavalry squadrons in the airborne divisions should be changed as follows:

Item	TOE	CSSG II	Change
Radio Set: AN/VRC-49 mtd in 1 1/4 ton truck	0	1	+1
Radio Set: AN/VRC-46* mtd in 1 1/4 ton truck	0	1	+1
Radio Set: AN/GRC-160* mtd in 1/4 ton truck	0	1	+1
Radio Set: AN/GRC-160 mtd in 1 1/4 ton truck	2	0	-2
Radio Set: AN/VRC-49 mtd in 1 1/4 ton truck	1	0	-1
Truck, 1/4 ton	0	1	+1
Truck, 1 1/4 ton	1	1	0

NOTE: *With speech secure equipment

14.2.19 Vehicle and radio authorizations for the FSS supporting the air cavalry squadron, air assault division should be as follows: (new requirement for one section)

Item	Quantity
Radio Set: AN/VRC-49 mtd in 1 1/4 ton truck	1
Radio Set: AN/VRC-46* mtd in 1 1/4 ton truck	1
Radio Set: AN/GRC-160* mtd in 1/4 ton truck	1
Truck, 1/4 ton w/trailer	1
Truck, 1 1/4 ton	1

NOTE: *With speech secure equipment

14.2.20 Maneuver battalion/squadron FSS equipment authorizations should be as listed in the Phase I column, Tables 13-24 and 13-25.

14.2.21 Maneuver brigade FSS responsibilities and equipment be changed as follows:

- Delete doctrinal requirement for operation of a retransmission station (AN/VRC-49).

- Reconfigure vehicles and radios as follows:

  Armored and Mechanized Infantry Divisions -

  ' Two AN/VRC-46 radios mounted in M577A1 command post carrier

  ' One AN/VRC-47 radio mounted in truck, utility, 1/4-ton

  Infantry, Airborne, and Air Assault Divisions -

  ' Two AN/VRC-46 radios mounted in truck, cargo, 1 1/4 ton

  ' One AN/VRC-47 radio mounted in truck, utility, 1/4 ton

- Change other equipment as listed in the Phase I column, Table 13-26, Summary of Maneuver Brigade Equipment Changes.

14.2.22 All armored cavalry troop and the ACR tank company FISTs should be identified in requirements and authorization documents as "Armored Cavalry FISTs" to distinguish them from "Tank Company FISTs" organized to support tank companies of tank battalions.

14.2.23 The company mortar FD net and the CFC net should be combined in all type infantry companies. The appropriate title is "Company Fire Control Net" and the net control station should be the company FIST headquarters. The "Troop Fire Control (TFC) Net" is retained for use in armored cavalry troops.

14.2.24 Doctrine should be changed to state that FISTs will be attached to the supported maneuver unit upon the onset of hostilities. This status should be recognized in the positioning of POMCUS stocks in USAREUR. (Propenency: USAFAS and FORSCOM.)

14.2.25 The United States Army Field Artillery School and the United States Army Armor School should add and/or amplify doctrinal discussion of fire support for aerial maneuver units in accordance with their proponency for the following field manuals:

FM 6-20 - Fire Support in Combined Arms Operations

FM 6-20-1 - Field Artillery Cannon Battalion

FM 6-20-2 - Division Artillery/FA Brigade/FA Section, Corps

FM 17-47 - Air Cavalry Combat Brigade

FM 17-50 - Attack Helicopter Operations

FM 17-95 - Cavalry

14.2.26 Doctrinal discussions of the capabilities, employment, and requirements for FAAO's should be added to the following fire support manuals:

FM 6-20 - Fire Support in Combined Arms Operations

FM 6-20-1 - Field Artillery Cannon Battalion

FM 6-20-2 - Division Artillery/FA Brigade/FA Section, Corps

14.2.27 The draft doctrine, published in TC 6-20-10, FIST, which established the additional duty of assistant fire support officer for the maneuver battalion heavy mortar platoon leader, should be deleted.

14.2.28 A fire support net (AM) (Voice) be established in the ACR for the conduct of fire support coordination between squadron and regimental FSE's. No additional equipment is required to implement this recommendation.

14.2.29 A fire support net (FM) (Voice) be established in the armored cavalry regiment for the conduct of fire support coordination between squadron and regimental/brigade FSE, when appropriate. This requires one AN/VRC-46 radio per squadron FSO and the deletion of the R-442 (auxiliary receiver) from the regimental FSO. An additional AN/VRC-47 with secure device is required to be mounted in the M151A1 of the squadron and regimental FSOs for use during split operations.

14.2.30 Training and education in the preparation and execution of detailed reconstitution plans for FIST and FSO should be developed. The purpose of this instruction should be to instruct officers and senior enlisted personnel in the details of reconstituting personnel and equipment losses sustained in combat. CSSG II visualized the development of written plans for each unit which specify the appropriate source of immediate replacement personnel and equipment for the unit.

14.3 PHASE II - DIGITAL OPERATIONS

14.3.1 The following procedures for submission of fire requests for indirect fires in the FIST be adopted for use during the initial fielding of TACFIRE.

The platoon FO should transmit a digital or voice request for FA fires to the FIST HQ for fire support coordination purposes prior to transmission of the digital request to the FA FDC. The control of mortar fires will be as currently defined in TC 6-20-10, FIST (Three options for controlling fire requests initiated by platoon FOs.)

14.3.2 The basis of issue for the Digital Message Device (DMD), AN/PSG-2, be expanded to include the following requirements:

- One DMD for each maneuver battalion/squadron FSS.
- One DMD for each separate observation/lasing team.

14.3.3 A product improvement program be initiated for the current DMD, to provide the following capabilities--receive a request from an observer on one channel, display, permit editing and retransmission on another channel. This product improved DMD should be fielded by 1983 on the following basis of issue:

- One per FIST
- Two per FSS, aerial maneuver units.
- One per FSS, maneuver battalion/squadron, pending development of a replacement for the variable format message entry device.

14.3.4 A development program be initiated for an improved digital message device for use by FISTs. The device should permit a fire request, received from an infantry platoon observer on a fire net to be displayed, edited, and on order from the FIST Chief, transmitted to the FDC or other fire support agency on a second net. This device should include a net busy sensing and graphics capability.

14.3.5 A development program be initiated for an improved variable format message entry device for use by maneuver battalion/squadron FSS's. This equipment should permit the maneuver battalion FSE to receive all requests for indirect fires, evaluate the relative effectiveness of mortar vis-a-vis FA, determine which means to employ to achieve the desired results, and retransmit the request, either as a fire order to the battalion heavy mortar section, or as a fire request to the FA FDC. It should be fielded to replace the current VFMED in each maneuver battalion/squadron FSS.

14.3.6 USAFAS and USAIS jointly investigate the feasibility of integrating tactical fire control for battalion heavy mortars into the TACFIRE system.

14.3.7 Upon fielding of the FIST DMD and the mortar fire control calculator all fire requests originating within the FIST should be in digital mode. Voice requests received from other requestors will be placed in digital format by the fire support agency receiving the request.

14.4 PHASE III - LASER OPERATIONS

14.4.1 The infantry FIST, infantry division, and air assault division be increased by two personnel to accommodate fielding of the ground laser locator designator (GLLD). The two-man team be organized as follows:

- Personnel - One E5, MOS 13F20
  One E3/4, MOS 13F10

- Major Equipment - One truck, utility, 1/4-ton
  One trailer, cargo, 1/4-ton
  Radio: AN/GRC-160
  Radio: AN/PRC-77
  GLLD
  Night Sight, AN/TAS-4
  DMD

14.4.2 Separate observation/lasing teams be organized on the following basis:

- Armored/Mechanized Infantry Divisions - six, three-man teams per DS battalion, organized as follows:

  Personnel - One E5, MOS 13F20
  One E4, MOS 13F10
  One E3, MOS 13F10

  Major Equipment - One Carrier M113A1
  Radio: AN/VRC-46
  Radio: AN/GRC-160
  GLLD
  Night Sight, AN/TAS-4
  DMD

- Infantry Division - Three, two-man teams per DS battalion, organized as follows:

  Personnel - One E-5, MOS 13F20
  One E3/4, MOS 13F10

  Major Equipment - Truck, utility, 1/4-ton
  Trailer, cargo, 1/4-ton
  Radio: AN/VRC-46
  Radio: AN/PRC-77
  GLLD
  Night Sight, AN/TAS-4
  DMD

Air Assault Division - Three, two-man teams per DS battalion, organized as follows:

Personnel - One E-5, MOS 13F20
One E3/4, MOS 13F10

Major Equipment - Truck, utility, 1/4-ton
Trailer, cargo, 1/4-ton
Radio: AN/GRC-160
Radio: AN/PRC-77
GLLD
Night Sight, AN/TAS-4
DMD

- Armored Cavalry Regiment - Three, three-man teams per regimental headquarters troop, organized and equipped in the same manner as separate observation/lasing teams for the armored/mechanized infantry divisions.

A complete listing of equipment required for separate observation/lasing teams is at table 13-27.

14.4.3 That 16 of the 32 spaces in the sound/flash observation sections, sound/flash platoons, target acquisition battery, armored/infantry/ mechanized infantry divisions, be traded-off against the space requirements for separate observation/lasing teams.

14.4.4 That eight of the sixteen spaces in the sound/flash observation sections, sound/flash platoon, target acquisition battery, airborne/air assault divisions, be traded-off against the space requirement for separate observation/ lasing teams.

14.4.5 The basis of issue plans for laser designator equipment should be changed to reflect the following requirements:

° Ground Laser Locator Designator (GLLD), AN/TVQ-2

- One per FIST in armored, mechanized infantry, infantry and air assault divisions.

- One per separate observation/lasing team.

- Delete requirement for GLLD in sound/flash observation section in all divisions.

° Hand Held Designator - One per mechanized infantry, infantry, airborne, and air assault FIST.

14.4.6 The fielding of a laser designator equipped helicopter be supported as an urgent operational requirement.

14.4.7 The basis of issue of the Laser Infrared Observation Set/Device, AN/GVS-5, should be changed as follows: (See Tables 13-22 - 13-23 for trade-off quantities of Binoculars: 7 x 50mm)

ELEMENT	QUANTITY
Armor/Armored Cavalry FIST	1
Infantry/Airborne Infantry/Air Assault Infantry/Mechanized Infantry FIST	4

14.4.8 Draft doctrine for COPPERHEAD employment in the armored and mechanized infantry divisions be changed to reflect the following concept for employment organic FIST GLLDs.

Option One - The FIST chief and the GLLD operate in the M113A1 vehicle. The procedure for this option are described in the COPPERHEAD O&O concept and TC 6-20-10, FIST.

Option Two - The FIST chief operates from the company commander's vehicle and the FIST M113A1 with GLLD is positioned separately in a vantage position within the company area. The FIST Chief removes one AN/PRC-77 from the FIST M113A1 and performs the required command and control functions on the CFC net.

Option Three - The FIST chief and an additional man operate from the company commander's vehicle and the FIST M113A1, with GLLD, is utilized outside the company area. This option degrades fire support in that the FIST HQ radios must be divided between two areas, i.e. the observation/ lasing team (M113A1 and GLLD) utilizes the AN/VRC-46 radio on the field artillery FD net and AN/GRC-160 radio to net with the supported unit. The FIST chief utilizes the two remaining radios (AN/PRC-77s) on the CFC and/or mortar and FA fire direction nets. This option should only be used when separate observation/lasing teams are not available to meet the operational requirement.

When employing option three, the FIST chief will be required to utilize personnel from the platoon FO teams to provide sufficient personnel for the observation/ lasing team (three personnel) and the FIST HQ (two personnel).

14.4.9 Draft doctrine for COPPERHEAD employment in the infantry and air assault divisions be changed to reflect the following concept for employment of organic FIST GLLDs.

The GLLD will be employed by the observation/lasing team, organic to the FIST. The two-man team transports the GLLD and ancillary equipment (radios, night sight, etc.) in a 1/4 ton truck and trailer, moving to the desired position if possible, or utilizing a combination of vehicle/backpack movement to reach the position. When employed within the company sector, the team operates radios on the CFC Net and the appropriate FD frequency. In some cases it may be desirable to deploy the team outside the company sector in order to increase the concentration of designators. When so

employed the team will operate under the control of a designated FIST chief or FSO.

14.4.10 The following draft doctrine for the employment of separate observation/lasing teams be adopted:

- Separate observation/lasing teams are assigned to the DS FA battalion of the armored, infantry, air assault and mechanized infantry divisions in equal numbers. The teams are task organized within the brigade based on the maneuver commander's guidance for the concentration of laser designators and employment of COPPERHEAD. The division commander may task organize these assets between brigades when required by the tactical situation.

When the airborne division is deployed . is expected that one or more of the 155mm battalions assigned to the XVIII Airborne Corps will be deployed in support of the division. When so deployed, the separate observation/lasing teams organic to the 155mm battalion will be subsequently attached to the airborne division artillery. When so attached they will be further task organized in support of maneuver brigades.

14.5 PHASE IV - GLLD UNDER ARMOR

14.5.1 The FIST Vehicle (FISTV) ROC be changed to reflect CSSG II recommendation for reduction in size of the armor/armored cavalry FIST, change in radio configuration, replacement of the DMD with the FIST DMD, and the change in basis of issue for the hand held designator.

14.5.2 The FIST Vehicle Kit be procured for separate observation/lasing teams initially equipped with the M113A1 carrier.

14.5.3 Developmental action should be continued on the FISTV. Progression of development should occur in the following sequence: M113A1 w/pintle mounted GLLD, M113A2 modified as the FISTV throught a replacement vehicle at the end of the life cycle for the FISTV.

14.5.4 Development action should be initiated on a replacement vehicle for the FIST Vehicle system. CSSG II analysis indicates that this vehicle should be a modified Cavalry Fighting Vehicle (CFV).

14.5.5 Command and control requirements for operation of a FIST HQ element in the mechanized infantry company commander's Infantry Fighting Vehicle be provided the United States Army Infantry School.

14.5.6 A high mobility multi-purposed wheeled vehicle be developed to replace the 1/4-ton truck and trailer currently projected for use by the observation/ lasing teams equipped with wheeled vehicles.

14.6 PHASE V - DIVISION 86 (ARMORED AND MECHANIZED DIVISIONS)

14.6.1 A ten (10) man FIST is required to support the mechanized infantry company.

14.6.2 A four (4) man FIST is required to support the tank company and armored cavalry troop.

14.6.3 Fire support personnel for the Air Cavalry Attack Brigade should consist of:

ACAB - one (1) FA staff officer (Major) (FSO).

ACAS - a three man FSS consisting of one officer and two enlisted per each air cavalry attack squadron.

NOTE: This results in a net saving of 43 spaces within the currently envisioned aerial maneuver units of the AIM Divisions. The exact number of ACABs to be placed in the force structure is unknown at this time.

14.6.4 Digital communications must be developed that can handle anticipated fire request traffic in a responsive manner. The addition of a digital switching capability at the battalion FSE can reduce net traffic with minimal impact on response time.

APPENDIX A

STUDY DIRECTIVE

DEPARTMENT OF THE ARMY
UNITED STATES ARMY FIELD ARTILLERY SCHOOL
FORT SILL, OKLAHOMA 73503

Mr. Panepacker/clw/1-3669

ATSF-CD-R

26 DEC 78

SUBJECT: Combat Developments Study Plan: Close Support Study Group II (CSSG II)

TO: COL John E. Donohue, Chairman
Close Support Study Group II
Tactics/Combined Arms Department
USAFAS
Fort Sill, OK 73503

1. PURPOSE:

a. To determine the optimum organization of FIST Organizations (armor, armored cavalry, mechanized infantry, infantry, airborne and air assault) during the 1979-86 timeframe.

b. To determine optimum procedures for the employment of digital communications, laser designators, laser acquisition and precision guided munition systems during the 1980-86 timeframe.

c. To provide input to the DIVISION 86 study, a requirement of the TRADOC Battlefield Development Plan.

d. To provide appropriate issues for FIST FDTE tests.

2. REFERENCES: See Inclosure 1.

3. TERMS OF REFERENCE:

a. Problem: The FIST concept, which resulted from the work of the CSSG I, was approved by the Vice Chief of Staff on 27 June 1977, and has since been implemented in most Army divisions. This current FIST was designed to work with existing FA communications and munitions. Reports from field units that have successfully implemented FIST indicate that some "fine tuning" is needed to correct equipment authorization problems. Although developmental systems were considered by the CSSG I, operational concepts were not available in sufficient detail to permit the CSSG to

fully examine their impact on the FIST. The additional tasks and responsibilities imposed on the FIST by developmental systems, e.g. TACFIRE (digital communications with DMD), laser rangefinder and designators (AN/GVS-5, LTD, GLLD), precision guided munitions (COPPERHEAD/HELLFIRE), laser acquisition systems (Airborne Laser Tracker/PAVE PENNY) and Forward Observer Vehicle require an investigation of the ability of the current FIST to effectively employ these equipments/systems in the combined arms team.

b. Impact of Problem. Failure to optimize doctrine and procedures for employment of new fire support equipment/systems could significantly reduce the effectiveness of combined arms operations by unnecessarily limiting the combat power that can be generated and applied against the threat force.

c. Objectives:

(1) To review current FIST organizations and determine adequacy to perform fire support tasks under conditions of severe loading as exemplified by the SCORES 2A scenario.

(2) To determine additional FIST level fire support responsibilities/tasks generated by the introduction of the new equipment/systems listed in paragraph 3d below.

(3) To determine if the above responsibilities should be assigned to the FIST or other organizations (current or conceptual).

(4) To determine what additional FIST level personnel and/or equipment is required, if any, for the employment of the systems listed in paragraph 3d.

(5) To determine the adequacy of draft doctrine/procedures for new equipment/systems.

(6) To recommend new doctrine/procedures, when appropriate, for new equipment/systems.

(7) To make appropriate recommendations for tests.

(8) To make appropriate recommendations for personnel/equipment tradeoffs within total force structure constraints.

(9) To recommend appropriate changes in USAFAS resident and exported training programs.

d. Scope: The study will examine each of the current FIST organizations (armor, armored cavalry, mechanized infantry, infantry, airborne, air assault) for the purpose of determining their capabilities and limitations. The need for FIST organizations to support air cavalry and attack helicopter units will also be examined. New equipment/systems are then addressed in phases, described below, to determine optimum doctrine, organization and procedures for use by FIST-level organizations in the combined arms team.

Phase	Title	Equipment/System
I	Conventional FIST	Current organization and equipment
II	Digital FIST	TACFIRE, BCS, Mortar Fire Calculator Vinson Speech Secure Equipment
III	Laser FIST	LTD, GLLD Designators AN/GVS-5 Laser Rangfinder Airborne Laser Tracker (ALT) PAVE PENNY COPPERHEAD HELLFIRE
IV	GLLD Under Armor	Forward Observer Vehicle and all above systems

e. Assumption: Equipment/systems listed in 3d above will be fielded in accordance with established IOC's.

f. Essential Elements of Analysis (EEA):

EEA	Phase EEA Addressed 1	2	3	4
1. What are the basic tasks of the FIST organization?	X	X	X	X

		Phase EEA Addressed			
		1	2	3	4
2.	What are the individual duties of FIST members?	X	X	X	X
3.	What is a representative load of FIST tasks for a 24-hour period as typified by the SCORES 2A scenario?	X	X	X	X
4.	What changes to the current FIST organizations and equipment are required to accomplish required tasks?	X	X	X	X
5.	Does proposed doctrine for employment of precision guided munitions adequately reflect a combined arms approach with respect to the type, quantity, and priority of targets to be engaged by these systems?			X	X
6.	What are the preferred organizations for the employment of new equipment/systems?		X	X	X
7.	What are appropriate personnel/equipment trade-offs?	X	X	X	X
8.	What is the essential radio traffic that the FIST HQ must receive/monitor from platoon FOs?	X	X	X	X
9.	What is the essential radio traffic that the battalion/task force fire support element must receive/monitor from FIST's?	X	X	X	X
10.	What is the appropriate radio net structure for FISTs when TACFIRE, BCS, Vinson Speech Secure Equipment, and the Mortar Fire Calculator are fielded?		X	X	X

	Phase EEA Addressed			
	1	2	3	4
11. What are the radio nets and procedures for the conduct of CAS missions?	X	X	X	X
12. What are the procedures for Army ground designation of targets for hand-off to CAS, and Army helicopter laser acquisition systems?			X	X
13. What are the procedures for remote ground designation for HELLFIRE?			X	X
14. What are the observer procedures for COPPERHEAD designation?			X	X
15. What are appropriate issues for test?	X	X	X	X
16. What changes to TRADOC schools resident and export training are required?	X	X	X	X

g. Constraints: None

h. Alternatives: The study shall consider the following alternatives for employment of designator assets:

(1) Employ designators in an alternative organization, either existing or conceptual.

(2) Employ designator team as an addition to the current FIST organization.

(3) Employ designators within the current FIST organization.

(4) Employ designators in a combination of the above alternatives.

i. Operational Concepts: The status of operational concepts for the FIST and new equipment/systems involved in this study is:

(1) Current FIST: As reflected in TC 6-20-10,

(2) TACFIRE/BCS: FM 6-1 (Draft), TACFIRE describes system doctrine and procedures; however, the specific procedures for FIST's equipped with the DMD have not been finalized. An operational concept for BCS has not been written. BCS replaces the Battery Display Unit in the cannon battery and is transparent to the FIST except when the cannon battery is operating in an autonomous mode.

(3) Vinson Speech Secure Equipment: Operational and Organizational Concept for Vinson Tactical Wideband Communication Security TSEC/KY-57 and Artillery Equipment, Dec, 1977, USA Signal School.

(4) Mortar Fire Calculator (MFC): Operational concepts not available. Letter Requirement states that the MFC will be interoperable with the DMD.

(5) COPPERHEAD and Ground Designators: Operational concepts have been published for the COPPERHEAD system and for the Sound/Flash Observer equipped with the Ground Laser Locator Designator. See inclosure one.

(6) AN/GVS-5 Laser Rangefinder: Procedures for use are described in FM 6-30.

(7) CAS Procedures. Joint (USAF, Army) procedures are described in TRADOC Training Text 6-20-7/TAC Pam 20-51, FAC/FIST Operations (Final Draft), November, 1978.

(8) ALT/PAVE PENNY/HELLFIRE: Proponent operational concepts are not available at this time. USAFAS concepts for use with the PAVE PENNY and HELLFIRE systems are described in "Draft ABCA Position Papers," 26 May 1978.

(9) FIST Vehicle System: A brief operational concept and mission profile is contained in the draft ROC.

j. Mission Profile: TBD

k. Measures of Effectiveness:

(1) The quantity, type and timeliness of fire support tasks completed by alternative non-laser equipped FIST organizations during periods of intense combat.

(2) The quantity, type, and timeliness of fire support tasks completed by alternative FIST laser-equipped organizations during periods of intense combat.

(3) The quantity, type and timeliness of fire support tasks completed by alternate designator organizations during periods of intense combat.

(4) Trade-off evaluation (personnel/equipment costs and availability) of alternative organizations.

1. Methodology. The study is a subjective analysis supported by analytical data from completed and on-going studies. The following specific guidance applies:

(1) FIST tasks and duties will be developed from the following sources:

Soldiers' Manual MOS 13F

FA LT's Manual

FA ARTEP's

MANEUVER ARTEP's

TC 6-20-10

FM 6-20

FM 6-30

FM 7-10

FM 7-15

FM 7-20

FM 71-1

FM 71-2

Training Text 6-20-7/TAC Training Pamphlet 50-21 (Draft), FAC/FIST Operations.

Unit reports on implementation of the FIST concept

Mission Profiles

Operational Concepts for New Equipment/Systems

(2) Mission profiles will be developed based on threat arrays from SCORES scenarios.

(3) FIST tasks and duties will be quantified based on above mission profiles.

(4) TACFIRE OT data will be used to quantify digital communications capabilities.

(5) Military judgment will be applied to the following data to develop operational concepts for laser acquisition systems/precision guided munitions:

Ground Laser Locator Designator and COPPERHEAD test data

COPPERHEAD COEA designator mixes and associated effectiveness

(6) Recommendations for change to TRADOC resident and export training will be based on a comparative subjective analysis of FIST tasks/duties derived from this study and current or projected USAFAS training.

(7) Recommendations for FIST use of Vinson Speech Secure Equipment will be based on a subjective analysis of the following:

Physical characteristics of Vinson equipment and operational concepts for its use.

Projected Vinson/TACFIRE and Vinson/MFC interface and associated secure capabilities.

DA policy for the security of radio nets.

FIST secure requirements and alternative methods of satisfying requirements.

m. Related Studies:

(1) Close Support Study, 1975-77.

(2) COPPERHEAD COEA, Phase I.

(3) Battlefield Research Project, Light Infantry FIST, 10 August, 1978 USAFAS, FAOBC 1-78.

(4) TRADOC Battlefield Development Plan, October 78 (BDP I).

(5) Army Science Board/Air Force Scientific Advisory Board Joint Summer Study "Battlefield Systems Integration" (S), July 1978.

n. Related Tests:

(1) Test	Time Period
HELBAT 7	February-March, 79
BCS OT II	January-March, 79
COPPERHEAD OT II	March 79
TACFIRE FDTE	May-July 79
FIST FDTE (Phase I)	Fourth Qtr, FY 79

o. Criterion of Choice: Subjective analysis will be used to select the organization capable of satisfactorily completing all required tasks for continuous 24-hour operations during periods of intense combat.

4. ENVIRONMENT/THREAT CONSIDERATIONS: The SCORES Sequence 2A Scenario is the basis for mission profiles for the mechanized and armor FIST's. The SCORES Sequence 2A Scenario as modified by USAFAS for use in Phase III of the Legal Mix V study for Light Divisions will be used to develop a mission profile for light infantry FISTS's.

5. SUPPORT AND RESOURCE REQUIREMENTS:

a. Support Requirements:

(1) USAFAS: Provide study director and appropriate representation from School elements.

(2) USACACDA, USAIS, USAARMS, USASIGS: Provide full time representation on study group.

(3) USAF: Provide representation on study group as required.

(4) Other TRADOC Schools: Provide representation as required.

(5) TSM HELLFIRE/TSM Attack Helicopter: Provide representation as required.

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SUBJECT: Combat Developments Study Plan: Close Support Study Group II (CSSG II)

(6) DARCOM Agencies (HEL, PM's, etc.): As required.

(7) Active and Reserve Component Units: Study Director may request an input and/or representation from FA and Maneuver units with FIST experience.

b. Resource Requirements:

(1) USAFAS: Manpower requirements are estimated as 7 personnel and approximately 300 mandays.

(2) Other Representatives:

Full-time: 30 mandays each
Part-time: 10 mandays each

c. Observers: USMC Liaison Officer USAFAS.

6. STUDY SCHEDULE:

a. Milestone schedule CSSG II. See inclosure 2.

b. Related Schedule-Battlefield Development Plan:

Phase I	Formulation	Oct-Nov 78
II	Force Development	Dec 78 - May 79
III	Gaming-Synthesis	Jun 79 - Sep 79
	Brief CSA	Oct 79

c. Point of Contact: Mr. Roy E. Penepacker, Materiel Development Team, phone 351-3669/2372.

d. Correlation: ACN to be determined.

EDWARD A. DINGES
Brigadier General, USA
Assistant Commandant

DEPARTMENT OF THE ARMY
UNITED STATES ARMY FIELD ARTILLERY SCHOOL
OFFICE OF THE COMMANDANT
FORT SILL, OKLAHOMA 73503

ATSF-CD-R

28 NOV 1978

General Donn A. Starry
Commander
USA Training and Doctrine Command
Fort Monroe, Virginia 23651

Dear General Starry:

In 1975, General DePuy commissioned the TRADOC Close Support Study Group (CSSG) to examine fire support and to recommend ways of improving and integrating fire support into the overall combined arms operation. As a result of this study, the Fire Support Team (FIST) concept was developed and ultimately approved by the VCSA in mid-June 1977 for Army-wide implementation.

The FIST concept has since been implemented in most Army divisions. After a somewhat slow start, the implementation of the FIST concept is gratifying. Units in the field report that FIST does indeed work and brings significant improvements in fire support operations.

The FIST organization that is in the field today was termed the quick-fix solution by the CSSG and was optimized to work with standard FM communications and conventional munitions. Since the concept was developed and approved, new equipment has been, or will be, fielded and additional tasks have been added to FIST; for example, digital communication, lasers designating targets for COPPERHEAD, close air support and HELLFIRE. The CSSG addressed the requirement for the long-range FIST but did not examine it in any detail. With these additional tasks, the number of personnel within the FIST may not be adequate and not properly organized since it was never envisioned that the quick-fix FIST would be the organization for the 1980-85 time frame.

I am convinced that the time has come to reconvene the CSSG and to address these operational and organizational problems. Specifically, the CSSG must address the overall requirements placed on the FIST and the laser designator issue within the FIST. The possible requirement

28 NOV 1978

ATSF-CD-R
General Donn A. Starry

for additional designator parties, either within or supplemental to the FIST, for the family of emerging precision guided munitions must be considered. The communications requirements and the critical digital interface with TACFIRE must be addressed as well as protection for the designators.

Unless you pose some objection, I am prepared to take the lead in this effort as part of my perceived charter as the suppression/counterfire "Czar" under the Battlefield Development Plan and convene an ad hoc study group dedicated to the question of indirect fire support in the maneuver company sector of the battle during the 1982-85 time frame. While we will do the majority of the work, I don't believe that we can or should address the question of indirect fire support in a vacuum. As a minimum, this ad hoc committee should consist of membership from Fort Benning, Fort Knox and Fort Sill. Additionally, there may be a need for the committee to visit each school and to also discuss selected issues with US Air Force representatives.

Sincerely,

JACK N. MERRITT
Major General, USA
Commandant

Copies furnished:
CDR USACAC
CDR USAARMC
CDR USAIC

HEADQUARTERS
UNITED STATES ARMY TRAINING AND DOCTRINE COMMAND
OFFICE OF THE COMMANDING GENERAL
FORT MONROE, VIRGINIA 23651

ATCG

15 December 1978

Dear Jack,

This responds to your 28 November letter concerning the need to reconvene the Close Support Study Group. I agree that we need to continue the work which brought the FIST team into being. There is some question as to whether this should be a new endeavor, or whether you should fold it into Division 86 as part of your responsibilities in that work. In any event the work you cite will be necessary as part of Division 86. So I'll leave it to you as to how best to proceed.

Sincerely,

DONN A. STARRY
General, United States Army
Commanding

Major General Jack N. Merritt
Commandant
U. S. Army Field Artillery School
Fort Sill, Oklahoma 73503

DEPARTMENT OF THE ARMY
UNITED STATES ARMY FIELD ARTILLERY SCHOOL
FORT SILL, OKLAHOMA 73503

ATSF-CA

9 Jan 1979

Dear General Starry,

This is in reply to your 15 December letter concerning the advisability of reconvening the Close Support Study Group at the same time that TRADOC is deeply immersed in Division 86. The two efforts are inseparable, but in my view, the Close Support Study must proceed because it will go beyond the heavy division of Division 86 and address fire support requirements within infantry, airborne, and air assault division.

My plan is for CSSG II to examine the fire support system with the primary goal of defining the roles, missions, and equipment requirements of fire support representatives at company, battalion, and brigade levels. There is a need to delineate what the Army expects from its fire support system. We must organize correctly with respect to automated fire control, digital communications, and the emerging family of laser devices. Toward that end, I feel that the Armor, Aviation, and Infantry Schools must be involved as we examine such issues as how attack helicopters, HELLFIRE, Air Force laser systems, and Copperhead can best be managed from a fire support standpoint.

Therefore, it is my intent to proceed with the Close Support Study, recognizing that the ad hoc study group will be tailor-made to provide significant input to Division 86. I will keep you informed of our progress.

Sincerely,

/s/ Jack N. Merritt
JACK N. MERRITT
Major General, USA
Commandant

General Donn A. Starry
Commander
U. S. Army Training and Doctrine Command
Fort Monroe, Virginia 23651

COPY

APPENDIX B

ESSENTIAL ELEMENTS OF ANALYSIS

B-1 Introduction. The Essential Elements of Analysis are noted in study directive sequence and are briefly summarized as developed within the phasing of the study.

B-2 Essential Elements of Analysis

a. What are the basic tasks of the FIST organization?

In the current conventional FIST (Phase I) fire support tasks are identified in Appendix G, Annex E and identify approximately 54 tasks necessary to accomplish the fire support mission. These tasks remained valid and were not changed during the Phase II & III & IV. New tasks were identified specifically during Phase III & IV for the employment of laser designators and the use of the FIST V.

b. What are the individual duties of FIST members?

Individual duties identified for enlisted fire support members are correctly stated in the 13F series of Soldiers Manuals. Duties of the FIST chief and fire support officer are stated in the USAFAS Officer Task Analysis for OPMS (Draft) 29 March 79. Individual and collective tasks for Phase III & IV discussion are described in Appendix G, Annex F, and Annex M.

c. What is the representative load of FIST tasks for a 24-hour period as typified by the SCORES 2A scenario?

The absence of detailed analytical data precluded a total answer. FIST mission profile extracted from the LEGAL MIX V target acquisition model was used as a basis for subjective analysis as to the representative workload required of the FIST. Detailed data is provided at Annex G, Appendix G.

d. What changes to the current FIST organization and equipment are necessary to accomplish required tasks?

Changes to the current FIST organization and equipment were identified during conduct of Phase I the study and are identified in Chapters 3 through 6 and in 8. The changes are summarized in Chapter 13, Discussion and Chapter 14, Recommendations.

e. Does proposed doctrine for employment of precision guided munitions (PGM) adequately reflect a combined arms approach with respect to the type, quantity and priority of targets to be engaged by these systems?

The study group examined the propoced doctrine to identify the various types of priority targets suitable for engagement by PGM that were identified by the maneuver commander. The latest proposed doctrine as found

in the COPPERHEAD O&O provides an adequate basis for the maneuver commander and his FSCOORD to determine selection of priority targets.

f. What are the preferred organizations for employment of new equipment systems?

The required changes in personnel and equipment for employment of new systems are identified in Phases II and III of chapters 3-6 and in 8. Equipment changes for Phase IV are identified at chapter 9. The required changes are summarized at Chapters 13, Discussion and Chapter 14, Recommendations.

g. What are the appropriate personnel/equipment trade-offs?

A summary of all personnel and equipment trade-offs is provided in Chapter 13. There are significant personnel/equipment trade-offs required expecially in the light (infantry) divisions.

h. What is the essential radio traffic that the FIST HQ must receive/ monitor from platoon FOs?

Detailed analysis is found in Chapter 5 of the study.

i. What is the essential radio traffic that the battalion/task force fire support element must receive/monitor from FIST's?

Analysis is provided in Chapters 3, 5 & 6 of the study.

j. What is the appropriate radio net structure for FISTs when TACFIRE, BCS, Vinson secure equipment and the mortar fire control calculator (MFCC) are fielded?

With the introduction of digital devices, the study group superimposed digital traffic on proposed nets. These nets were the FA FD net, the battalion heavy mortar net and the company fire control (CFC) net, which was a consolidation of the company mortar FD net and the CFC net. The need for a digital communication system to speed service was clearly identified. A discussion of a proposed digital system is found in Chapter 10, Division 86.

k. What are the radio nets and procedures for the conduct of CAS mission?

Detailed discussion of FAC-FIST interface for conduct of close air support mission if found in Chapter 11. Appropriate radio nets and procedures are also discussed in Tactical Air Command Pamphlet/TRADOC Training Text 6-20-7 dated 1 April 79.

1. What are the procedures for Army ground designation of targets for handoff to CAS, and Army helicopters laser acquisition systems?

The designation of targets for CAS is discussed in the previous EEA and also in TACP/TRADOC TT 6-20-7. The Army will not field a helicopter laser acquisition system in the near future. It is expected that when fielded the equipment characteristics will permit similar procedures as stated in TT 6-20-7 to be used.

m. What are the procedures for remote ground designation of HELLFIRE?

Remote ground designations procedures for voice communications are briefly addressed in the HELLFIRE Organizational & Operational Concepts (DRAFT) dated February 1979. Digital message formats and procedures are under development and will be tested during HELLFIRE OT II.

n. What are the observer procedures for COPPERHEAD designation?

Observer procedures for COPPERHEAD designation in the voice mode and the manual/FAOAC fire direction system are addressed in the COPPERHEAD Operational & Organizational Concepts, dated 19 Jan 79 w/changes and also in the COPPERHEAD draft FM 6-30 dated Dec 78 with changes. The study group did not identify any changes to these procedures. These procedures were tested in COPPERHEAD OT II. Procedures for COPPERHEAD in the digital mode and TACFIRE for the 1981-1986 time frame are currently being drafted by USAFAS.

o. What are the appropriate issues for test?

Issues for test are addressed in Appendix C, FDTE Issues.

p. What changes to TRADOC school resident and expert training are required?

This EEA was not addressed by the study group during CSSG II. Follow on action is required by TRADOC schools. An independent evaluation may provide sufficient information as to the weakness/strong point of current FIST/FSO training.

APPENDIX C

FORCE DEVELOPMENT TEST AND EXPERIMENTATION (FDTE) ISSUES

C-1 Detailed issues for Phase I FDTE Test are found at inclosure 1.

C-2 Draft issues for subsequent phases are found at inclosure 2. Results from additional tests and evaluations of digital & laser.

Inclosure 1 - Phase I
Issues

1.0 Issue. What is the optimum FIST configuration?

1.1 Scope. The scope includes an examination of the FIST's ability to accomplish all functions adequately during varying levels of combat activity for periods of 72 continuous hours. Two alternative FIST organizations are examined: (1) current FIST organization; (2) four-man FIST HQ and three one-man platoon FO teams. Each segment of the FIST will be examined in the alternative organizations to determine if it can accomplish individual tasks currently stated in FM 6-13F and officer task lists currently being staffed by the Directorate of Training Developments, USAFAS. The ability of the FIST to perform the collective tasks in ARTEP 6-365 will also be examined.

1.2 Criteria.

a. The FIST personnel shall be able to perform their assigned mission in a mounted and dismounted roles.

b. The FIST shall be able to perform its assigned mission in a buttoned up configuration while moving.

c. The FIST Headquarters shall be able to acqure targets, coordinate fires, integrate fires, plan fires, request fires, adjust fires, acquire and pass battlefield information, and maintain assigned equipment during sustained operations in intense combat operations.

1.3 Rationale. CSSG II has considered comments from field units that indicate the need for an additional man in the FIST headquarters. Comments also indicate that some units have satisfied this requirement by moving a man from a platoon FO team to the FIST HQ. Testing is required to provide quantifiable data on which TOE and doctrinal changes can be based. The test should demonstrate the ability of the FIST to perform its mission for extended periods of time in the alternative organizations described above.

1.4 Source. Close Support Study Group II (CSSG II) has examined the FIST configuration and has determined that it must be tested through an FDTE.

2.0 Issue. Does the current FIST radio net configuration allow the mechanized infantry FIST to perform its assigned mission?

2.1 Scope. The scope of the test includes an examination of FIST use of the radio net configurations as defined by TC 6-20-10 and CSSG II in conjunction with the platoon FO control options described in the TC. Testing will include an analysis of the need for the platoon FO teams and the FIST HQ element to operate in the various nets.

2.2 Criteria. The radio nets available to the FIST shall permit the FIST to operate effectively and perform its assigned mission in mounted and dismounted roles.

2.3 Rationale. Comments received from field units indicate that the current radio net configurations is unsatisfactory in that insufficient radio transmitters are authorized to operate in nets prescribed by TC 6-20-10. The CSSG II has also concluded that the number of radio nets required can be reduced to simplify FIST operations. Test data will be used to determine the tactical utility of the present net configuration.

2.4 Source. CSSG II.

3.0 Issue. Does combining the present CFC net and company mortar FD net allow the FIST to operate more efficiently?

3.1 Scope. The scope of the test includes an examination of the operational impact of combining the present CFC net and the company mortar FD net.

3.2 Criteria.

a. The combined radio net shall permit the FIST to perform fire support tasks with increased efficiency.

b. The combined radio net shall permit the FIST to perform its mission in mounted and dismounted roles.

3.3 Rationale. Comments received from field units in regard to FIST implementation have indicated the desirability of simplifying the FIST radio net configuration. CSSG II examined this issue and concluded that the desired results could be obtained by combining the CFC and company mortar FD nets. Data from this test will be used to validate these conclusions.

3.4 Source. CSSG II.

4.0 Issue. Does the current radio/intercom configuration allow the mechanized infantry FIST to perform its assigned mission?

4.1 Scope. The scope of the test includes an examination of the FIST use of the radios and intercom in conjunction with the platoon FO control options described in TC 6-20-10.

4.2 Criteria.

The current FIST radios and vehicle intercom system shall permit the FIST to operate effectively and perform its assigned mission in a mounted and dismounted role.

4.3 Rationale. The current radio configuration does not permit the FIST HQ element to operate simultaneously on the five radio nets described in TC 6-20-10 nor does the present vehicle intercom provide the requisite flexibility for crew members to transmit on any of the required nets. The test assesses the operational impact of the required nets. The test assesses the operational impact of these limitations.

4.4 Source. The FIST V ROC requires an improved intercom for closer/better inter-vehicular communications.

5.0 Issue. Does the substitution of a short range receiver transmitter in lieu of an auxiliary receiver in the FIST HQ allow the mechanized infantry FIST to operate more effectively?

5.1 Scope. The scope of the test includes an examination of the expected increase in operational effectiveness of the FIST with the revised radio configuration.

5.2 Criteria.

The proposed substitution of radios shall permit the FIST to operate more effectively and perform its mission in mounted and dismounted roles.

5.3 Rationale. Comments received from field units have indicated that the current radio configuration limits the operational effectiveness of the FIST. CSSG II has analyzed this issue and proposed the substitution of radios described above. The test measures the increased effectiveness of the revised radio configuration.

5.4 Source. CSSG II.

6.0 Issue. Does the provision of an AN/GRC-160 mount and external antenna on the platoon leader's vehicle allow the platoon FO to operate more effectively than with the current AN/PRC-77?

6.1 Scope. The scope of the test includes an examination of the expected increase in operational effectiveness of the platoon FO when the addition of a AN/GRC-160 mount and external antenna on the platoon leader's vehicle is available for his use.

6.2 Criteria. The proposed radio mount and antenna configuration on the platoon leader's vehicle shall permit the FO to operate more effectively and perform his assigned mission in mounted (hatches open/closed) and dismounted roles.

6.3 Rationale. The current AN/PRC-77 radio does not allow the FO to operate from the platoon leader's vehicle in a buttoned-up mode. When under attack (CBR, mortar/artillery) the antenna of the AN/PRC-77 must be withdrawn in order to close the hatches. When this occurs the FO's communications are limited to the platoon leader's vehicular mounted radios which are used on command nets; therefore, the FO's ability to enter FS nets for the purpose of executing planned fires is negated. The FO must have immediate access to FS systems designated for his use.

6.4 Source. CSSG II.

Inclosure 2 - Subsequent Phase

Issues

1. Does the substitution of the FIST DMD for the standard DMD in the FIST HQ allow the FIST to operate more efficiently?

2. Does the use of a FIST DMD or an improved VFMED in the battalion/squadron FSE permit the FSO to perform FS duties more efficiently?

3. Does the battalion/squadron FSO require a digital message device, such as a DMD, when operating as a member of the forward command group?

4. What is the optimal size of the FS organization for digital operations? Laser operations?

5. What is the impact of digital communications on FS duties performed by the company/troop FIST and battalion/squadron FSO?

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APPENDIX E

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APPENDIX F

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APPENDIX G
ANNEX A

CSSG VERSUS DA TOE IMPLEMENTATION

A-1. The tables below compare the CSSG QUICK FIX and LONG RANGE mechanized and armor organizations with the organizations approved for implementation in DA TOE. Infantry, air assault, and airborne organizations are similar to mechanized infantry organization except for the use of wheeled vehicles and dismounted radios.

MECHANIZED INFANTRY

CSSG QUICK FIX	CSSG LONG RANGE	APPROVED TOE/BOIP
FIST HEADQUARTERS		
(1) LT - FIST Chief	(1) LT - FIST Chief	(1) LT - FIST Chief
(1) SSG - SR FS SGT	(1) SFC - SR FS SGT	(1) SSG - SR FS SGT
(1) SGT - Asst FS SGT	(1) SSG - Asst FS SGT	(1) SP4 - FS Spec/Dvr
(1) SP4 - Per Carr Dvr/RTO	(1) SP4 - Per Carr Dvr	
	(1) PFC - RTO	
PLATOON FO PARTY (3)		
(1) SGT - FO	(1) SGT - FO	(1) SGT - Asst FS SGT/FO
(1) PFC - RTO	(1) SP4 - Asst FO	(1) PFC - RTO/Asst FO
	(1) PFC - RTO	
HQ EQUIPMENT		
(1) M113A1	(1) M113A1 w/FO kit	(1) M113A1
(1) AN/VRC-47	(1) GLLD	(1) AN/VRC-47
(2) AN/GRC-160	(1) PADS	(2) AN/GRC-160
(1) AN/GRA-39	(1) AN/VRC-47	(2) AN/GRA-39
(1) KY-38	(2) AN/GRC-160	(1) KY-38
	(1) KY-38	(1) GLLD
	(1) RC-292	(1) DMD
	(1) AN/GVS-5	
	(1) LWLD	
	(1) DMD	
	(1) AN/GRA-39	
	(1) AN/PRC-77	
FO EQUIPMENT (3)		
(1) AN/PRC-77	(2) AN/PRC-77	(1) AN/PRC-77
	(1) AN/GVS-5	(1) DMD
	(1) LWLD	(1) LTD
	(1) DMD	(1) AN/GVS-5

NOTES:

1. Enlisted grade structure changed to improve MOS pyramid.

2. M113A1 was approved for current FIST on 5 Apr 78.

3. CSSG Addendum 1 indicated that the 3-man FO party would probably be needed when new equipment was added and recommended field testing to determine the size party required.

4. Original CSSG recommended DMD at FIST HQ only. Platoon level DMD added by Addendum 2 .

ARMOR/ARMORED CAVALRY

CSSG QUICK FIX	CSSG LONG RANGE	APPROVED TOE/BOIP
PERSONNEL		
(1) LT - FIST Chief	(1) LT - FIST Chief	(1) LT - FIST Chief
(1) SSG - SR FS SGT	(1) SFC - SR FS SGT	(1) SSG - SR FS SGT
(1) SGT - Asst FS SGT	(1) SSG - Asst FS SGT	(1) SP4 - FS Spec
(1) SP4 - Per Carr Dvr	(1) SP4 - Per Carr Dvr	(2) PFC - RTO/Asst FO
(1) PFC - RTO	(1) PFC - RTO	
EQUIPMENT		
(1) M113A1	(1) M113A1 w/FO kit	(1) M113A1
(1) AN/VRC-46	(1) GLLD	(1) AN/VRC-47
(2) AN/GRC-160	(1) PADS	(2) AN/GRC-160
(1) KY-38	(1) AN/VRC-47	(1) KY-38
(1) AN/GRA-39	(2) AN/GRC-160	(1) AN/PRC-77
	(1) KY-38	(2) DMD
	(1) RC-292	(1) GLLD
	(1) AN/GVS-5	(1) LTD
	(1) LWLD	(1) AN/GVS-5
	(2) DMD	
	(1) AN/GRA-39	
	(1) AN/PRC-77	

NOTES:

1. Enlisted grade structure changed to improve MOS pyramid.

2. M113A1 approved 5 Apr 78.

3. Original CSSG recommended only one DMD for armor FIST. A second DMD (for a separate observer party) was added in Addendum 2.

APPENDIX G
ANNEX B

UASAFAS FIST RELATED TRAINING

B-1. USAFAS related training is listed in the following tables:

-- FA Officers Basic Course

-- FA Cannon Battery Officer Course

-- FA Cannon NCO Advanced Course

-- FA Fire Support Specialist Course

Subject	Officer's Basic Course Hours
Observed Fire Procedures	54.5
Instruction to Fire Support Planning	2.5
FA Missions and Organization for Combat	2.5
Fire Support Planning	5.9
Duties of the FIST Chief	2.5
Principles of Fire Support Coordination	4.2
Application of Fire Support Coordination	4.2
Offensive Operations	4.2
Defensive Operations	4.2
Total	84.7

Subject	Cannon Battery Officer's Course Hours
Observed Fire	11.7
Direct Support Arty Battalion Fire Planning	4.2
Fire Support Systems	8.4
Combined Arms Team in the Attack	5.9
Offensive Operations	5.9
Defensive Operations	4.2
FIST Emergency Control of CAS	8.4
FIST CPX	8.4
FO Emergency CAS Training Review	1.7
Total	58.8

Subject	FA NCO Advance Course Hours
Observed Fire Review	4.2
Fire Support Planning and Coordination	7.5
FA Fire Planning and Coordination of FA Positions	4.2
Tactical Missions and Organization for Combat	1.7
Fire Support Exercise	7.5
Fire Support for Offensive Operations	4.2
Direct Support Battalion CPX	8.4
Fire Support for Defensive Operations	4.2
FIST Emergency Control of CAS	8.4
Combined Arms Team in the Illuminated Night Defense	5.0
Combined Arms Team in the Attack	5.9
Offensive Operations	4.2
Defensive Operations	4.2
Employment of Armored/Air Cavalry	2.5
Dunn Kempf Battle Simulation	8.4
The Maneuver System	4.2
Fire Support Systems	8.4
Total	93.1

Subject	FA Fire Support Specialist Course Hours
Observed Fire Procedures	88.3
Map Reading/Target Acquisition	32.0
Organization and Mission of FA Units	3.3
Organization and Employment of FIST	2.5
Duties of Fire Support Specialist	3.3
Total	129.4

APPENDIX G
ANNEX C

TEST REPORTS AND FIELD COMMENTS

C-1. The following reports were considered by the study group in determining issues for analysis:

-- FIST Report, 3d Armored Division, 1976.

-- FIST After-Action Report, HQ 1st Bn, 5th Arty, 1st Inf Div Arty, 23 December 1977.

-- Trip Report, Exercise REFORGER 77, Tactics/Combined Arms Department, USAFAS, 25 October 1977.

-- TM 4-78, Human Engineers Laboratory Forward Observer Transportability Test (HELFOTT), March 1978.

C-2. Extracts of unit reports, listed above, are at inclosure 1.

C-3. The study group also considered post publication comments on Training Circular 6-20-10, FIST. These comments appear at inclosure 2.

C-4. Comments resulting from FIST workshop conducted by USAFAS, 29 Nov - 1 Dec 77, are at inclosure 3.

Inclosure 1 UNIT REPORTS (ARMOR - MECH)

1. The traditional company FO role suffered slightly at the expense of the FIST Chief's fire support coordination effort. . .FIST evaluators with the maneuver teams suggest a ten percent savings to the commanders by having FIST technicians present to provide detailed fire support planning and coordination. . .The most significant indicator was the degree of interaction between the field artillery observer and mortar observers. In those maneuver units which operated without a FIST, use of fires was disjointed. No mortar FO's called for field artillery fires and a unified fire plan, properly distributed throughout the company, was virtually non-existent. . .The only problem which surfaced was one of control and net discipline. As FIST mission load increased, FS nets tended to overload. The value of the company fire net concept came into sharp focus. The company fire net--or minimally a mortar fire direction net doubling as a company fire net--appeared to be the most practical solution to the overload of the company command net which occurs during peak stress. . .Although the observer organization proved very effective overall, the role of the lieutenant exhibited a pronounced shift to the fire support coordination tasks as opposed to the habitual tasks of the forward observer. The risk is the loss of the officer observer at the maneuver company. The company commander needs this FO to assist in fighting the company team battle. . .The multi-net system freed company command net of fire support traffic. . .Increased electromagnetic emission results in a greater electronic warfare risk. . .The density of radios in the FIST HQ and the resultant increase in transmission provided a very lucrative target for electronic countermeasures. . .The FIST HQ, during defensive operations, must be afforded, by means of a switchboard link, the capability to utilize an integrated radio-telephone communication system. . .The CSSG proposal called for the 4.2 mortar platoon leader to be an assistant FSO at battalion level. The tactical mission requires the platoon leader to reconnoiter new firing positions; and coordinate movement, emplacement, and firing of the 4.2 mortars. . .The (liaison) section works effectively without adding more people. . .It would appear that the CSSG label of Assistant FSO for the 4.2 mortar platoon leader is a formal recognition of the working relationship that has habitually existed between the 4.2 mortar platoon leader and the battalion FSO. . .The increased manning level which provides for a 2-man FO party does not appear to be a practical necessity. The mech maneuver unit commander for the FIST evaluation maintained that a platoon element consisting of a platoon leader, platoon sergeant, and platoon FO could handle the platoon FS requirement on a sustained basis. The other side of the coin is that the same line-up is required for the tank platoon. The evaluation showed that the platoon leader could not be the observer for the tank platoon and continue to effectively discharge his duties as platoon leader . . .the radio from the field artillery FO section is mounted in a maneuver unit vehicle. Such a configuration becomes a semi-permanent arrangement which causes a loss of control by the commander holding the AN/GRC-160 on a property book. The maneuver unit commander should receive an equipment adjustment to reflect the complete system--vehicle plus radios. The result would be a cleaner procedure for accountability and would facilitate the requisition of replacement and PLL items. Such an arrangement is not unprecedented in that the maneuver units holds the equipment for Air Force FAC's, who are united with their equipment during mission execution. . .Discussions with some of the battalion commanders surface a

risk which is provided along with the recommendation that the FIST concept be developed deliberately. The risk in proceeding too hastily with the FIST is that one can produce an over-optimized subsystem at the expense of a greater whole system. (3d Armd Div FIST Report)

2. Our FSO's, battalion, and brigade commanders appear to be comfortable with the explanation and understand what it is FSO's must do. The execution of FSO responsibilities is a far different matter. . .Provide indirect fire support for current operations--This task implies FSO's will remain in close proximity to commanders, who themselves should be located forward (battle CP's). . .The FSO location should be where he can influence the battle and provide immediate fire support. . .Lastly, the FSO must provide fire support planning for future operations. Much of this activity will be accomplished at the main battalion CP. (BG Burdeshaw, ADC, 1st Cav Div)

3. The training schedule incorporated two overnight observed fire exercises. . .There was no mortar participation as the support maneuver unit was undergoing its annual AGI. . .There must be live fire training with mortars in any future program of this type. There are many subtle differences between adjustment procedures, responsiveness, terminal effects, etc. . .The (M113) driver/RTO cannot function as both driver and RTO. This was especially true during offensive operations when the M113 was always on the move. The driver is totally committed to driving his APC and cannot be expected to be utilized as an RTO. . .A crew of <u>four</u> in the FIST headquarters was not sufficient. . .The driver is not available as an RTO and needs to be replaced with another RTO. Also, if the FIST Chief is not present in the vehicle (for example when he is with the company commander in his vehicle) the FIST headquarters has insufficient personnel to operate efficiently. . .The track commander (FIST NCOIC) was often too busy to be effective as an RTO when the vehicle was moving. . .The platoon FO's had a difficult time operating without an assistant. In the platoons where there was an assistant, there was a marked difference in the team's ability to produce effective target lists, handle simultaneous missions, etc. However, this extra person did create a space problem in some of the platoon leader's tracks due to overcrowding. . . The FIST Chief must have a working knowledge of the maneuver unit's direct fire support capability, i.e., TOW, Dragon, etc. . .The radio configuration, as designed in TC 6-20-10, was not adequate. . .Nets were found to be proper nets for best support. However, it was found that the auxiliary receiver was not a satisfactory substitute for a complete radio . . .Switching becomes almost impossible while in fast moving situations and while moving. To alleviate this problem at Fort Irwin, the 4.2 inch mortar FDC was placed on the artillery FD net. . .This eliminated the radio switching, but added congestion and confusion on the artillery FD net. . .Frequency overlap was another communications problem. . .When the platoon was under CBR attack and was required to button-up, the antenna of the AN/PRC-77 had to be withdrawn in order to close the hatches. When this occurred, all communication was lost. . .Recommend some sort of external radio antenna be mounted on the platoon leader's vehicle for use by the FO so that communications may be continuous during buttoned-up operations. . .A re-trans capability is available at the supported battalion fire support section (AN/VRC-49 mounted in M-577). However, the CEOI did not have any provision for each of the FSO's to have a retrans frequency. . . The FSO is currently required to monitor the artillery

FD net and the artillery fire coordination net (CMD 2). Experience at Fort Irwin showed that he should also be monitoring the 4.2 mortar net; this could be accomplished by the adition of an auxiliary receiver, such as the R-442. . . The infantry platoon leaders were skeptical of the "all the eggs in one basket" situation which exists within the M113 FIST headquarters. (FIST After-Action Report, 1-5 FA, 1st Inf Div)

4. The signature effect caused by four antennas jutting up from an APC is significant. The vehicle is easily identified as an FO vehicle. An APC used with a tank pure team has the same problem. . .When the vehicle is combat loaded, the rear hatch cannot be used as an observer position while moving. It was found that all the equipment used a tremendous amount of space. If the equipment was stored to the rear of the TC hatch, leaving the inside of the vehicle free for work, it greatly enhanced the effectiveness of the operation. . .The FIST team should retain one jeep. This could come from the one that the 4.2 FO was authorized or the current artillery FO vehicle. Either way the jeep is almost a necessity in a European environment, where forces can be expected to move rapidly over large distances. . .The FO couldn't pull his track out to go over and see the company commander. . . Because of radio traffic, jamming, and interference, it was impracticable to do it over a radio net. . .AN/PRC-77 was not adequate to maintain communications with the battalion FSO and battery FDC. . .The feasibility of obtaining nets 15 MHZ apart for a corps area are slim to none. The battalion couldn't even obtain a retrans freq for the FSO's who were supposed to have one. . .Override was a serious problem. Even the radios in the FIST vehicle interfered with each other. This problem was reduced by removing the radios (AN/PRC-77's) from the track, placing them about 100 meters away, and remoting them back. This caused other problems when nets had to be switched. . .The power drain caused by the operation of the radios and secure is a definite factor for FIST operations. (REFORGER 77 After-Action Report, 1-7 FA, 1st Inf Div)

5. Problems encountered during REFORGER 77 suggest that fire support personnel and their equipment should deploy (overseas) with their supported maneuver unit rather than with their parent FA unit. . .There was no 81mm play at all (one company commander consequently used his 81mm section as riflemen). . .CEOI's made no provision for FIST. There were no call sign suffixes for platoon FO's, and there was no company fire control frequency. There was only one frequency for the entire weapons platoon of the mechanized company: there was no 81mm fire direction frequency. . .FIST tracks experienced problems from incompatible frequencies on adjacent radios. . .FIST must draw some frequencies from one CEOI item (the FA battalion's) and some from the CEOI item for the supported unit. For example, the artillery fire direction net from the DS Bn CEOI item could be only .05 MHz from the supported company command frequency. The result would be no communications in the FIST track if frequencies so close together are placed on adjacent radios. . .Occasions when FIST chiefs could talk directly to a battery FDC were extremely rare. The FSE at maneuver battalion becomes a full-time relay station. Since FSO tracks contain a AN/VRC-49, retransmission could be done automatically if a retrans frequency were provided (one was not). Doctrinally, (TC 6-10-1) an FSO is supposed to operate in two nets. If he uses his auto-retrans capability, he can only operate in one. While platoon FO's did not have their own radios, it is safe to guess that their AN/PRC-77's

will achieve much less range than FIST chiefs' RT-524's. Since FIST chiefs proved unable to contact battery FDC's directly, the question is whether platoon FO's can even relay through the FSO. . .Habitual garrison relationships posed problems in the field. FSO secure radios were on the division artillery (COMSEC) account, and had to be evacuated through artillery channels. Repair would have been much more rapid had secure equipment been on the supported brigade account. Likewise, CEOI material for FSO/ FIST needs to be on supported unit accounts. At one point, FSO's and FIST's with two battalions were without current CEOI's for two whole days. . .One battalion reported great success using the mortar platoon leader as a member of the FSE during CPX's, but found the system did not work during actual FTX's. . . If the battalion FSO is to coordinate all fires for the battalion, he must operate in the heavy mortar FD net, which he cannot do with currently authorized radios. One battalion put the heavy mortar FDC on the FA FD net. Apparently this worked on REFORGER, but throughout the FTX there was seldom more than one battery operating on any given FD net. When FSO's are issued 1/4-ton trucks with AN/VRC-47 radios, there will be a capability to remote the mortar FD net. The optimum solution would appear to be to authorize battalion FSO's an auxiliary receiver to be mounted in the FSO track. . .Considering only field operations and not peacetime training requirements, it would appear that FSE's and FIST's should be assigned to maneuver units. Many problems during REFORGER would not have occurred except that FSO's depended on the DS battalion for support (which it could not provide). Even simple items, like mail and pay for soldiers, proved extremely difficult. Since FSE's and FIST's will be assigned to DS battalions, it is clear that detailed SOP's will be required to support field operations, and especially overseas deployments. (REFORGER 77 After-Action Report by T/CAD, USAFAS observer)

6. FIST chiefs should be included in the company orders group which goes to battalion headquarters to receive the operations order. . .The control of attack helicopters needs to be examined. Doctrinally they are a maneuver force; however the FIST chief may be in a better position to employ them and integrate their fires. . .The FIST chief must be within talking distance of the company commander. . .Discussion on the proposed FIST vehicle, a modified M113, was not favorable --too many antennas and too much confusion due to the number of radio nets. . . (4th Inf Div Tactical Seminar I, 1-29 FA)

7. The most important controversy that arose over employment of FIST was the location of the FIST chief. Most maneuver company commanders still want their FIST chief to ride in the vehicle with them. This was especially true of the experienced company commander. . .One FIST chief rode on the outside of a tank with an AN/PRC-77 radio. . .Other FIST chiefs stayed in their FIST HQ and maintained communications with the company commander by radio. This was satisfactory but a compromise seemed to work best. The FIST chief placed an RTO with an AN/PRC-77 in the vehicle with the company commander. This, however, necessitates another radio and further ties up communications on the FD net. . .The FIST chief was normally given the mission to employ the attack helicopters. . .On CALFEX the helicopters were controlled by the FIST chief on the maneuver company command net. This tied up the net when the helicopters were working. . .FIST chiefs need to coordinate the use of attack helicopters. The control of the attack helicopters

may be by the scouts but their fires need to be coordinated with the other fire support means. (After-Action Report, 2d Bde, 4th Inf Div Combined Arms Live Fire Exercise, CALFEX, 1-29 FA)

8. During the defensive phase, the major problems were camouflage, security, selection of positions for vehicles and dismounted personnel, control and distribution of fires, and resupply procedures. . .Both 4.2 and the 81mm mortar proficiency demonstrated the need for increased live fire training. . . The FIST operations proceeded smoothly when the FIST chief operated from his own vehicle with an RTO and a back pack radio in the team commander's vehicle. This released both the FIST chief and the commander to concentrate on their fire support and command requirements respectively. . .The FIST chief should train and be used as the complete fire support coordinator at team level, to include the control and use of close air support, helicopter gunships, artillery and mortars. . .Current regulations dictate that the ALO controls close air assets. Also the gunships have, in practice, been controlled through the team commander (via the scouts). The FIST teams are trained to handle all fire support. They should do so in practice. They should coordinate with the ALO for air clearance, but they should direct the aircraft. They should also be the element in contact with the scouts, in order to direct the gunships. This brings all assets under the control of the team commander when necessary. . .The FIST should be given VHF and UHF in a personnel carrier to enhance their communications capability with aircraft. (Ltr, 2d Bde, 4th Inf Div, subject: Bulldog Shootout I After-Action Report, 9 Nov 78)

9. FORSCOM concurs in principle with the FIST vehicle concept but is concerned over divergent roles/missions for the FIST chief. . .The FIST chief should stay close to the maneuver commander to facilitate the management of available fire support. The G/VLLD, on the other hand, should be in an "overwatch" position that best supports the operation. Thus, the FIST chief will often need to be mobile or in a location well away from the G/VLLD. (Message, Cdr FORSCOM, 081845Z Jan 79)

Inclosure 2 TC 6-20-10, FIST, Post-Publication Comments

1. Armd Cav Troop needs mech type FIST--FO's ride with plt ldr or inf sqd. Given cav plt frontages, 3 tanks/M551 and one 4.2 tube not enough to change fire power balance. (LTC, AR, CDR, 1-4 CAV)

2. What is FA School's concept concerning use of the nine 107mm mortars organic to the Armd Cav Sqdn? (CPT, FA, FSO, 3-8 Cav, 8th ID)

3. Mech plt FO AN/PRC-77 not capable of transmitting at range and terrain environment needed. Capability of transmitting (carrying) a great deal of equip in a mech unit is limited.

4. As a heavy mortar platoon leader I am concerned with the disposition of my FO's. (SSG, CSC, 1-36 Inf, 3d AD)

5. Us in the infantry don't have too many TC's or FM's explaining much about FIST. We need another one with training techniques, tactics for FIST. (1LT, 4.2 Plt Ldr and Mech Team FIST Chief, 2-87 Inf)

6. I am bothered by the vast discrepancies between this TC and reality. . . Get out of your ivory TRADOC tower and come talk. Let's try to solve these very real problems. (LTC, IN, CDR, 1-12 Inf, 4th ID)

7. The commanders appear to be afraid of losing their teams to the FA units. I feel that some manual needs to be distributed to infantry commanders. (SGT, FIST Chief, 2-48 Inf, 3d AD)

8. Inf bn mortar plt and co mortar plt have to depend upon the DS FA Bn tng schedule to program their firing. In the 9th Div, we never saw our FO in training--only for ARTEP's and off-post deployment. Assign the FIST to the maneuver unit, then attach them to the DS for tng. (CPT)

9. Recommend dialogue with the Infantry School to prepare for when mortars are consolidated into 2 platoons of 4-81mm mortar tubes each for a mech inf bn. . .I need face-to-face dialogue with my FIST chief. My command net is too crowded for me to explain my scheme of maneuver on it, not to mention security. Therefore, recommend extra radios in my vehicle for FIST chief and NCO to use. We are asking for trouble when we have the FO on the ground with a AN/PRC-77 changing frequencies. (CPT, IN, CDR, C/1-7 Inf)

10. Who decides what the FIST Chief does? Does the Company cdr determine the FSCOORD duties versus the FO duties of the FIST Chief? Amplification to explain the monitoring of mortar nets is needed as it is not clearly defined. . .An explanation on how the FIST Chief keeps abreast of the 81-mm mortars is needed. . .ADD: OPTION 4. The FO can initiate calls directly on any assigned net--either mortar or FA (if within the range of organic radio communications). The FIST would have a monitor/override capability to transfer calls for fire from one supporting unit to another. . .The FIST HQ would have a fire control role such as the FSE at battalion level. . .The FIST use the Co mort FD net on which to communicate with all FIST elements and not tie up the existing command and control net. . .The weapons/heavy

mortar plt ldr can be used as a back-up link to support radio communications in keeping the FDC's updated. . .In the active defense, the FIST and the company commander are usually collocated. . .The team commander should specifically tell the FIST Chief where he wants obscuration and screening smokes planned and he should inquire as to how much smoke by type is available to support the attack. If he (FIST) has priority of fires from 107mm, why wasn't it used to fire the screen? . . .To insure the target can be fired when required, all three elements (81mm, 107mm, and artillery) should plan to fire the target. . .TRP's are used for the control of direct fire. . .The company commander would not use planned artillery targets to delineate sectors of fire. . .TC 6-20-10 does not adequately address the integration of mortars and artillery into the FIST concept. . .the weapons platoon leader (81mm) is never addressed in the TC. Does this mean that he no longer advises the team commander on how to employ the direct fire system of the company? . . .If FIST is to work, it must adequately incorporate the infantry's role into indirect fire support literature. . .The TC makes reference to the bn mortar platoon leader as the bn assistant FSCOORD. It should be clearly understood that this is not his primary mission and cannot detract from his duties as platoon leader. (USAIS, ATSM-I-V-TDMD, 19 May 78)

11. The duties and responsibilities of the battalion FSO and company FIST, as outlined in FM 6-20 and TC 6-20-10, meet the infantry needs. (USAIS Statement of Need, 19 Jan 79)

12. . . .I could find no information on the actual conduct of an operation. The FM's and TC's are full of information concerning fire planning, fire coordination, and fire support capabilities, but did not let an FO know how to go about attaching himself, when to plan fires, and how he was going to get needed tactical information . . .our problems on who does what, when. (1LT, FA, C/2-321 FA)

Inclosure 3 FIST WORKSHOP 29 Nov - 1 Dec 77

1. Many units lack adequate personnel to implement FIST, particularly lieutenants and NCO's.

2. Lack of knowledge at unit level to train FIST.

3. Air assault (101st) and 3d ACR felt FIST inadequate to provide sufficient fire support.

4. Ranger battalions say TOE (identical to airborne) too much for Ranger mission, type operations.

5. "Light Infantry" (82d Abn, 7th ID, 25th ID) stated need for retrans capability because AN/PRC-77's limited in range.

6. "Light Infantry" raised issue of vehicle-mounted radio versus backpack radio.

7. Concern of experience level of green 2LT to do the job.

APPENDIX G
ANNEX D

Inclosure 1 USAARMS Statement of Need

1. US Army tank companies and battalions and armored cavalry troops and squadrons require full-time FS representatives who can assist tank and armored cavalry unit commanders in FS training of subordinates and in management of FS during combat operations. This fire support includes the mortars organic to armor and armored cavalry units; howitzer batteries organic to regimental armored cavalry squadrons; attached and supporting FA; naval gunfire when available; and close air support (CAS). The FS representatives, whether organic to the armor/ armored cavalry units or furnished by a supporting FA battalion or other type FS agency (such as the naval gunfire shore fire control party and the air force tactical air control party) must be proficient in planning, coordinating, calling for, and adjusting fire support. The FSCOORD--company/ troop FIST chief and battalion/ squadron FSO--is the commander's principal advisor on FS and must be skilled in employment of all FS assets, to include support from other services and allied nations. The FSCOORD must be thoroughly knowledgeable in infantry, armor, armored and air cavalry, and attack helicopter tactics and must be proficient in the operation of sophisticated equipment required for acquisition of targets, laser range finding and target designation, and communications between elements of the fire support system. When FSCOORD's are furnished by FA units, the armor requires that the same team be furnished to the same maneuver unit for every exercise and operation. Specific armor and armored cavalry requirements of the FS representatives are listed below.

2. Armor Companies and Battalions.

a. Battalion scout platoon: Officers and enlisted members (MOS 19D, formerly 11D) are trained to call for and adjust fire support. There is no requirement for an additional FO. The armor school does not require that scout platoons and scout squads be equipped with a digital message device (DMD), but a laser device capable of designating moving targets out to 5-7 kilometers is required. This equipment requirement applies to the scout platoons of all armor and infantry battalions. In cases when an additional forward observer is required to augment the scout platoon, it is the battalion commander's prerogative to task organize FS personnel available in the battalion FSE and the company FIST's to fulfill mission requirements.

b. Role of the battalion heavy mortar platoon leader: The Armor School does not concur with the doctrine in TC 6-20-10 which states that the mortar platoon leader is the assistant FSO. The heavy mortar platoon leader's primary duty is commanding his platoon. He serves as the principal mortar representative to the FSO, and assists the FSO in the conduct of mortar fire planning. The mortar platoon receives its missions from the battalion command group, of which the FSO is a part. The FSO advises the commander on the tactical employment of the mortar platoon, but has no decision-making authority.

c. Battalion heavy mortar platoon and TACFIRE: The Armor School desires that 107mm mortars be incorporated into TACFIRE communications links to facilitate rapid tactical fire control (FC) decisions at battalion level and to permit massing and employment of mortars assigned to maneuver battalions committed, but not engaged.

d. FSO command link in TACFIRE: The Armor School requires that the battalion FSO have the same active command influence capability under TACFIRE as he has with voice communications. This requires that the FSO have a digital link which will permit him to input command approval, disapproval, or modification of requests for 107mm mortar and FA fires originating at company level.

e. FSO vehicle: The FSO must have an armored vehicle equal in mobility to those of the tank battalion. The ¼-ton vehicle currently authorized for the armor battalion FO cannot be permitted in the area of the battalion tactical command post, which consists solely of tracked vehicles.

f. Mortar technical fire control: The mortar fire control calculator (MFCC) will provide automated solution of the technical gunnery problem for the battalion heavy mortars. Manual back-up procedures are required for the FDC.

g. Close air support: Procedures for requesting and controlling (CAS) at company and battalion level will be as prescribed in draft Training Text 6-20-7, FAC/FIST Operations (Tactical Air Command Pamphlet 50-21).

h. Composition of armor company FIST: Platoon FO's are not required. The platoon leader and/or platoon sergeant will request FS from the FIST at company level, using their AN/VRC-12 radio. The armor company command net may not be used for this purpose. The FIST will either assume control of the mission or will tell the platoon leader/platoon sergeant how to net with the appropriate FDC for adjustment of fire. The composition of the FIST headquarters will be as determined by USAFAS. There is no requirement for an additional observer party within the FIST headquarters.

i. FIST vehicle: The vehicle used by the armor company FIST must have mobility equal to the main battle tank with armor protection which will allow it to maneuver with tanks and survive on the modern battlefield. A tank is not acceptable because its use by the FIST would result in misutilization of the tank's primary firepower. An M-113 is not acceptable because it lacks sufficient armor protection and mobility. The infantry/cavalry fighting vehicle (IFV/CFV) meets the mobility and survivability requirements; and in most situations the IFV/CFV will be found intermingled with main battle tanks, thus reducing the distinct physical signature of the FIST vehicle.

j. Digital message device: The FIST requires a DMD. It is desired that fire requests from the platoon be sent by voice to the FIST (DMD) for coordination, then routed to the appropriate FDC. A digital device is required at battalion level that permits the FSO command decision capability on all digital fire requests.

k. Laser devices: No laser designators are required at platoon level. The laser rangefinder on the main battle tank is available for target location by the platoon leader/platoon sergeant. At company level, a laser designator capable of engaging moving targets at 5-7 kilometers is required either in the

FIST or available to it. Laser devices are not required at the battalion level; the designator in the scout platoon meets the battalion commander's requirements.

l. Communication nets: The FIST requires radio equipment that provides continuous contact with the company commander and platoon leaders (company command net), and the battalion FSO and heavy mortar and FA FDC's (mortar and FA FD nets). Requests for fire from platoon level and conduct of CAS strikes are not permitted on the company command net. A net is required to facilitate control of platoon FO's with cross-attached mech platoons. The battalion FSO must operate in the battalion heavy mortar and FA FD nets and the direct support artillery battalion command and fire net and must have access to the armor battalion command net and the air force tactical air request net.

3. Divisional Armored Cavalry Troops and Squadrons.

a. Air Cavalry Troop: The air cavalry troop requires FS coordination representation as expressed in the attack helicopter/air cavalry statement of need.

b. Tactical fire control of troop mortars: Each cavalry troop is authorized a 107mm mortar section consisting of three mortar tubes. When individual mortar squads are attached to (or employed in direct support of) armored cavalry platoons, the mortars operate on the platoon command net and coordination by the FIST is not required. When the mortar section is employed in support of the troop, active coordination by the FIST is required. In either case, active coordination and a command link are not required by the squadron FSO.

c. Technical fire control of mortars: When mortars are attached to/in direct support of a platoon, requests for fire are on the platoon command net (voice). A MFCC is desired, but not required, for individual mortar squads using voice communications. A MFCC is required for the mortar section FDC when the section is placed in support of the troop, with requests for fire transmitted on the company command net (voice) or a separate digital net. In all cases, a manual backup is required for FD computations.

d. Composition of armored cavalry troop FIST: Platoon level FO's are desired but not required, as armored cavalry platoon members are trained to call for and adjust fire. The platoon leader/scout squad leader (or FO when provided) will send requests for fire to the troop FIST or direct to the 107mm squad if attached or in direct support of the platoon. The troop FIST net may be used to request FS other than from the organic mortar platoon. Composition of the FIST headquarters will be as determined by the USAFAS. There is no requirement for a separate FO party within the FIST headquarters.

e. FIST vehicle: The vehicle used by the armored cavalry troop FIST must have mobility equal to the main battle tank and armor protection which will allow it to maneuver with the troop and survive on the modern battlefield.

Tanks are not acceptable. The M-113 is acceptable as an interim vehicle for the FIST. When armored cavalry M-113's are replaced by the CFV, the M-113 will no longer be acceptable as a FIST vehicle.

f. Digital message device: The FIST requires a DMD that permits active coordination of requests for fire from the mortar platoon in general support and from supporting FA. The squadron FSO requires a device that will permit interface with the TACFIRE of supporting FA and an active command decision capability for all requests originating at troop level.

g. Laser devices: A laser designator with moving target designation capability at 5-7 kilometers is required at platoon level (platoon leader/scout section leader or FO) and at troop level (in the FIST or available to it). Laser designator capability is not required at squadron level.

h. Communications nets: The FIST requires radio equipment that provides continuous contact with the troop commander and platoon leaders, platoon FO's if provided, the troop mortar platoon when employed in general support of the troop, the squadron FSO, and supporting FA FDC's. Requests for FA support and conduct of CAS strikes are not permitted on the troop command net. If a separate troop fire control net is established, requests for fire from the troop mortar platoon in general support will be moved from the troop command net to the troop fire control net. The squadron FSO must have continuous communications with troop FIST's and with the next higher FSE and with the supporting FA unit, and must have access to the squadron command net and the air force tactical air request net. Due to the frontages typically assigned to armored cavalry squadrons and troops, communication range requirements exceed those of armor and infantry battalions.

i. Field artillery support: Providing adequate FA support to the armored cavalry squadron is the responsibility of the next higher commander. The FSCOORD recommends FA organization for combat to the next higher commander (DS FA battalion commander when the squadron is OPCON to a brigade; division artillery commander when the squadron is under division control).

j. Close air support: Procedures for requesting and controlling CAS at troop and squadron levels will be specified in draft Training Text 6-20-7, FAC/FIST Operations.

k. FSO vehicle: Vehicle requirements for the squadron FSO are identical to those for the armor battalion FSO.

4. Armored Cavalry Regiment Troops and Squadrons: Fire support requirements for the ACR are identical to those for the divisional armored cavalry squadrons, with the following additions:

a. Squadron howitzer battery: The howitzer battery requires a battery computer system (BCS) for technical fire control to receive digital requests from FIST DMD's. The squadron FSO requires a digital device that will permit him to monitor requests on the howitzer battery FD net and to exercise active control in approving, disapproving, and modifying requests for FA

fires. Howitzer batteries are the squadron commander's organic FS and, under normal deployment (long distances), there is no requirement for a capability to mass the fires of the regiment's howitzer batteries nor for the regimental FSO to monitor their activities.

b. Field artillery augmentation: When corps FA units are attached to the ACR, the regimental commander will determine FA organization for combat based upon recommendation from his organic regimental FSO. The BCS of the organic howitzer batteries must be tied in to the attached FA battalion's TACFIRE computer, and the squadron and regimental FSO's must be provided command links with TACFIRE to permit active control and coordination of FA support within the regiment. The squadron and regimental FSO's require active command links with the channels for requesting additional fires from main battle area FA units that are augmenting the fires of the covering force FA.

c. Communications nets: The regimental FSO requires continuous communications links with squadron FSO's, attached FA headquarters, and the next higher FSE (usually corps).

5. Communications security: The requirement for security in communications nets prescribed in this statement of need is identical to the security requirement for parallel maneuver channels.

Inclosure 2 USAIS Statement of Need

1. US Army infantry battalion and companies are in need of FS representatives capable of maximizing all available FS resources. This fire support includes mortars, field artillery, naval gunfire, and close air support. The fire support representatives, the Fire Support Officer (FSO) at battalion level and the FIST chief at company level, must be skilled in planning, coordinating, calling for and adjusting the above FS systems as well as being knowledgeable of infantry and armor tactics and proficient in the employment of the sophisticated equipment needed for target acquisition, target designation, and communication. The duties and responsibilities of the battalion FSO and company FIST as outlined in FM 6-20 and TC 6-20-10 meet the infantry needs. The duties and responsibilities do not change with the type infantry unit.

2. Specific infantry requirements of the FS representatives:

a. The heavy mortar platoon leader's primary duty is commanding his platoon. The heavy mortar platoon leader will assist the FSO in the conduct of mortar fire planning and fire control for battalion mortar. Under emergency situations, he may become the FSO for short periods.

b. Battalion FSO:

(1) Provides the target list including numbers from the DIV ARTY fire plans and gives copies to the FIST and FDC's.

(2) If mortars are firing part of a series or program of targets, based on the maneuver commander's guidance, the FSO identifies which mortar platoon fires, and coordinates them through the FDC's.

(3) FSO must know the location, status of registration, status of ammunition of the heavy mortar platoon and shift firing priorities and source when required.

(4) Controls shut off of mortar and FA if required for aircraft.

(5) Coordinates the availability of FA survey and meteorological data for the infantry mortars.

c. Company FIST:

(1) Provide target list and target overlay to the company commander, rifle platoon leaders, weapon platoon leader/FDC, and FSO.

(2) Record and list all target reference points (TRP) for the company.

(3) Mechanized infantry FIST must have a dismounted capability.

(4) The FIST must control CAS in the absence of the FAC.

(5) Equipment Requirements:

(a) FO teams will be equipped with laser designators to guide precision munitions.

(b) FO teams will be equipped with hand held laser range-finders to aid in target location.

d. The battalion FS representatives will be required to train key maneuver personnel in fire planning and calling for fire.

APPENDIX G
ANNEX E

FIRE SUPPORT TASK LIST

The following is a task list inventory prepared for the Close Support Study Group. Tasks identified were used by the study group to analyze responsibilities and functions and were a lead-in to other issues developed by the study group.

1. Acquire a target through visual observation.
2. Identify likely target locations through map inspection.
3. Acquire a target from intelligence sources external to the unit.
4. Acquire a target from the maneuver element commander/S3/S2.
5. Acquire a target from higher FSE/individual.
6. Acquire a target from a subordinate element/individual.
7. Process information into target information.
8. Pass a target to a higher FSE/individual.
9. Pass a target to a lower FSE/individual.
10. Pass a target to an adjacent FSE/individual.
11. Determine results desired on a target.
12. Determine the FS means which will accomplish the desired results.
13. Recommend positioning of organic fire support units.
14. Control positioning of organic FS units.
15. Coordinate FS with adjacent units.
16. Insure safety of supported element from effects of FS fires.
17. Recommend allocation of FS assets.
18. Preclude unnecessary duplication of FS.
19. Prevent indirect fire interference with air assets.
20. Advise the commander on capabilities and limitations of FS.
21. Advise the commander of availability of FS.
22. Advise on the use of FS for an operation.

23. Recommend which FS asset will be used to attack a target.

24. Obtain FS guidance from the maneuver commander.

25. Provide guidance to subordinate FS personnel.

26. Recommend measures for controlling FS.

27. Recommend type and quantity of ammunition to be fired.

28. Maintain record of ammunition status for organic FS units.

29. Maintain record of general status of FS units.

30. Manage firing of organic FS assets in accordance with the maneuver commander's guidance.

31. Approve request for firing of non-organic FS asset.

32. Prepare a target list.

33. Prepare a target overlay.

34. Schedule fires of organic FS units.

35. Submit a request for company mortar fires for the FDC.

36. Submit a request for 81mm fires to the FIST headquarters.

37. Submit a request for battalion mortar fires to the FDC.

38. Submit a request for battalion mortar fires to the battalion FSE.

39. Submit a request for FA fires to the FDC.

40. Submit a request for FA fires to the next higher FSE/individual.

41. Submit a request for CAS to the next higher FSE.

42. Adjust indirect fire.

43. Visually identify a target for attack aircraft.

44. Use indirect fires to identify a target for attack aircraft.

45. Designate an attack aircraft target with a laser designator.

46. Direct CAS in the absence of a FAC.

47. Advise the commander on capability of enemy FS.

48. Acquire battlefield information through observation.

49. Pass battlefield information to the next higher FSE/individual.

50. Pass battlefield information to the supporting FA.

51. Pass battlefield information to the next lower FSE/individual.

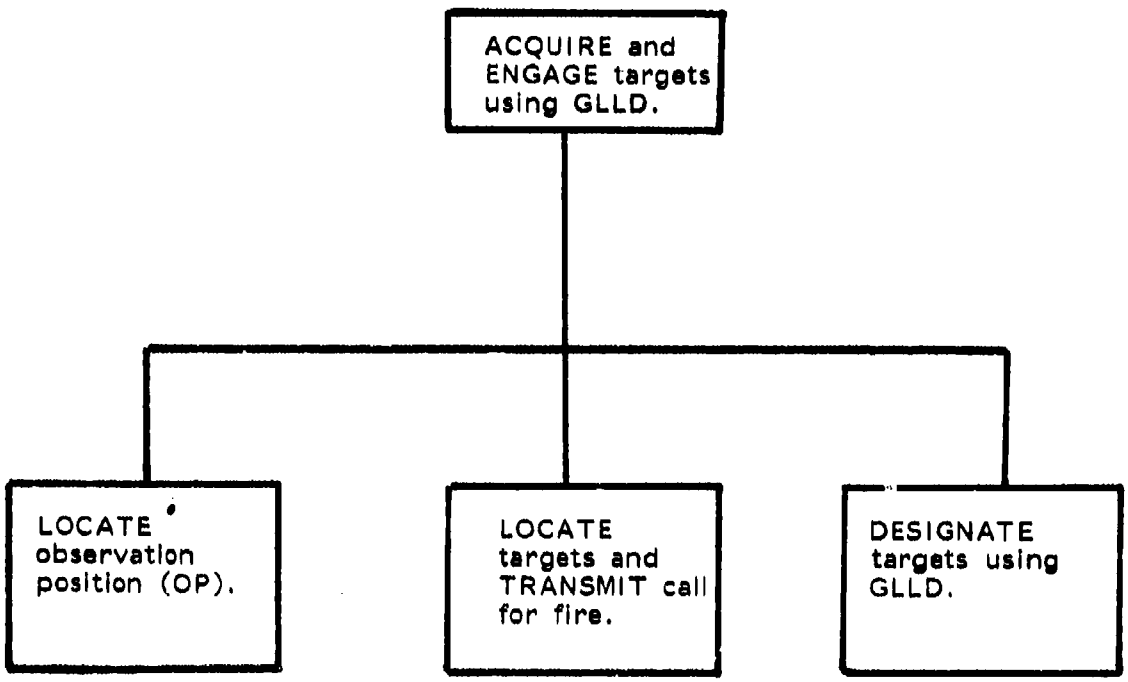
52. Pass battlefield information to the unit mortar FDC.

53. Pass battlefield information to the unit commander/S2/S3.

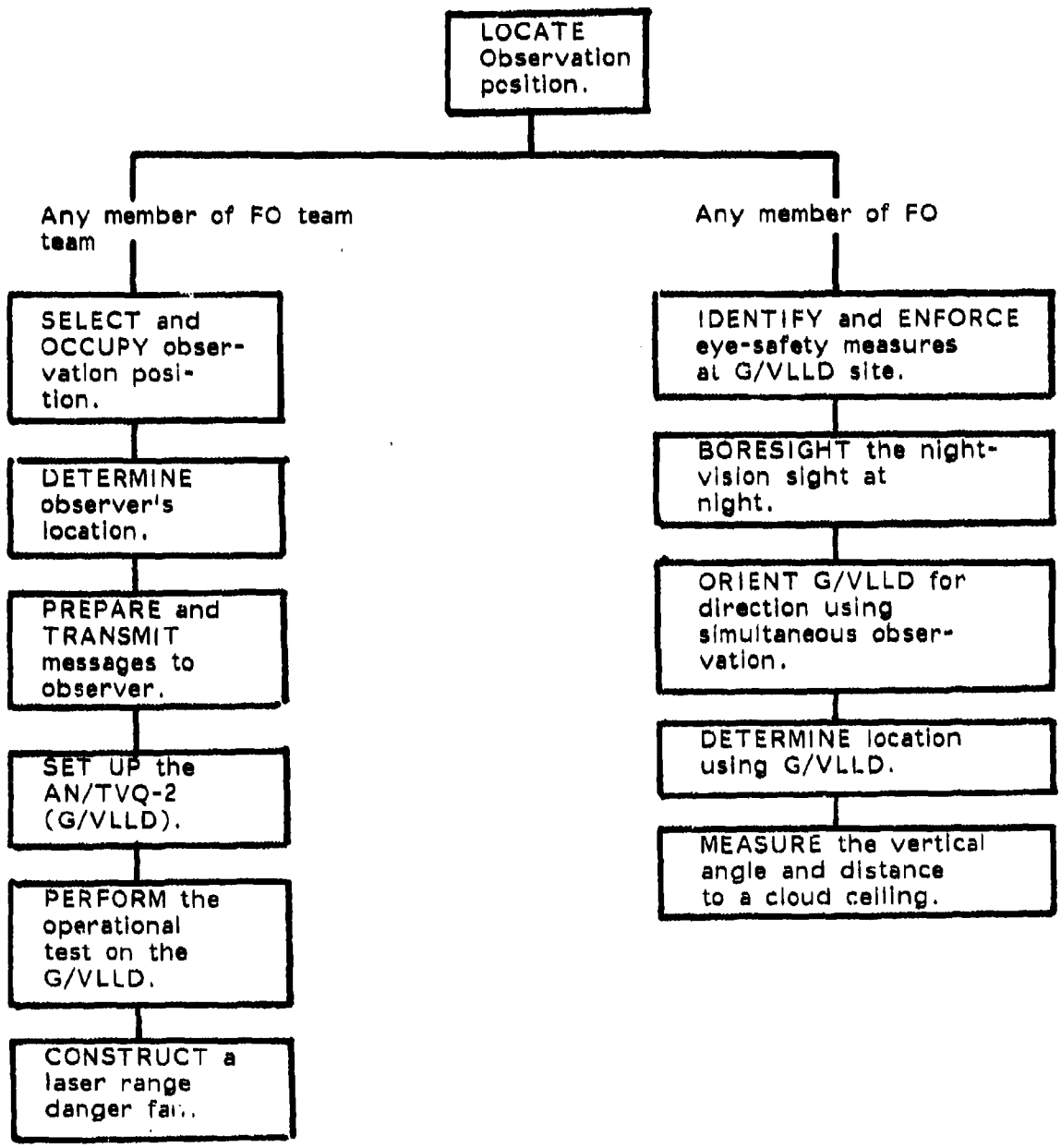
54. Assist subordante FSE/individuals.

Tasks are not all conclusive but reflect those considered by the Close Support Study Group.

APPENDIX G
ANNEX F



Collective Task



COLLECTIVE OBJECTIVE FOR FORWARD OBSERVER SECTION (ARTEP 6-365)

TASK	CONDITION	TRAINING/EVALUATION STANDARDS	REFERENCES
LOCATE observation position.	An observer is equipped with the GLLD, M2 compass, and a 1:50,000 map. Terrain is hilly and partly wooded. Situation is known and comm is operational.	Select position to insure: Maximum line of site for GLLD. Maximum coverage of area of operations. Mutual support for other GLLD positions. Orient GLLD for direction and boresight the night vision sight. Determine location by map spot within 150 meters of actual location. Refine location by survey or resection as soon as possible. Give location within 30 seconds of being told by the trainer to do so. Report cloud height to FDC as soon as possible after occupation.	FM 21-26 FM 6-30 Draft COPPER-HEAD 0/0

INDIVIDUAL OBJECTIVE FOR MEMBERS OF FORWARD OBSERVER PARTY

SELECT AND OCCUPY observation position.	You will be given a declinated M2 compass, binoculars, an AN/TVQ-2(GLLD), a map, a situation overlay, a zone of observation, and communitions equipment. You can best accomplish your mission from a stationary OP.	Select an OP that allows surveillance of the assigned zone of observation, and sufficient range to engage moving targets with laser-guided munitions. Select an OP that takes advantage of the terrain and existing cover and concealment while avoiding landmarks and prominent terrain features.	FM 21-26 FM 6-30 Draft COPPER-HEAD 0/0

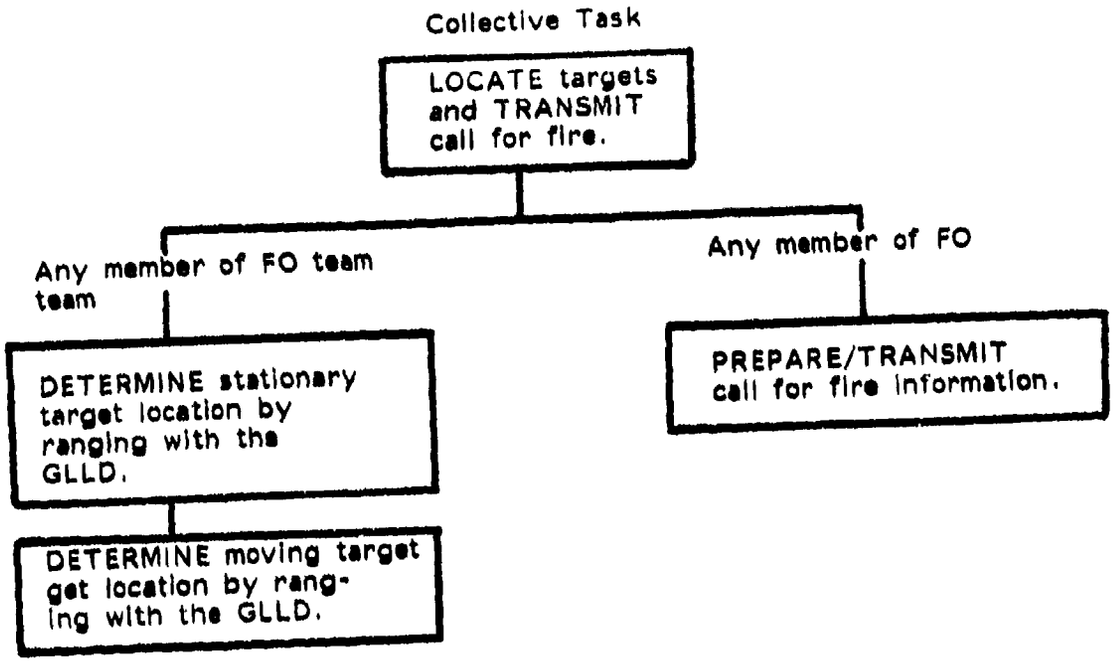
TASK	CONDITION	TRAINING/EVALUATION STANDARDS	REFERENCES
		Provide concealed access and exit routes to the position. Occupy the OP without detection from the target area.	

INDIVIDUAL OBJECTIVES FOR ANY MEMBER OF FORWARD OBSERVER PARTY

TASK	CONDITION	TRAINING/EVALUATION STANDARDS	REFERENCES
DETERMINE observer's location.	Observer is equipped with GLLD and has FDCs assistance in determining location. Observer provides necessary data for FDC to derive FO's location.	FDC determines observation location to the nearest 10 meters. Determine location within 1 minute of receipt of data from observer.	Draft COPPERHEAD 0/0
PREPARE and TRANSMIT messages to observer.	You will be given an observer's call for fire, a fire order, and the fire order standards.	Transmit all necessary elements as required without delay, in sequence, and without error. Performance measures: 1. After the fire order is announced by the FDO, transmit the following information to observer: a. Unit firing. b. Number of rounds in effect. c. Laser code. d. Time-of-flight. 2. Transmit "SHOT" and "ROUNDS COMPLETE", if applicable, after it is announced by the computer. 3. Tranmit "LASE ALERT" to observer 20 seconds before the round impacts.	Draft COPPERHEAD 0/0

TASK	CONDITION	TRAINING/EVALUATION STANDARDS	REFERENCES
SET UP the AN/TVQ-2 (GLLD).	You will be given an AN/TVQ-2, a position designated for its replacement.	Set up the AN/TVQ-2 or battery power) without error, within 5minutes.	Draft COPPER-HEAD 0/0
PERFORM the operational test on the AN/TVQ-2 (GLLD).	You will be given AN/TVQ-2 (GLLD) set up in a field position.	Perform the operational test on the AN/TVQ-2 (GLLD) without error within 5 minutes.	Draft COPPER-HEAD 0/0
CONSTRUCT a laser range danger fan for a GLLD	You will be given sheet of paper, pencils, a protractor, and an AN/TVQ-2 (GLLD) set up in a field location.	Construct a laser range danger fan without error within 5 minutes.	Draft COPPER-HEAD 0/0
IDENTIFY and ENFORCE eye-safety measures, around the GLLD site.	Given an FO looking through binoculars, at a target to be designated, an RTO in the danger area, and an operator without goggles about to lase a target.	Identify the eye-safety violations. Indicate enforcement measures to correct the violations.	Draft COPPER-HEAD 0/0
BORESIGHT the night vision sight at night.	No flashlight or other artificial light is available to the observer.	The night vision sight is boresighted to zero mils within 2 minutes.	Draft COPPER-HEAD 0/0
ORIENT GLLD for direction using simultaneous observation.	GLLD is to be emplaced at OP where there is no survey or other means of obtaining direction.	GLLD is oriented for direction using simultaneous observation procedures within 3 minutes.	Draft COPPER-HEAD 0/0
DETERMINE location using GLLD.	Observer has occupied new position and no survey is available.	In conjunction with the FDC, the FO determines his location to the nearest ten (10) meters.	Draft COPPER-HEAD 0/0

TASK	CONDITION	TRAINING/EVALUATION STANDARDS	REFERENCES
MEASURE the vertical angle and distance to a cloud ceiling.	Clouds are covering the observer's area of responsibility. Laser-guided munitions are available to the observer.	Observer ranges clouds over the center of his area of responsibility and passes this data to the FDC. Thereafter, he reports changes only when the change in cloud height exceeds 150 meters.	Draft COPPERHEAD 0/0


Collective Task
LOCATE targets and TRANSMIT call for fire.
Any member of FO team team
Any member of FO
DETERMINE stationary target location by ranging with the GLLD.
DETERMINE moving target get location by ranging with the GLLD.
PREPARE/TRANSMIT call for fire information.

COLLECTIVE OBJECTIVES FOR FORWARD OBSERVER SECTION (ARTEP 6-365)

TASK	CONDITION	TRAINING/EVALUATION STANDARDS	REFERENCES
LOCATE targets of opportunity and TRANSMIT calls for fire for COPPERHEAD.	Maneuver unit is conducting offensive or defensive operations. Observer has positioned and oriented the GLLD. A stationary hard-point target is to be attacked. Observer position has been refined to nearest 10 meters and is known in the FDC.	Time: 1 minute. Start: Observer identifies target. Stop: Complete call for fire is transmitted. Accuracy: Target location is within 100 meters. Use correct observed fire and communications procedures.	Draft COPPERHEAD 0/0
	A moving target is to be attacked.	Time: 1 min, 20 sec. Start: Observer identifies target. Stop: Complete call for fire is transmitted. Accuracy: Target intercept point is within 100 meters of actual location. Determine speed direction and intercept point. Use correct observed fire and communications procedures.	
LOCATE on-call, planned targets and TRANSMIT to bn FSO.	Maneuver unit is conducting offensive or defensive operations. Observer has positioned and oriented the GLLD.	Use visibility diagram and template set to select target engagement areas that: Are visible and provide for uninterrupted line-of-sight.	Draft COPPERHEAD 0/0

TASK	CONDITION	TRAINING/EVALUATION STANDARDS	REFERENCES
	Observer position has been refined to nearest 10 meters and is known in the FDC. Observer knows locations of batteries. Commander's guidance is known.	Are along likely enemy avenues of approach. Provide support to scheme of maneuver or defense. Compute target polar data to grid coordinates. Transmit planned targets to FSO.	

COLLECTIVE OBJECTIVES FOR BATTALION FSO SECTION (ARTEP 6-365)

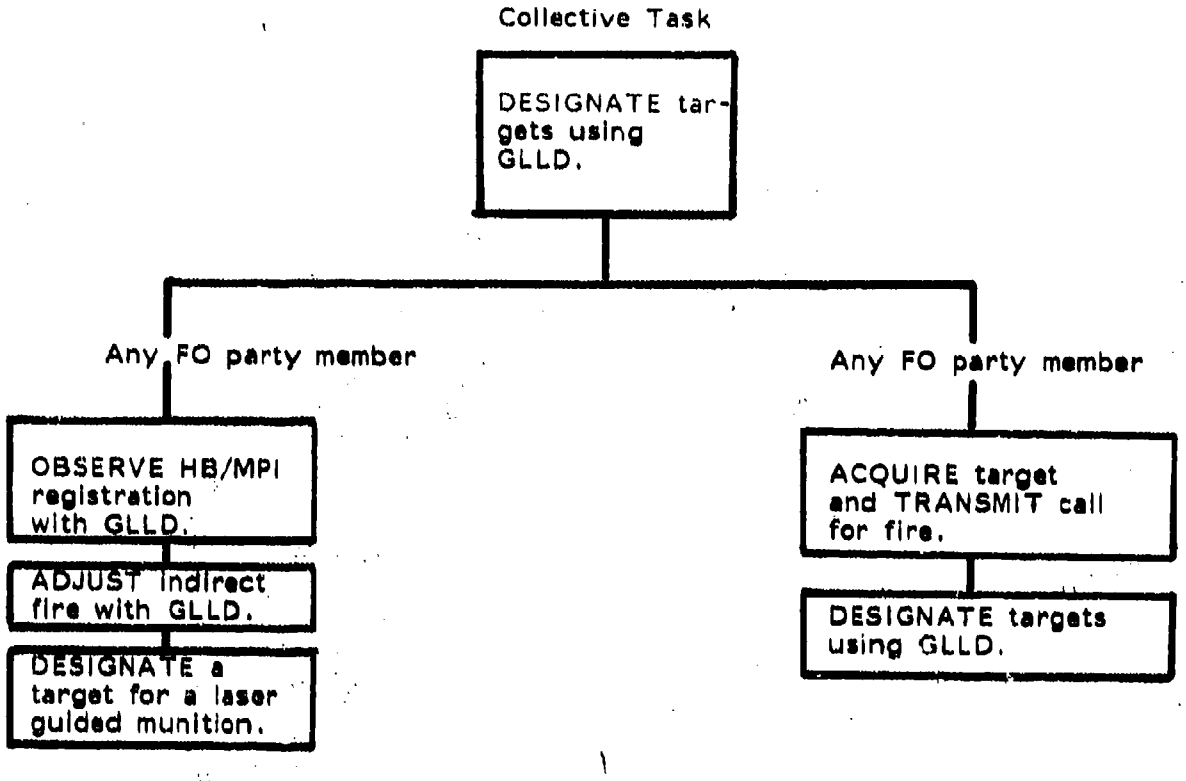
NOTE: Ther are no tasks specifically identified for the FSO peculiar to employment of COPPERHEAD. The below listed FSO tasks were extracted from ARTEP 6-365 and standards modified which provide a basis for training and evaluating the FSO with COPPERHEAD. These training objectives and the remainder of the FSO objectives in ARTEP 6-365 will aid in the FS planning and coordination process.

TASK	CONDITION	TRAINING/EVALUATION STANDARDS	REFERENCES
PLAN and COORDINATE fires in support of maneuver battalion/brigade in the defense.	The supported unit has been ordered into a defensive posture. A frag order has been issued requiring the planning of fire support.	Plan fires to: Delay and disorganize enemy's approach. Disrupt enemy's attack preparation. Impede enemy attack. Break up enemy's assault by use of FPFs. Limit penetrations. Support the counterattack. Coordinate fires delivered before the enemy forms for attack. Recommend appropriate FS coordination measures. Coordinate time of opening fire with supported commander. Transmit planned target locations to FDC. Coordinate fire to insure most effective attack of enemy targets. Use lowest echelon capable of providing adequate support. Notify supported unit of available FPF.	FM 6-20 Draft COPPERHEAD 0/0

TASK	CONDITION	TRAINING/EVALUATION STANDARDS	REFERENCES
		Notify DS FA bn of planned priority targets to include those for engagement by COPPERHEAD. Plan fires in support of the counterattack which are immediately responsive to the counterattack force.	
COORDINATE all FS on surface targets.	On the basis of the tactical situation, command guidance, targets, and FS available.	Assign requests for immediate fire support to the appropriate FSrepresentative. Assign approved fire requests to lowest echelon capable of providing adequate support. Accomplish coordination as required for all FS. Recommend fire coordination to supported commander and report to FA battalion. Inform higher and adjacent FSE's of operations affecting them. Receive, issue, and disseminate warnings concerning FS. Provide advisories on FS operations as appropriate.	FM 6-20 Draft COPPER-HEAD 0/0
PROCESS FA support.	The supported unit commander's scheme of maneuver and concept of operations have been provided.	As rapidly as the situation requires, process FA support. Assign targets identification numbers. Assign targets to appropriate FS means.	FM 6-20 Draft COPPER-HEAD 0/0

TASK	CONDITION	TRAINING/EVALUATION STANDARDS	REFERENCES
		Provide method of attack that obtains desired results at the designated time using the lowest echelon of support possible.	
		Coordinate template sets and laser pulse codes for use with COPPERHEAD.	
REPORT tactical situation, plans, and location of supported unit.	The tactical situation, plans and disposition of the supported unit are available.	Report plan of maneuver and needs for FS as known.	FM 6-20 FM 21-26 FM 21-30
		Maintain and report current situation.	
		Maintain current positions of COPPERHEAD armed units.	
		Maintain and report location of companies and patrols.	
INDIVIDUAL OBJECTIVES FOR FORWARD OBSERVER PARTY MEMBERS			
DETERMINE stationary target location by ranging with the GLLD.	The target is stationary and is to be engaged. GLLD is oriented for direction and the location of the OP is known.	Call for fire initiated within 50 seconds of determination of target location.	Draft COPPERHEAD 0/0
DETERMINE moving target location by ranging with the GLLD.	The target is moving and is to be engaged. GLLD is oriented for direction and the location of the OP is known.	FO determines feasibility/appropriateness of engaging the target. FO selects an engagement point.	Draft COPPERHEAD 0/0

TASK	CONDITION	TRAINING/EVALUATION STANDARDS	REFERENCES
		Call for fire initiated within 50 seconds of determination of engagment point.	
PREPARE/TRANMIT call for fire information.	You will be given a situation which would require you to conduct a fire mission, a copy of the unit CEOI, and communications with FDC. You will also be given all information necessary to complete the call for fire.	Transmit all necessary information without procedural error. Insure that all information transmitted is correctly received by FDC. Complete the call for fire within 1 minute.	Draft COPPERHEAD 0/0


Collective Task
DESIGNATE targets using GLLD.
Any FO party member
OBSERVE HB/MPI registration with GLLD.
ADJUST indirect fire with GLLD.
DESIGNATE a target for a laser guided munition.
Any FO party member
ACQUIRE target and TRANSMIT call for fire.
DESIGNATE targets using GLLD.

COLLECTIVE TASKS FOR THE FORWARD OBSERVER SECTION (ARTEP 6-365)

TASK	CONDITION	TRAINING/EVALUATION STANDARDS	REFERENCES
DESIGNATE target of opportunity for COPPERHEAD.	A stationary hardpoint target suitable for COPPERHEAD engagement has been identified. Call for fire has been sent to the FDC. G/VLLD is operational and oriented. A moving target suitable for COPPERHEAD engagement has identified. The call for fire has been sent to the FDC.	Observer uses "AT-MY-COMMAND. Designate the target 5 seconds after receiving the "LASE ALERT" message from FDC. Designate until impact of round. Determine the trigger point. Observer uses "AT-MY-COMMAND. Designate the target 5 seconds after receiving the "LASE ALERT" message from FDC. Designate until impact of round.	Draft COPPERHEAD 0/0
DESIGNATE planned targets for COPPERHEAD.	Targets to support the scheme of maneuver have been planned. Firing data has been computed. NOTE TO TRAINER: The GLLD is effective in achieving first round FFE. When used in adjust/fire missions, it may enable the observer to enter FFE after one adjustment.	Designate the target 5 seconds after receiving the "LASE ALERT" message from FDC. Designate until impact of round. Observer uses "AT-MY-COMMAND.	Draft COPPERHEAD 0/0

INDIVIDUAL OBJECTIVES FOR FORWARD OBSERVER PARTY MEMBERS

TASK	CONDITION	TRAINING/EVALUATION STANDARDS	REFERENCES
OBSERVE HB/MPI registration with GLLD.	GLLD is oriented for direction and the location of the OP is known.	Using GLLD, the observer determines the direction, distance and vertical angle to each burst and passes this data to the FDC. Data transmitted within 20 seconds of each round burst.	Draft COPPER-HEAD 0/0
ADJUST indirect fire with GLLD.	Target has been located using the GLLD.	FFE is entered after the first round. Subsequent adjustment transmitted to FDC within 15 sec of initial round impact. Correction causes FFE rounds to impact within are allowable radial error (ARE).	Draft COPPER-HEAD 0/0
DESIGNATE a target for a laser-guided munition.	A suitable target for a laser-guided munition has been identified and a call for fire submitted. Laser-guided munitions are available. Observer has laser codes. Lase alert is given.	Proper designator code placed on the GLLD. Lasing begins immediately upon the command "LASE" from the FDC. Laser beam remains on aiming point for the duration of the lasing period. Lasing continues until the munition impacts. Rounds impact within ARE.	Draft COPPER-HEAD 0/0
ACQUIRE target and TRANSMIT call for fire.	The target is stationary and is to be engaged. GLLD is oriented for direction and location of OP is known. The target is moving is to be	Call for fire initiated within 60 seconds of determination of target location. Rounds impact within ARE. FO determines feasibility/appropriateness of engaging target. FO selects engagement point. Call for fire initiated	Draft COPPER-HEAD 0/0

TASK	CONDITION	TRAINING/EVALUATION STANDARDS	REFERENCES
	engaged. GLLD is oriented for direction and location OP is known.	within 60 seconds of determination to engage target.	
DESIGNATE targets using GLLD.	Target has been located using GLLD. Target suitable for laser munitions is identified and call for fire submitted. Laser munitions are available. FO has proper codes.	Proper designation codes are placed on GLLD. Lasing begins immediately upon command "LASE" from FDC. Laser beam remains on aiming point for duration of lasing period.	Draft COPPERHEAD 0/0

APPENDIX G
ANNEX G

FIST MISSION PROFILE

G-1. The FIST mission profile information, at the inclosure, was developed from data gathered to support the Legal Mix Study, Phase III, 1986 time frame.

FIST PROFILE

1. General

a. Data Source: Target Acquisition Model (TAM) runs made to support Phase III of the Legal Mix V Study. The TAM simulates the acquisition process and includes among the systems simulated the FIREFINDER radars, BSTAR radar, RPV's, sound and flash, SOTAS. SLAR, ASA assets, and FIST. Within the FIST both company and platoon FO's are portrayed. For this profile, only the FIST data is used. Probability of line of sight is used rather than discrete terrain. The company FO is equipped with the GLLD and the platoon FO with the LTD.

b. Scenario: The basic scenario is the SCORES Scenario, Europe I, Sequence 2A. The data is based on one division slice from the scenario. Within the division slice there were 17 active company FO's and 28 platoon FO's.

c. Time Frame: The basic scenario was updated to the 1985-86 time frame. Data is based on a 24-hour period on D+1.

d. Constraint: The basic data to support the Legal Mix V Study was processed to resolve duplicated targets. In the original work this process took place at brigade level within the DS FA battalion. No attempt was made to resolve duplication between the company and platoon FO's. For this effort, the FO locations were plotted, estimates made of amount of area overlap, and number of duplicated targets at platoon/company level subjectively derived.

2. Identification of company FIST's and associated platoon FO's.

Co FO[1]	Plat FO[1]	Co FO	Plat FO
1604	----	1628[4]	1531
1612	1511	1622[3]	1522[*2]
	1512[*2]		1523
	1513	1624[3]	1524[*2]
1615[3]	1515[*2]		1521
	1514	1669[3]	1569
1617[4]	1516		1568
			1567
1648[3]	1547	1664[4]	----
	1548[*2]		
	1549	1661[4]	----
1645[3]	1545[*2]		
	1546	1658[3]	1558[*2]
			1557
1641[4]	1544		1559
1634[4]	----	1655[3]	1555[*2]
			1554
1632[3]	1532[*2]		1556
	1533		

NOTES:
1. 1600 numbers are company FO/FIST HQ; 1500 numbers are the platoon FO's.
2. Platoon FO's collocated with the company FO/FIST HQ.
3. Mech FIST.
4. Armor FIST.

3. Sensings by FO.

I Observer I.D.	II No of Targets Sensed in 24 Hours	III Hourly Max	IV No of Hours When Obs Had "0" Sensings	V Hourly Ave (x)	VI Estimated No of Sensings After Duplicated Targets Resolved[*2]	
					a. Total[*3]	b. Hourly Ave (x)[*1]
1607	156	9	0	6.5	156	6.5
1612/1512	180/178	10/9	0	7.5/7.4	118	5.0
1511	166	9	0	6.9	166	6.9
1513	170	10	0	7.1	112	4.7
1615/1515	156/170	8/10	0	6.5/7.1	153	6.4
1514	156	9	0	6.5	125	5.2
1617	161	9	0	6.7	153	6.4
1516	158	9	0	6.6	105	4.3
1622/1522	166/158	8/11	0/2	6.9/7.2	158	6.6
1523	151	10	1	6.6	143	6.2
1624/1524	151/154	10/9	3/3	7.1/7.3	139	6.6
1521	161	10	1	7.0	113	4.9
1628	146	10	2	5.9	97	4.4
1531	120	10	2	5.5	80	3.6
1632/1532	137/144	8/11	0/1	5.7/6.2	72	3.1
1533	55	9	11	4.2	44	3.4
1634	137	8	1	5.9	130	5.7
1641	84	9	4	4.2	84	4.2
1544	154	10	0	6.4	77	3.2

I	II	III	IV	V a. Total *3	VI b. Hourly Ave (x) *1
1645/1545	142/132	9/10	1/0	6.1/5.5	57	2.5
1546	149	9	0	6.2	75	3.1
1648/1548	96/113	10/10	3/3	4.6/5.3	75	3.6
1547	106	9	1	4.6	80	3.5
1549	101	9	4	5.0	71	3.5
1655/1555	43/38	6/8	12/13	3.5/3.5	43	3.5
1554	36	8	13	3.4	36	3.4
1556	46	7	11	3.5	30	2.4
1658/1558	106/108	8/10	4/4	5.3/5.5	81	4.1
1557	115	9	4	5.8	86	4.3
1559	72	9	4	3.7	72	3.7
1661	50	7	11	3.8	50	3.8
1664	122	9	3	5.8	110	5.2
1669	142	9	4	7.1	43	2.1
1569	151	10	3	7.2	30	1.5
1568	139	9	3	6.6	125	6.0
1567	139	10	3	6.7	104	5.0
x	127			5.9	94	4.4

NOTES:
1. Average is for all hours in which the observer had a sensing; does not include the hours in which he had no sensings (Col IV).
2. Estimated requests for fire.
3. Combines sensings when Co FIST and Plat FO are collocated.

4. Distribution of targets sensed by FEBA distance and type target.

FEBA-Target Distance (Kms)*:	0-1	1-2	2-3	3-4	4-5	5+
Percent of Targets:	78	13.5	5	2	1	0.5

Type Target:	Tank	APC	HQ/Svc	ADA	Mort/FA	OPs	Eng
Percent of Sensings:	76	18	1	1.5	2	0.5	0.5

*Plat and Co FO's were positioned approximately 500-1000M behind the FEBA.

5. Distribution of average hourly sensing rate (Col V and VIb, para 3).

a. Before duplication was resolved:

47% of the FO's sensed between 6.5 and 7.5 targets per hours.
23% " " " " " 5.5 and 6.5 " " "
12% " " " " " 4.5 and 5.5 " " "
18% " " " " " 3.5 and 4.5 " " "

b. After duplication was resolved:

11% of the FO's sensed between 6.5 and 7.5 targets per hours.
14% " " " " " 5.5 and 6.5 " " "
17% " " " " " 4.5 and 5.5 " " "
33% " " " " " 3.5 and 4.5 " " "
17% " " " " " 2.5 and 3.5 " " "
8% " " " " " 1.5 and 2.5 " " "

APPENDIX G
ANNEX H

81MM AND 107MM MORTAR PROFILE

(OMITTED)

Annex is classified. Available upon request

APPENDIX G
ANNEX I

FIRE SUPPORT TASKS

AERIAL MANEUVER UNITS

UNIT	MISSION	TASK	CONDITIONS	STANDARDS
Troop	Air Reconnaissance (Day and Night)	Prepare FS plan	One FA FO is attached. Troop has priority of fires of one battery.	Troop commander coordinates all available FS and integrates it into his plan.
	Simultaneous Zone and Route Reconnaissance (Day and Night)	Prepare FS plan	One FO is with troop. Troop has priority of fires with one FA battery. One 4.2-inch mortar from the attached armored cavalry platoon is also available.	Troop commander coordinates all available FS and integrates it into plan.
				Troop commander plans smoke and suppressive fires.
				Troop commander coordinates air corridors.
		Take actions on contact	Threat force engages elements of air cavalry troop.	Overwatch elements lay down heavy suppressive fire and request indirect fire support.

APPENDIX G, ANNEX I
Air Cavalry Troop Fire Support Tasks, Conditions, and Standards.
(ARTEP 17-205).
Inclosure 1

Air Cavalry Troop Fire Support Tasks, Conditions, and Standards. (ARTEP 17-205)

UNIT	MISSION	TASK	CONDITIONS	STANDARDS
Troop	Screen (Day and Night)	Prepare for screening mission.	Squadron commander provides an oral OPORD and overlay specifying general trace of the screen, units to be screened, and execution times.	Troop commander coordinates with screened force and FA and: --Establishes policies on supporting fires and ensures all available fire support is included in plan.
		Perform actions on contact	Sporadic threat activity occurs along the new screen line.	Scouts/listening posts/OP's use indirect FS against known or suspected threat locations.
	Occupation of Assembly Area (night)	Occupy assembly area	Squadron commander gives unit commander an oral warning order to prepare for another mission.	Troop integrates all available fires into a single plan.
			Squadron commander designates center of troop assembly area.	Troop establishes indirect FS plan.
Recon Platoon	Rapid Reaction Force (Night)	Eliminate threat resistance.	Larger threat force conducts counter-attacks.	Recon platoon leader calls for FS.

UNIT	MISSION	TASK	CONDITIONS	STANDARDS
Aeroscout Crew	Terrain Flight, Target Acquisition, and Handoff (Day and Night)	Acquire and identify targets	Terrain flight conditions	Aeroscout crew acquires targets and takes suitable action based on commander's orders (crew continues to observe and report, calls for and adjusts indirect fire, and uses aeroweapons aircraft and tactical air).
		Employ indirect fire support	Leader directs the engagement of a target with indirect fire (FA/mortar).	Aeroscout crew utilizes proper request for fire in accordance with unit SOP.
				Aeroscout crew properly adjusts FA using bracketing technique to destroy targets while remaining in the appropriate terrain flight mode.
		Employ CAS	CAS is allocated to engage a previously identified target.	Aeroscout crew coordinates with tactical aircrft and adjusts fighter aircraft on the target while providing essential information to vector USAF aircraft to proper run-in heading, friendly disposition, and threat situation.

Air Cavalry Troop Fire Support Tasks, Conditions, and Standards (ARTEP 17-205).

UNIT	MISSION	TASK	CONDITIONS	STANDARDS
Aero-weapons crew	Target Handoff and Target Attack	Plan and coordinate illumination and suppressive fire at designated points along main avenue of advance.	Attack crew has priority of fires from mortars or FA.	Crew plans location of desired burst of illumination and suppressive fires. Crew accurately provides request for fire data to supporting indirect fire unit for planned targets.
		Request illumination	During night operations only	Crew properly requests illumination based on planned sequence numbers as given by supporting indirect fire element.
		Adjust illumination	During night operations only	Aeroweapons crew initially requests center of sector illumination and provides adjustments to better illuminate the target area. Crew continues, temporarily discontinues, or ends illumination as appropriate.

UNIT	MISSION	TASK	CONDITIONS	STANDARDS
Aero-scout/ Aero-weapons (SWT)	Terrain Flight, Target Acquisition, Handoff, and Attack	Prepare for combat	SWT leader receives fragmentary order to: (1) Replace one of the troop's teams in combat (2) Continue the attack and pursuit of the withdrawing threat armor force	SWT leader coordinates for suppressive FA fires.
		Use suppressive fires to engage targets	Mortar and/or FA support available	Aeroscout aircraft properly request FS while aeroweapons aircraft move into attack positions.
		Request illumination	During night operations only	Aeroweapons crew properly requests illumination based on planned sequence as given by supporting indirect fire element.
		Adjust illumination	During night operations only	Aeroweapons crew initially requests center of sector illumination and provides adjustments to better illuminate the target area. Scout crew continues, temporarily discontinues, or ends illumination as appropriate.

UNIT	MISSION	TASK	CONDITIONS	STANDARDS
Aircraft Crew	Terrain Flight	Plan for day mission	Mission is received which requires crew to operate in the vicinity of the FEBA during daylight. Pilot in command receives briefing which includes enemy and friendly situation. Multiple routes to the objective are provided. The crew is provided 45 minutes to prepare for mission.	Suppressive fires are planned.
Aircraft Crewman	Crew Proficiency	Perform FA air observation and adjustment	Flight mission is planned so that it places the aircraft where crewmembers can observe the threat and engage with FA. Urgency of situation requires immediate engagement. Proximity to the threat and nature of the mission require NOE flight.	Target is located within 100m and identified as threat after correlation with known friendly information. FA radio net is entered as directed by proper authority, according to pre-flight/ mission briefing, and by referring to CEOI. A correct request for fire is submitted. Proper authentication is completed as requested.

Air Cavalry Troop Fire Support Tasks, Conditions, and Standards. (ARTEP 17-205).

UNIT	MISSION	TASK	CONDITIONS	STANDARDS
				Pilot uses time of flight information and "splash" to allow proper positioning of aircraft to observe bursts of rounds while remaining in defilade at other times. Crew uses the best observation techniques (e.g., "pop up", "stationary hover", dismounted observer) to reduce vulnerability of aircraft and accomplish the mission. All crewmembers aid in sensing the rounds and providing obstacle clearance for the aircraft. Adjustment is conducted using correct procedures (at least one engagement is accomplished using shift from a known point method). Fire for effect is entered after a maximum of three adjustments. Crew is familiar with the capabilities of the different fuze and shell options available with the 105mm, 155mm, and 8-inch systems.

UNIT	MISSION	TASK	CONDITIONS	STANDARDS
Company (ATKHC)	Defensive Operations (Day and Night)	Receive the OPORD	ATKHC commander receives an order to move forward and occupy initial battle positions within the covering force area.	ATKHC commander coordinates defensive plan with other CFA units. Coordination includes the integration of fire and coordination points.
		Coordinate FS and plan of defense		ATKHC commander identifies targets for the FSE. ATKHC commander informs subordinates of the FS plan.
		Use indirect fires	ATKHC has priority of fires from an FA battery	ATKHC calls for indirect fires to force threat elements to button up while attack aircraft move to firing positions.
	Offensive Operations (Pursuit) (Day and Night)	Coordinate FS	ATKHC has the priority of FA fire	ATKHC commander prepares an indirect fire plan and coordinates it with ground forces. Fire plan includes all avenues of approach and withdrawal, dominant terrain.
		Engage targets		Suppressive indirect FA fires are used with direct fires.

Attack Helicopter Company Fire Support Tasks, Conditions, and Standards (ARTEP 17-385).
Inclosure 2

UNIT	MISSION	TASK	CONDITIONS	STANDARDS
Attack Helicopter Team (AHT)	Terrain Flight, Target Acquisition, Handoff, and Attack. (Day and Night)	Prepare for combat	AHT leader receives fragmentary order to replace a team in contact or continue the attack and pursuit of the withdrawing threat armor force.	AHT leader coordinates for suppressive FA fires.
		Use suppressive fires to engage targets	Mortar and/or FA support is available	Scout aircraft properly request indirect FS while attack aircraft move into attack positions.
		Request illumination	During night operations only	Attack crew initially requests illumination based on planned sequence numbers as given by supporting indirect fire element.
		Adjust illumination	During night operations only.	Attack crew initially requests center of sector illumination and provides adjustments to better illuminate the target area. Scout crew continues, temporarily discontinues, or ends illumination as appropriate.

Attack Helicopter Company Fire Support Tasks, Conditions, and Standards (ARTEP 17-385).

UNIT	MISSION	TASK	CONDITIONS	STANDARDS
Attack Helicopter Crew	Target Acquisition, Target Handoff, and Attack (Day or Night)	Plan and coordinate illumination and suppressive fire at designated points along main avenue of advance.	Attack crew has priority of fires from mortars or FA	Attack crew plans location of desired burst of illumination and suppressive fires. Attack crew accurately provides request for fire data to supporting indirect fire unit for planned targets.
		Request illumination	During night operations only	Attack crew properly requests illumination based on planned sequence numbers as given by supporting indirect fire element.
		Adjust illumination	During night operations only	Attack crew initially requests center of sector illumination and provides adjustments to better illuminate the target area. Attack crew continues, discontinues, or ends illumination as appropriate.

UNIT	MISSION	TASK	CONDITIONS	STANDARDS
Scout Helicopter Crew	Terrain Flight, Target Acquisition, and Handoff (Day Night)	Acquire and identify targets	Threat vehicles/ positions are dispersed over the area. Some of the vehicles are moving.	Scout crew takes appropriate action based on commander's orders (i.e., continues to observe and report, calls for and adjusts indirect fire, uses attack helicopters, or requests tactical air).
		Employ indirect fire support	Commander directs the engagement of a target with indirect fire (FA/ mortar.	Scout crew utilizes proper request for fire in accordance with unit SOP. Scout crew properly adjusts FA using bracketing techniques to destroy targets while remaining in the appropriate terrain flight mode.
		Employ tactical air	Tactical air is allocated to engage a previously identified target.	Scout crew coordinates with tactical aircraft and adjusts fighter aircraft on the target while providing essential information to vector USAF aircraft to proper run-in heading, friendly situation, and threat situation.

UNIT	MISSION	TASK	CONDITIONS	STANDARDS
Aircraft Crewmen	Crew Proficiency	Perform FA air observation and adjustment	Flight mission is planned so that it places the aircraft crew where they can observe the threat and engage with FA. Urgency of situation requires immediate engagement. Proximity to the threat and nature of the mission require NOE flight.	Target is located within 100m and identified as threat after correlation with known friendly information. FA radio met is entered as directed by proper authority, according to preflight/mission briefing, and by referring to CEOI. A correct request for fire is submitted. Proper authentication is completed as requested. Pilot uses time of flight information and "splash" to allow proper positioning of aircraft to observe bursts of rounds while remaining in defilade at other times. Crew uses the best observation technique (e.g., "pop-up" stationary hover, dismounted observer) to reduce vulnerability of aircraft and accomplish the mission. All crewmembers aid in sensing the rounds and providing obstacle clearance for the aircraft.

UNIT	MISSION	TASK	CONDITIONS	STANDARDS
				Adjustment is conducted using proper procedures (at least one engagement is accomplished using shift from a known point method). Fire-for-effect is entered after a maximum of three adjustments. Crew is familiar with the capabilities of the different fuze and shell options available with 105mm, 155mm, and 8-inch systems.

Attack Helicopter Company Fire Support Tasks, Conditions, and Standards (ARTEP 7-385).

APPENDIX G
ANNEX J

SECTION: Fire Support Team

LEVEL	TASK	CONDITION	TRAINING/EVALUATION STANDARD	REFERENCE
		NOTE: Unless indicated, all training objectives apply to both field artillery and mortar fires. NOTE: Time standards are dependent upon operational communications. Time standards will be modified if communications are not operational for any reason including enemy jamming.		
1,2	3-I-5-1 LOCATE observation position.	With a 1:50,000-scale map in hilly, partly wooded terrain, observers must locate an observation position.	Time: Give location within 30 sec of being told by trainer to do so. Accuracy: Determine location within 150 meters of actual location.	FM 6-30 FM 21-26
1,2	3-I-5-2 SELECT and OCCUPY an observation post.	Fire support team personnel will be given a 1:50,000-scale map in hilly, partly wooded terrain, a situation overlay, and zone of observation.	Select a position that allows observation of assigned zone and take advantage of existing cover and concealment while avoiding landmarks and prominent terrain features. Provide concealed access and exit routes to position. Occupy position without detection from target area. Employ techniques for maximum reliability and minimum vulnerability of communications.	FM 6-30 FM 21-26
1,2	3-I-5-3 ' LOCATE targets and TRANSMIT calls for fire (adjust fire, fire for effect, and illumination).	With a 1:50,000-scale map in hilly, partly wooded terrain, observers may choose grid, polar plot, or shift to locate targets. Observers should be given time to orient themselves but should not be given OP grid or any known directions. Targets should be between 2,000 and 5,000 meters from observation post (OP). Trainers will provide nature of the target to the observer. Maneuver commander has approved the use of illumination.	Time: 1 min (illum 1 min 30 sec) Start: Observer identifies target. Stop: Complete call for fire is transmitted. Accuracy: Target location is within 250 meters of actual location. Use correct communications procedures. Request appropriate shell/fuse combination.	FM 6-30 FM 21-26

FIST Tasks, Conditions, and Standards (ARTEP 6-165)

Inclosure

SECTION: Fire Support Team

LEVEL	TASK	CONDITION	TRAINING/EVALUATION STANDARD	REFERENCE
1	3-I-5-4 LOCATE suppression targets and TRANSMIT call for fire for immediate suppression mission (shift from a known point, grid, polar plot).	With a 1:50,000-scale map in hilly, partly wooded terrain, observers may choose grid, polar plot, or shift from a known point to locate target. Observers should be given time to orient themselves but should not be given OP grid or known direction. Targets should be between 2,000 and 5,000 meters from OP locations Trainers will provide nature of target to the observer.	Time: 30 sec. Start: Observer identifies target. Stop: Complete call for fire is transmitted. Accuracy: Target location is within 300 meters of actual location. Use correct communications procedures.	FM 6-30 FM 21-26
1	3-I-5-5 LOCATE target and TRANSMIT call for fire for a quick smoke mission.	With a 1:50,000-scale map in hilly, partly wooded terrain, observers may choose grid, polar plot, or shift from known point to locate target. Observers should be given time to orient themselves but should not be given OP grid or known direction. Targets should be between 2,000 and 5,000 meters from OP locations. Maneuver commander has authorized the use of smoke. Trainers will provide nature of target to the observer.	Time: 1 min and 30 sec. Start: Observer identifies target. Stop: Complete call for fire is transmitted. Accuracy: Target location is within 250 meters of actual location. Transmit direction, size of target, and duration of smokescreen to FDC as required. Use correct communications procedures.	FM 6-30
1	3-I-5-6 LOCATE and TRANSMIT call for fire on a linear target.	With a 1:50,000-scale map in hilly, partly wooded terrain, observers locate a linear target. Observers should be given time to orient themselves but should not be given OP grid or known direction. Targets should be between 2,000 and 5,000 meters from OP locations. Trainers will provide nature of target to the observer.	Locate target by two or more grids or by grid, length, and attitude. Use correct communications procedures. Request appropriate shell/fuse combination.	FM 6-30
1,2	3-I-5-7 CONDUCT adjust-fire, fire-for-effect, suppression, or illumination missions on targets of opportunity.	With a 1:50,000-scale map in hilly, partly wooded terrain, observers may choose grid, polar plot, or shift to locate targets. Observers should be given time to orient themselves but should not be given OP grid or any known directions. Targets should be between 2,000 and 5,000 meters from OP	Upon identification of target by observer, transmit complete call for fire within 60 sec (90 sec for illum). Send subsequent corrections within 15 sec of high explosive (HE) round burst (30 sec when observer is in a moving vehicle). FFE within 50 meters of target (adjust fire and FFE only).	FM 6-30

(continued): FIST Tasks, Conditions, and Standards (ARTEP 6-165)

SECTION: Fire Support Team

LEVEL	TASK	CONDITION	TRAINING/EVALUATION STANDARD	REFERENCE
		locations. Trainer will provide nature of target. Use of illumination has been approved by maneuver commander.	Adjust illumination flare. Consider wind and terrain to provide maximum illum on target with height of burst adjusted so that burnout occurs as flare hits ground. Request appropriate shell/fuse combination. Base deviation corrections on correct observer-target (OT) factor and angular deviation. Use no more than three adjusting rounds in adjust-fire missions. Transmit target damage and/ : refinement data. Insure that illumination does not silhouette supported troops. Insure that illumination missions give adequate target coverage.	
1	3-I-3-8 ADJUST an immediate smoke mission.	With a 1:50,000-scale map in hilly, partly wooded terrain, observers may choose grid, polar plot, or hasty shift to locate targets. Observers should be given time to orient themselves but should not be given OP grid or any known directions. Targets should be between 2,000 and 5,000 meters from OP locations. Maneuver commander has authorized use of smoke.	Upon identification of target by observer, transmit complete call for fire within 30 sec. Send subsequent corrections within 15 sec of HE round burst (30 sec when observer is in a moving vehicle). Final suppression rounds within 150 meters of the target on second subsequent correction. Base deviation corrections on correct OT factor and angular deviation. Transmit target damage and/or refinement data. Insure that smoke gives adequate coverage of the target.	FM 6-30
1	3-I-3-9 CONDUCT a quick smoke mission.	With a 1:50,000-scale map in hilly, partly wooded terrain, observers may choose grid, polar plot, or shift to locate targets. Observers should be given time to orient themselves but should not be given OP grid or any known directions. Targets should be between 2,000 and 5,000 meters from OP locations. Obscuration of more than 5 min for shell HC (2 min with shell WP) is required. Maneuver commander has authorized the use of smoke.	Upon identification of target by observer, transmit complete call for fire within 1 min 30 sec. Transmit direction, size of target, and duration of smokescreen to FDC. Select adjusting point to take full advantage of wind. Insure that smoke gives adequate coverage of the target.	FM 6-30

FIST Tasks, Conditions, and Standards (ARTEP 6-165)

SECTION: Fire Support Team

LEVEL	TASK	CONDITION	TRAINING/EVALUATION STANDARD	REFERENCE
			Base deviation corrections on correct OT factor and angular deviation. Transmit target damage and/or refinement data.	
1	3-I-3-10 ADJUST two fire missions simultaneously.	Two targets of equal priority in the zone of the supported unit are located within a 1-min period.	Send both calls for fire within 1 min of identification of last target. Refer to the assigned target number for each fire mission. Base deviation corrections on correct OT factor and/or angular deviation. Transmit subsequent corrections within 15 sec of round burst. Insure that FFE is within 50 meters of each target. Use no more than three rounds in adjustment on each target.	FM 6-30
1	3-I-3-11 CONDUCT an adjust-fire mission (HE) under illumination.	Observer hears enemy movement, requests an illum mission, and then requests adjust fire with shell HE. Coordinated rather than continuous illumination is required due to ammo constraints.	Submit illumination call for fire within 90 sec after observer hears suspected enemy movement. Submit a call for fire within 1 min after observer identifies HE target. Send subsequent illum corrections in a timely manner. Insure illumination gives adequate target coverage. HE FFE is within 50 meters of target. Coordinate and use correct illum procedures. Use no more than three rounds in adjustment or HE target.	FM 6-30
1,2	3-I-3-12 CONDUCT a precision registration, quick and time (field artillery only).	The FDO has ordered a registration on a point known to both the fire support team (FIST) and fire direction center (FDC).	Make minor deviation corrections only when positive range spottings cannot be made. Terminate impact portion of the registration after spottings of two "overs" and two "shorts" along the observer-target line, at the same data or data 25 meters apart. Determine and send both range and deviation refinement data correctly. Conduct time portion correctly.	FM 6-30

FIST Tasks, Conditions, and Standards (ARTEP 6-165).

SECTION: Fire Support Team

LEVEL	TASK	CONDITION	TRAINING/EVALUATION STANDARD	REFERENCE
1,2	3-I-5-13 USE communications techniques for maximum reliability and minimum vulnerability.	The FIST is with the maneuver company on tactical operations. Enemy is employing jamming techniques and/or direction finding equipment.	Communicate by means other than radio whenever possible. Use alternate nets for radio traffic until it is necessary to expose artillery fire net. Use AN/GRA-39 for remote radio operations to improve antenna positioning if situation permits. Mask antenna in enemy direction and/or use directional antenna when feasible. Use secure radio for planning purposes when available. Establish wire communications when feasible. When out of range or in defilade, request retransmission service from fire support officer (FSO)/FIST chief on the appropriate net.	FM 6-30 FM 24-1 TC 6-20-10 TC 24-18 TC 30-12-1 (C) TC 30-12-2
1	3-I-5-14 REQUEST and ADJUST naval gunfire (NGF).	A fortified target has been identified. Ammunition rates prohibit engagement by heavy artillery or tac air. Naval gunfire is available. Naval gunfire spotter teams are not available, but a naval gunfire liaison officer (NGLO) is present in the fire support element (FSE). NOTE TO TRAINER: Although this task will seldom be performed in training due to lack of ships and ranges, FIST personnel should be familiar with the procedures.	Transmit call for fire upon identification of target by observer within 1 min. Send subsequent corrections within 15 sec of round burst (30 sec when observer is in moving vehicle). Insure FFE rounds effectively cover target. Inform supporting ship of the units of measure used for adjustment (mils, degrees, meters, or yards).	FM 6-20 FM 6-30
1	3-I-5-15 REQUEST an immediate or planned close air support (CAS) strike.	Maneuver unit is conducting combat operations. Other fire support assets are either inappropriate or unavailable.	Transmit request for immediate CAS strike to fire support section within 1 min of identification of the target. Request for immediate or planned CAS includes: Target location. Target description. Time on target and latest time that CAS strike can be used.	FM 6-20 TT 6-20-7
1	3-I-5-16 ASSIST flight leader of a close air support strike.	Maneuver unit is conducting combat operations. Planned or immediate CAS has been requested and is enroute. Forward forward air controller (FFAC) or a forward attack coordinator-airborne (FAC-A) has arrived at the FIST location. Laser target designator (LTD) is available.)	Assist FFAC/FAC-A in locating: The target. Friendly locations. Enemy air defense artillery (ADA). Prepare to initiate and control on-call ADA suppression mission. Mark the target.	TT 6-20-7

FIST Tasks, Conditions, and Standards (ARTEP 6-165)

SECTION: Fire Support Team

LEVEL	TASK	CONDITION	TRAINING/EVALUATION STANDARD	REFERENCE
		NOTE TO TRAINER: Brigade air liaison officer (ALO), other FAC personnel, and fire support officer (FSO) should assist in this training whenever possible.	Laser designate the target if appropriate.	
		FFAC/FAC-A are not available to direct or control air. (LTD is available.)	Pass target information to tactical air control party (TACP). Prepare to initiate and control on-call ADA suppression mission. Mark the target. Laser designate the target if appropriate. Prepare to assist fighters. Adjust ordnance onto target. Abort mission if necessary. Submit damage assessment.	
1,2	3-I-3-17 PLAN and COORDINATE fire support for maneuver unit in the defense.	The supported unit is in a forward defense position and has been ordered to occupy and engage the enemy from a fixed position.	Plan defensive fires to support company and platoon fighting positions, forward and rear areas. Plan fire support for primary and alternate positions. Plan defensive fires, adjust and fire as per instructions from the unit commander.	FM 6-20 FM 71-1 TC 6-20-10
		The unit has been ordered to patrol forward of fighting positions. Patrol plans are completed concurrently with fire support plan.	Coordinate fire plans with FSO and disseminate to all platoon leaders. Maintain locations of supported unit's radars, night observation devices, and unattended ground sensors. Furnish complete information on all patrols to FSO. Plan available support for the patrol and coordinate with patrol leader prior to the finalization of the plan. Plan and number terrain reference points and give to patrol leader. Obtain communication instructions, including emergency signals, from patrol leader. Consider commander's guidance and ammunition available when planning targets.	

FIST Tasks, Conditions, and Standards (ARTEP 6-165)

SECTION: Fire Support Team

LEVEL	TASK	CONDITION	TRAINING/EVALUATION STANDARD	REFERENCE
1,2	3-I-5-18 PLAN and COORDINATE fire support for maneuver unit in the offense.	The maneuver unit has been ordered to make a deliberate/ hasty attack on enemy positions.	Plan fires on known or suspected enemy locations and critical areas, to include prominent terrain and maneuver checkpoints. Coordinate fire plan with FSO, if time permits, and disseminate to subordinate element leaders. Observer sections occupy position to best observe unit actions, adjust fire, and advise the commander during the attack. Plan fires to protect maneuver elements in consolidation. Plan fires for continuation of attack if appropriate. Assign targets a relative priority. Consider commander's guidance and ammunition availability when planning targets. Coordinate with adjacent units to insure safety of their maneuver elements.	FM 6-20 FM 71-1 TC 6-20-10
1,2	3-I-5-19 REPORT tactical situation to FSO and supporting FDC.	A maneuver unit is conducting offensive or defensive operations. Independent company and platoon operations are being conducted.	Determine, report, and update disposition of the company on the ground, to include platoon locations and patrol actions. Convey plans for tactical operations as rapidly as possible without being compromised. Report required information (size, activity, location, unit, time, equipment) concerning enemy activity as actually observed.	FM 6-20 FM 71-1 TC 6-20-10
1,2	3-I-5-20' ADVISE commander on fire support capabilities.	FIST is supporting a maneuver unit that is conducting offensive or defensive operations.	Advise commander on the positions, capabilities, and limitations of all available fire support and target acquisition means. Make known the FA survivability considerations.	FM 6-20 TC 6-20-10
1,2	3-I-5-21 PLAN and COORDINATE mortar indirect fires.	Maneuver indirect fire weapons are available.	Maintain information on positions, current capability of weapons, status of ammunition, and controlled supply rates. Coordinate fire plans with maneuver commander, FSO, and all organic observer parties, and disseminate to subordinate element leaders.	FM 6-20 TC 6-20-10

FIST Tasks, Conditions, and Standards (ARTEP 6-165)

SECTION: Fire Support Team

LEVEL	TASK	CONDITION	TRAINING/EVALUATION STANDARD	REFERENCE
1,2	3-I-5-22 DETERMINE which type of fire support to employ against a target.	While supporting maneuver operations, a target has been identified. Several different fire support assets are available.	Use lowest echelon capable of providing adequate fire support. Decide employment based on weapon capability, ammunition, and nature of target.	FM 6-20 TC 6-20-10
1,2	3-I-5-23 REGISTER and CONFIRM/ADJUST a parallel sheaf, mortar (mortar only).	An observer is directed to conduct a registration using the base mortar and adjust the remaining mortars parallel to the base mortar. NOTE TO TRAINER: This task requires live firing of mortar to measure/evaluate performance. Unit can train any time mortar units are firing. Coordination should be made for mutual support training.	Split 100 meter bracket, make range corrections to within 25 meters of target, and send appropriate corrections to FDC. Fire and adjust sheaf to within 50 meters range and 40 meters lateral spread between rounds.	FM 6-30
1,2	3-I-5-24 ADJUST final protective fires (FPF) for FA and mortars.	Maneuver unit is in defensive position, and commander has directed that FPFs be adjusted in. NOTE TO TRAINER: To train this task an identifiable terrain feature or a line between two known targets may be designated as the forward edge of friendly position.	Insure call for fire includes "danger close" for method of engagement. Use creeping fire method of adjustment. When mortars are used, request fuze delay.	FM 6-30 FM 23-90 FM 23-91
1,2	3-I-5-25 MAINTAIN assigned equipment.	Operator maintenance is required to insure operational equipment.	Operator performs preventive maintenance checks and services on equipment IAW applicable TM. Supervisors insure that maintenance is performed correctly and in a timely manner. Keep all equipment record folders and administrative records and send reports as required.	FM 29-2 TM 38-750 Appropriate equipment TM

FIST Tasks, Conditions, and Standards (ARTEP 6-165)

APPENDIX G
ANNEX K

INCLOSURE 1 FIRE SUPPORT TASKS--MOS 19D

Skill Level 1 tasks, MOS 19D (FM 17-11D 1/2)

TASK 171-11D-7601

Call for supporting fires.

TRAINING CONDITIONS

Given one operational radio, map, binoculars, compass call signs, and targets.

PERFORMANCE MEASURES

1. Establish radio communication with supporting unit.
2. Identify yourself.
3. Issue a fire mission warning order.
4. Describe location of target.
5. Describe target.
6. Prescribe method of engagement, such as type of ammunition or using "danger close."
7. Prescribe method of fire or control.

TRAINING STANDARDS

Within 2 minutes, call for a fire mission on an enemy target.

STUDY PROGRAM/REFERENCES

FM 6-40, para 9-1 and 9-9.
FM 23-91.
TEC 949-062-0001-F thru TEC 949-061-0004-F.
TC 6-40-4.
Skill Level 1 tasks, MOS 19D (FM 17-11D 1/2)

TASK 171-11D-7602

Adjust supporting fire.

TRAINING CONDITIONS

In a field location, given a map, compass, binoculars, a radio, call signs, a designated observation post, a designated target, an indirect fire support element, and a message to observe from fire support element.

PERFORMANCE MEASURES

1. Transmit observer-target direction to fire support element.
2. After impact of a round, use the bracket method to send adjustments:
   a. Sense each round when it impacts as over or short, right or left of your target.
   b. Transmit corrections in meters to Fire Direction Center; first correction should bracket the target.
   c. Continue making corrections, splitting the bracket in half each time.
   d. Transmit fire for effect when splitting 100-meter bracket or achieving effect on target.

TRAINING STANDARDS

Within 5 adjustments, using the bracket method to adjust fire, achieve effect on target.

STUDY PROGRAM/REFERENCES

FM 6-40, para 10-2, p 10-1; and para 10-11, p 10-7.
FM 23-91.
TC 6-40-4.
TEC 949-061-0005-F.
TEC 949-061-0006-F.
Skill Level 4 task, MOS 19D (FM 17-11D 4).

TASK 171-11D-7711.

Prepare a platoon fire plan.

TRAINING CONDITIONS

Given a map, overlay paper, range cards, platoon vehicle commander and an assigned battle position.

PERFORMANCE MEASURES

1. Assign sectors of responsibility to each vehicle commander.
2. Have each crew prepare a range card for both primary and alternate positions.
3. Have vehicle commander give recommendation for additional fire coverage by attached or supporting weapons.
4. Coordinate with units on the flanks to provide overlapping fire between units.
5. Coordinate fires of platoon weapons in the defense, and prepare a platoon fire plan using the range cards from all the vehicles of the platoon.

TRAINING STANDARDS

Using appropriate performance measures, prepare fire plan.

STUDY PROGRAM/REFERENCES

FM 17-12.

TASK NUMBER	TITLE	TRAINING MATERIAL REFERENCES	SKILL LEVEL INIT TNG	RESPONSIBILITY/LOCATION FOR INITIAL TRAINING INSTITUTIONAL BCT	AIT	PNCOC	BNCOC	ANCOC	UNIT SOJT	SELF
SILL LEVEL ONE										
CHAPTER 2: OBSERVED FIRE PROCEDURES Section I: Skill Level 1 Tasks										
-1501 (2-2)	Determine Direction Within the Target Area	FM 6-40, Chap 7 TEC Lesson 949-061-0001-F	1		I		R		R	R
-1502 (2-4)	Locate a Target by Grid Coordinates	FM 6-40, Chap 8 FM 6-40-5, Chap 4 TEC Lesson 949-061-0002-F	1		I		R		R	R
-1503 (2-5)	Locate a Target by Polar Plot	FM 6-40, Chap 8 FM 6-40-5, Chap 4 TEC Lesson 949-061-0002-F	1		I		R		R	R
-1504 (2-6)	Locate a Target by Shift From a Known Point	FM 6-40, Chap 8 FM 6-40-5, Chap 4, 5 TEC Lesson 949-061-0003-F TC 6-40-4	1		I		R		R	R
-0227 (2-8)	Transmit Conduct of Fire Information	FM 6-10, Chap 10 FM 6-40, Chap 18 FM 6-40-5, Chap 5 TC 6-10-1 TEC Lesson 949-061-0004-F	1		I				R	R
-1506 (2-10)	Request and Adjust Area Fire (HE: Q, VT, TI; ICM) Using Successive Bracketing Procedures	FM 6-40, Chap 10,11 FM 6-40-5, Chap 6 TEC Lesson 949-061-0005-F	1		I				R	R

TASK NUMBER	TITLE	TRAINING MATERIAL REFERENCES	SKILL LEVEL INIT TNG	RESPONSIBILITY/LOCATION FOR INITIAL TRAINING INSTITUTIONAL BCT	AIT	PNCOC	BNCOC	ANCOC	UNIT SOJT	SELF
-1507 (2-14)	Request and Adjust Area Fire (HE: Q, TI, VT: ICM) Using Hasty Bracketing Procedures	FM 6-40,Chap 10, 11 FM 6-40-5, Chap 6 TEC Lesson 949-061-0005-F	1		I					
CHAPTER 3: FIRE SUPPORT PLANNING AND COORDINATION										
Section I: Skill Level 1 Tasks										
-1751 (3-2)	Establish and Maintain Communications With Supported Elements, Fire Support Delivery Agencies and Fire Support Coordinating Agencies	FM 6-20, Appendix A, B, I FM 6-10 FM 11-50 TC 6-10-1 TEC Lesson 936-061-0108-F thru 936-061-0114-F	1		I		R		R	R
-1767 (3-4)	Prepare and Maintain a Daily Staff Journal	AR 220-15 FM 101-5, Annex H	1						I	
-1768 (3-5)	Prepare and Maintain a Fire Support Situation Map	FM 6-20, Appendix H FM 21-26, Chap 7 FM 21-30, Chap 2, 3, 4	1							I
-1770 (3-8)	Prepare a Fire Support Capability Overlay	FM 6-20, Appendix H FM 101-5, Chap 4 and App D, F FM 21-30, Chap 2, 3, 4	1						I	
-1771 (3-9)	Encode and Decode Target Unit Coordinates Using the KAL-61	CEOI	1		I					R R

TASK NUMBER	TITLE	TRAINING MATERIAL REFERENCES	SKILL LEVEL INIT TNG	RESPONSIBILITY/LOCATION FOR INITIAL TRAINING INSTITUTIONAL BCT	AIT	PNCOC	BNCOC	ANCOC	UNIT SOJT	SELF
SKILL LEVEL 2										
CHAPTER 2: OBSERVED FIRE PROCEDURES										
Section II: Skill level 2 Tasks										
-0336 (2-18)	Select and Occupy Observation Post	FM 6-20, Appendix G FM 6-40, Chap 7 FM 6-50, Chap 3, 4, 6 FM 6-140, Chap 8	2						I	
-0351 (2-20)	Select Registration Points and Reference Points	FM 6-40, Chap 7, 19	2						I	R
-1551 (2-22)	Construct a Terrain Sketch	FM 6-40, Chap 7	2						I	
-1552 (2-24)	Construct a Visibility Diagram	FM 6-40, Chap 7 FM 21-26, Chap 6	2						I	R
-1508 (2-26)	Request and Adjust Area Fire Using Creeping Procedures	FM 6-40, Chap 7 FM 6-40-5, Chap 6 TEC Lesson 949-061-0006F	2						I	R
-1509 (2-28)	Request and Adjust Area Fire Using Sound Adjustment Procedures	FM 6-40, Chap 13	2						I	
-1554 (2-30)	Request and Adjust Continuous and Coordinated Illumination	FM 6-40, Chap 13 TEC Lesson 949-061-0007-F	2			R			I	R
-1555 (2-33)	Request and Adjust Final Protective Fires Targets	FM 6-40, Chap 24	2						I	

TASK NUMBER	TITLE	TRAINING MATERIAL REFERENCES	SKILL LEVEL INIT TNG	RESPONSIBILITY/LOCATION FOR INITIAL TRAINING INSTITUTIONAL BCT	AIT	PNCOC	BNCOC	ANCOC	UNIT SOJT	SELF
-1556 (2-35)	Request and Adjust Fire on Irregularly Shaped	FM 6-40-5, Chap 6	2				R		I	
-1559 (2-38)	Conduct a Destruction Mission	FM 6-40, Chap 13 FM 6-40-5, Chap 6	2						I	
-1563 (2-40)	Conduct an Immediate Smoke Mission	FM 6-40-5, Chap 7 TC 6-20-5			2		R		I	
-1564 (2-43)	Conduct a Mortar Precision Registration	FM 23-91, Chap 8	2						I	
-1510 (2-45)	Conduct an Impact and Time Registration	FM 6-40, Chap 13 FM 6-40-5, Chap 6 TEC Lesson 250-061-6385-F	2				R		I	
-1553 (2-47)	Build and Maintain a Quick Smokescreen	FM 6-40, Chap 13 FM 6-40-5, Chap 7 TC 6-20-5	2				R		I	
-0314 (2-50)	Determine Direction or Locate an Unknown Point on the Ground by the Indirecti Fire Technique	FM 6-40, Chap 8 FM 21-26, Chap 2-6	2		I				R	
CHAPTER 3: FIRE SUPPORT PLANNING AND COORDINATION										
Section II: Skill Level 2 Tasks										
-1753 (3-12)	Plan Fires to Support an Offense	FM 6-20, Chap 4, Appendix H, I TC 6-20-1 TC 6-20-2 TC 6-20-6	2				R	R	I	R

TASK NUMBER	TITLE	TRAINING MATERIAL REFERENCES	SKILL LEVEL INIT TNG	RESPONSIBILITY/LOCATION FOR INITIAL TRAINING					
				INSTITUTIONAL				UNIT	
				BCT	AIT	PNCOC	BNCOC	ANCOC	SOJT	SELF
-1754 (3-15)	Plan Fires to Support a Defense	FM 6-20, Chap 5, Appendix H, I TC 6-20-6	2				R	R	I	R
-1756 (3-18)	Prepare/Process Forward Observer Target List	FM 6-20, Appendix H	2				R	R	I	R

TASK NUMBER	TITLE	TRAINING MATERIAL REFERENCES	SKILL LEVEL INIT / TNG	RESPONSIBILITY/LOCATION FOR INITIAL TRAINING: INSTITUTIONAL BCT	AIT	PNCOC	BNCOC	ANCOC	UNIT SOJT	SELF
SKILL LEVEL 3										
CHAPTER 2: OBSERVED FIRE PROCEDURES										
Section III: Skill Level 3 Tasks										
-1557 (2-54)	Request and Adjust Naval Gunfire	FM 6-40, Chap 29 FM 21-26, Chap 2-6	3			I				R
CHAPTER 3: FIRE/SUPPORT PLANNING AND COORDINATION										
Section III: Skill Level 3 Tasks										
-1757 (3-22)	Consolidate/Process Target Lists	FM 6-20,AppendixH,I TC 6-20-6	3			I		R		R
-1759 (3-24)	Advise Supported Unit/ Supported Headquarters of Friendly and Enemy Fire Support Capabilities and Limitations	FM 6-20, Appendix H, I, J FM 21-26 TC 6-20-6 TC 6-4-1	3			I		R		R
-1760 (3-26)	Coordinate Requests for Preplanned Close Air Support	FM 6-20, Appendix D FM 100-26 TC 101-5	3			I				R
-1761 (3-29)	Monitor/Coordinate Requests for Immediate Close Air Support	FM 6-20, Appendix D FM 100-26 TC 6-20-6 TC 101-5	3			I		R		R
-1762 (3-32)	Monitor/Coordinate Requests for Naval Gunfire	FM 6-20, Appendix E	3			I		R		R

TASK NUMBER	TITLE	TRAINING MATERIAL REFERENCES	SKILL LEVEL INIT TNG	RESPONSIBILITY/LOCATION FOR INITIAL TRAINING INSTITUTIONAL BCT	AIT	PNCOC	BNCOC	ANCOC	UNIT SOJT	SELF
-1764 (3-34)	Recommend and Disseminate Fire Support Coordination Measures	FM 6-20, Appendix H, I, J	3				I	R	R	
-1765 (3-36)	Monitor Supported Unit Operational Plans and Fire Support Needs and Inform Field Artillery Headquarters and Fire Support Coordination Centers	FM 6-20, Appendix G-K FM 21-26, FM 21-30, Chap 2, 3, 4	3				I	R	R	
-1766 (3-38)	Monitor Field Artillery Plans and Operations and Inform Supported Headquarters	FM 6-20, Appendix G-K TC 6-20-6	3				I	R	R	
SKILL LEVEL 4										
CHAPTER 2: OBSERVED FIRE PROCEDURES Section IV: Skill Level 4 Tasks										
-1565 (2-60)	Direct a Close Air Support (CAS) Strike	FM 6-20, Appendix D FM 6-140 FM 100-26	4				R	R	I	
CHAPTER 3: FIRE SUPPORT PLANNING AND COORDINATION Section IV: Skill Level 4 Tasks										
-1758 (3-42)	Coordinate Company Level Fire Support	FM 6-20, Chap 3-6, Appendix A-K	4				I	R	R	

APPENDIX G, ANNEX L
FIELD ARTILLERY AIR OBSERVER AND OBSERVATION AIRCRAFT AUTHORIZATIONS

UNIT	FA AIR OBSERVERS	OBSERVATION HELICOPTERS OH-58)
Armor/Mech Div	8 - Assigned to HHB, Division Artillery (TOE 6-302H)	10 - Assigned to Division Artillery Support Section, Division Aviation Company, Combat Aviation Battalion (TOE 17-87H0)
Infantry Div	8 - Assigned to HHB, Division Artillery (TOE 6-302H)	14 - Assigned to Division Artillery Support Platoon (2 in platoon headquarters, 4 per artillery DS Aviation Section), Aviation General Support Company, Combat Aviation Battalion (TOE 57-58H3Z0)
Airborne Div	6 - Assigned to HHB, Division Artillery (TOE 6-201H)	14 - Assigned to Division Artillery Support Platoon (2 in platoon headquarters, 4 per artillery DS Aviation Section), Aviation General Support Company, Combat Aviation Battalion (TOE 57-58H310)
Air Assault Div	None authorized	16 - Assigned to Aviation Platoon, Target Acquisition Battery (TOE 6-797H00) (4 OH-58 per DS Aviation Section and 4 in GS Section.)
Non-divisional	4 per FA Brigade, assigned to HHB (TOE 6-401H)	20 - Assigned to Corps Aviation Company (4 observation helicopter sections with 5 OH-58 each.)

APPENDIX G, ANNEX M

FIST HQ TASK PERFORMANCE IN FIST-V

	VEHICLE STATION				PERSONNEL		
TASK/SUB-TASK	TARGETING	OBSERVER	COMM	DRIVER	FIST CHIEF	FS SGT	DRV/FS SPEC
Select Vehicle Position					X	X	X
Locate Position							
Initialize/Update VPE		P				X	X
Operate VPE		P			X	X	
Send Position to FDC/FSO			P			X	X
Measure Vertical Angle and Distance to Cloud Ceiling	P				X	X	X
Advise Cmdr on Empl of Fire Support			P		X	X	
Develop/Transmit Hasty Fire Plans and Target Lists			P		X	X	
Plan and Coordinate FS in Off/Def Operations			P		X	X	
Prepare/Maintain Status Charts Situation Maps					X	X	
Coordinate Opns of Forward Observers	P				X	X	

	VEHICLE STATION				PERSONNEL		
TASK/SUB-TASK	TARGETING	OBSERVER	COMM	DRIVER	FIST CHIEF	FS SGT	DRV/FS SPEC
Observe Battlefield	P	A			X	X	X
Locate Targets	P	A			X	X	X
Transmit Calls for fire	P	A	A		X	X	X
Adjust Indirect Fires	P	A			X	X	X
Adjust Simultaneous Fires	P	A			X	X	X
Request Attack Helicopters and CAS Strikes			P		X	X	X
Direct CAS	P	A			X	X	
Boresight Night Sight/GLLD	P					X	X
Designate Targets for Laser Guided Munitions	P					X	X
Set Laser Codes						X	X

TASK/SUB-TASK	VEHICLE STATION				PERSONNEL		
	TARGETING	OBSERVER	COMM	DRIVER	FIST CHIEF	FS SGT	DRV/FS SPEC
Prepare for Operation and Operate AN/GRC-160 and AN/VRC-47 Radio Sets	P	P	P	P	X	X	X
Prepare for Operation and Operate Speech Security Equip			P		X	X	X
Prepare for Operation and Operate Intercom Set	P	P	P	P	X	X	X
Perform Operator Checks and Services on Comm Equip			P			X	X
Perform Before/During/ After Operations Checks and Services on M113 APC				P			X
Operate the M113 APC under all Conditions				P			X
Perform ESC on M113A1				P			X
Perform Operator Maint on VPE		P				X	X

TASK/SUB-TASK	VEHICLE STATION					PERSONNEL	
	TARGETING	OBSERVER	COMM	DRIVER	FIST CHIEF	FS SGT	DRV/FS SPEC
Perform Operator Maint on AN/TVQ-2 (GLLD)/AN/TAS-4 Night Sight	P					X	X
Perform Operator Maint on AN/PSG-2 (DMD)			P			X	X
Perform Operator Maint on M27 Cupola	P					X	X

P - Primary

A - Alternate

APPENDIX G
ANNEX N

LASER DEVICES, MUNITIONS, DELIVERY SYSTEMS

1. DESIGNATING EQUIPMENT: The following laser designation equipment was considered by the Study Group.

a. Laser Target Designator (LTD). A light weight (16 lbs), hand-held battery-operated laser designator configured similar to a rifle. It is "shoulder-fired" (aimed as a rifle when designating targets). It consists of three basic modules--the transmitter module; the electronics module and the battery module. It is battery powered (self-contained) and has the additional capability for operation from an external 24 volt vehicular power source when connected with a cable and filter. A night vision adapter is provided for use with the AN/TVS-5 during night or low light level conditions. The LTD can be carried by shoulder slings; however, transit casea are required for protection of the components when transported by vehicle.

(1) The LTD was designed for use primarily as an area target marker for aerial vehicle equipped with the airborne laser trackers (ALT). Its secondary role, in Army use, is to designate point targets for laser terminal homing munitions. Precise tracking and accurate target location are not required for its primary function.

(2) The night sighting device uses ambient light as its light source and depending on weather conditions, is capable of ranging to approximately 1200 meters.

(3) Total system weight with ancillary equipment - 115 lbs.

b. Modular Universal Laser Equipment (MULE). A man-packed, battery-operated laser device weighing approximately 40 lbs. It consists of three modules--the laser designation rangefinder module (LDRM), a north finding module (NFM) and stabilizing tracking module (STTM).

(1) The LDRM contains all of the MULE electronic circuitry providing for the visual sighting, laser transmission, and laser reception functions. Digital range readout is displayed in the operator's eyepiece.

(2) The NFM, weighing about five pound, mounts in the STTM head and interfaces with the LDRM. It provides a digital readout of azimuth to an accuracy of three mils.

(3) The STTM provides the platform for the MULE and also serves as the interface with a digital message device (DMD) to allow for serial transmission of range, azimuth and elevation data and for receipts to a command signal to alert the observer to begin designation. Digital readouts of azimuth and veritcal angles can be displayed.

(4) The AN/TAS-4 night sight and its associated equipment increase the overall weight of the system by approximately 70 pounds. The MULE can operate from its self-contained battery or from an external 24 volt vehicular power source when connected with a cable and filter. It can be used in a similar manner as the LTD, hand-held or tripod mounted.

(5) Total system weight with ancillary equipment - 241 lbs.

c. Ground Laser Locator Designator (GLLD) is a man-portable, battery operated laser device weighing approximately 60 pounds. It consists of four separable units and two backpacks for the major units; the laser designator/ rangefinder (LD/R) unit and the traversing unit (TU), tripod and spare battery in the other.

(1) The LD/R unit contains all of the GLLD electronic circuitry providing for the visual sighting, laser transmission and laser reception functions. Digital readouts of range, azimuth and elevation can be displayed in the operator's eyepiece.

(2) The TU and tripod provide a stable platform for the GLLD.

(3) The AN/TAS-4 night sight is also used with the GLLD. The night sight with associated equipment weigh approximatley 70 pounds. The GLLD can operate from its self-contained battery of from an external 24 volt vehicular power source when connected with a cable and filter. Also, the GLLD can be track vehicle mounted for use in armored and mechanized infantry FIST units.

(See Figure 1) GLLD are currently programmed one per FIST HQ with an additional eight devices under the control of Division Artillery in the AIM Division. Air assault and airborne division basis of issue are one per FIST and four under control of Division Artillery.

(4) The GLLD provides lasing capability, both rangefinding and target designating, in excess of five kilometers and provides the operator with a device for accurate self-location. It is capable of digital interface with the digital message device (DMD) of the TACFIRE system. This interface permits the input of data on preformatted messages for computer action. As TACFIRE matures, the capability for improved data transmission, such as moving target prediction may be realized.

(5) The GLLD is scheduled for fielding in FY 80-81 time frame.

(6) Total system weight with ancillary equipment - 185 lbs.

d. PAVE SPIKE and PAVE TACK are current laser designators mounted on high performance aircraft primarily in the Air Force interdiction role. These devices provide the laser spot necessary for engagement by on-board laser munitions.

2. ACQUISITION EQUIPMENT

a. Target Acquisition Designation System (TADS) is a turret mounted system which provides an aircraft crew with the capability to accurately search out, detect, recognize, and engage enemy targets. The system consists of five major subsystems--direct view optics, forward looking infra red, television, laser disignator/rangefinder (LDRF), and a laser tracker. It is being developed for application to the AH-64 advanced attack helicopter and is a candidate for the advanced scout helicopter.

(1) Laser target designation is accomplished by the LDRF for engagement by HELLFIRE missiles or for remote attack by other aircraft with HELLFIRE missiles or FA units armed w/COPPERHEAD munitions. The laser tracker enables the air crewman to automatically acquire targets being designated by other laser designation systems for engagement with the HELLFIRE missile system. TADS is compatible with the GLLD, LTD and MULE.

(2) It functions throught the lock-on of the laser spot from another designator, providing target directional information to the pilot for directing the aircraft towards the target. This allows one aircraft to designate targets for another aircraft, serving as an airborne designation system. As a designator then, it can designate for itself, for other aircraft or as a handoff to an aircraft equipped with an acquisition system. It can also receive target handoffs through its laser tracker.

b. Airborne Laser Tracker (ALT) is an aircraft-mounted system designed to automatically search, acquire and track target reflected laser energy. The system was developed in conjunction with the LTD but is compatible with any laser designator of the same wavelength. It is scheduled to be installed on AH-1 series Cobra in the FY 1983 time frame.

c. Remotely Piloted Vehicle System (RPV) is designed to acquire targets and combat information, in real time, beyond the line of sight of supported ground forces and associated laser devices. The system has the capability to detect, recognize and identify targets out to twenty (20) kilometers forward of the line of contact.

(1) It consists of an RPV with an ELECTRO-OPTICAL (EO) sensor package, truck-mounted ground control station, rail launcher unit, a recovery unit and associated ground support equipment.

(2) The RPV device resembles a delta-shaped flying wing powered by an 11-horsepower engine. It is six feet long, with a span of 12 feet and a weight of 145 pounds. It can cruise at altitudes up to 11,000 feet, at speeds up to 126 mph (110 knots).

(3) Control of the RPV is accomplished by the ground control station with computer assistance for flight programming and a real time video display. The system operator can designate targets for precision guided munitions or for laser target hand-off, if aircraft equipped with this capability are available.

(4) It is scheduled for fielding in the FY 1983-84 time frame.

d. Hand-Held Laser Rangefinder (AN/GVS-5 laser infrared observation device) is a lightweight, hand-held battery-operated device designed for use by platoon FO's to more accurately determine location and range of targets' known points. Range is determined by measuring the time of flight of a laser pulse to and from a target and converting this time into a distance. This laser rangefinder weighs approximately five pounds, has a 7x50 optical sighting system in a monocular configuration and makes a range determination in one second. It has a range determination accuracy of ±10 meters at distances of 200 - 9999 meters. Development has been completed, initial production contract awarded with a fielding date of 2d Qtr FY 80.

e. PAVE PENNY. A current Air Force laser seeker and acquisition device which will search for, acquire and lock-on a laser spot. It provides an indication to the pilot on a heads-up display, allowing him to turn the aircraft/weapons systems toward the target for visual or EO acquisition. PAVE PENNY will be used on CAS aircraft, enhancing aircraft survivability by greatly decreasing target acquisition time. Ground laser designation will be provided primarily by Air Force TACP personnel equipped with an LTD or by the FIST chief equipped with the GLLD, when Air Force TACP personnel are not available. Communications between the ground designator and the aircraft must be established. The ground designator must lase the target prior to arrival and acquisition by the aircraft.

f. Laser Acquisition Device (LAD). A laser acquisition device mounted on a standard pilot's helmet. Currently being developed by the Air Force for fielding in the 1981-1982 time frame. It provides rapid acquisition of a laser designated target. It functions by illuminating reticle rings on the pilot's visor thus indicating when his line of sight is on line with a spot from a laser designator, i.e., a target. It is envisioned to be used on interdiction aircraft not equipped with PAVE PENNY. The pilot can use his LAD to acquire a target designated by a ground or remote designaotr, choosing either to drop a laser guided bomb while the ground designator lases the target or using an airborne designator to designate the target (target hand-off) prior to dropping the laser guided bomb. The LAD is compatible with the GLLD, LTD and MULE.

3. MUNITIONS

a. COPPERHEAD. The Cannon Launched Guided Projectiel XM712 is a 155mm projectile which is significantly longer (54 inches) and heavier (137 lbs) than the standard 155mm projectile. It requires no special assembly or testing at the firing site other than that normally afforded standard ammunition. The projectile is shipped and stored in a sealed container.

(1) It consists of three main sections--guidance, warhead and control. The guidance section contains a laser seeking device and associated electronics. The warhead section is loaded with a shaped charge explosive, a fuze module and an explosive train. The exterior of the warhead contains the laser code and timer switches which must be set in accordance with the given

fire commands. The control section contains four fins for control and four wings for extending range. They are activated after the projectile leaves the gun tube to provide stability, roll control and flight control.

(2) The projectile is fired either in a ballistic or glide mode providing it the best opportunity to seek the designating laser energy. The designator operator places this laser energy on the target continuously during the last 13 seconds of the COPPERHEAD trajectory. Loss of the laser energy and subsequent reduction of Ph may be caused by many things, including equipment failure, battelfield obstruction by smoke, vegetation, terrain, dust, fires and explosions.

(3) The COPPERHEAD projectile provides the maneuver commander an additional direct fire capability, augmenting those organic resources available for his use within his fire distribution plan. this augmentation is accomplished through the use of those laser designating devices previously mentioned and the remotely piloted vehicle (RPV) which also provide a laser energy source sought by the round. Primary designator for the COPPERHEAD munition is the GLLD. Fielding of the round is projected for FY 80-81 time frame.

b. HELLFIRE. HELLFIRE modular missile system has been designed for the AH-64 advanced attack helicopter as a primary point target weapons system in the 1982-83 time frame.

(1) The HELLFIRE missile system consists of a modular launcher; pilot and co-pilot/gunner control panels, remote HELLFIRE electronics and the HELLFIRE missile.

(2) The missile consists of a common missile body assembly, warhead assembly and motor assembly and a seeker assembly. It is packaged in a common container for field use. Field testing for operability is conducted by the on-board fault detection location system (FD/LS) of the aircraft. There are various seeker assemblies, laser, fire and forget (IRIS - imagine IR sensor) and air defense suppression (RF/IR radiation seeker) under development for use with this missile.

(3) The laser seeker device is designed to search for laser energy matching the code that has been set upon the warhead. Communications requirements exist between a remote laser designator and the aircraft to effect necessary coordination during engagements. HELLFIRE system is compatible for use with the GLLD, MULE, LTD and TADS.

c. AIR FORCE BOMBS AND MISSILES.

(1) LASER GUIDED BOMBS. These are standard air force munitions fitted with a laser seeker. The seeker acquires a laser spot from a laser designator and guides the bomb to the target. These laser guided bombs were not designed as a point target weapon; however, they provide a circular error probable (CEP) suitable for use against bridges and bunkers. These bombs are used on aircraft in the Air Force interdiction role and will not

normally be used in the CAS function. If they must be used in the CAS role, they will used in conjunction with the LAD helmet or PAVE PENNY and ground designation.

(2) LASER MAVERICK is a current version of the Air Force MAVERICK (air/ground missile) fitte[d] [w]ith a laser seeker device. The seeker acquires a laser spot from a designa[tor] and locks onto it. The pilot receives an indication that the missile seeker [is] locked onto the target and fires the missile which is guided to the target [by] the laser energy. This munition was designed as a point target used prim[arily] against moving and stationary armored vehicles. It can be carried [on] CAS air[craft] and used in conjunction with PAVE PENNY. It is compatible [w]ith the C[AS], MULE and LTD, preferring designation by GLLD due to designati[on] [c]apability. Forecast for fielding is uncertain.

4. DELIVERY SYSTEMS

a. The systems currently being developed for Army use/delivery of laser guided munitions include the COPPERHEAD system and the HELLFIRE systems. The munitions involved in these systems have been previously discussed; therefore, the focus of attention is the delivery weapons. For use with COPPERHEAD, the 155mm howitzer (M109A1/2/3) is the weapon for firing the COPPERHEAD munition to a range of 17 kilometers. The M109A1 howitzers are organic weapons, for the armored and mechanized divisions. They may also be found at the corps level under the control of the corps or FA brigades. The M198 howitzer is the newly developed towed version of the 155mm howitzer. It will be available for use in the infantry, airborne, and air assault divisions, either as an organic weapon or through attachment/ assignment from the corps headquarters. The cannon tubes of the M109A1 and M198 are identical.

(1) Current proposed FA tactics and doctrine incorporate the use of the COPPERHEAD munition within the overall fire support plan for the maneuver elements.

(2) Artillery battalions for the Army of the mid 1980's will be organized with three firing batteries each possessing six to eight howitzers. Direct support battalions will be equipped with the 155mm howitzer except the airborne division, thus providing a delivery system for the COPPERHEAD munition.

(3) Availability of artillery assets, especially the 155mm howitzer, are quite important. There are insufficient additional 155mm howitzer battalions avilable at the corps level to service COPPERHEAD and conventional targets. Responsiveness to COPPERHEAD requests is based on availability of firing unit, ammunition and responsive communication links, whether voice or digital. These aspects must be considered when employing the weapons system. In addition, requirements for conventional close support must be considered.

(4) The COPPERHEAD system functions fundamentally the same as the conventional system, with the exception of laser commands necessary for

the observer to commence the thirteen second lasing reuired for projectile laser seeker guidance. This designation and the communications required are integral components of successful mission accomplishment.

b. The advanced attack helicopter will be the vehicle for employment of laser HELLFIRE. Attack helicopters may fight as part of the divisional/non-divisional organizations but are normally placed under operational control of a division, ground combat brigade or an ACR. Each attack helicopter will be equipped with 16 missiles, having various seeker devices. The laser seeker is currently being developed and will be fielded first to help defeat those individual hard point targets well forward of the ground maneuver elements, beyond the effective range of ground anti-tank weapons and as a supplement to the fires of the weapons within range, including FA and CAS.

(1) FM 17-50 and FM 90-1 identify the tactics and doctrine for the employment of attack helicopters. HELLFIRE envisions as its primary airborne laser designator the TADS system, and the GLLD as its primary ground laser designator. The LTD and MULE are compatible with HELLFIRE but their use is limited due to their designation range capabilities. Attack helicopter employment is normally accomplished by placing three attack helicopter teams of the attack helicopter company under the operational control of a maneuver brigade.

(2) This attack helicopter team is normally composed of five attack helicopters and three scout aircraft. The scout's mission is to see the battlefield, acquire targets and coordinate movement of the attack helicopters who remain masked behind terrain features until given appropriate instructions by the scout. This scout will be equipped with a TADS system, capable of laser target designation. The attack helicopter can operate in a laser autonomous mode, taking target handoff from the scout and engaging the target or the laser remote mode whereby an aircraft or a ground remote designator designates for the HELLFIRE missile laser seeker.

(3) When using the autonomous designator mode, the attack helicopter must remain exposed to designate the target until missile impact. The designator (aircraft) must have line of sight to the target for the seeker to achieve lock-on. In the laser remote mode, the attack helicopter does not need to be exposed for great periods of time, because the laser seeker searches for the laser energy emitted by the remote designator, whether it is airborne or ground located. This remote designator must continue to designate the target until missile impact. Again, communications (voice or digital) must be established between the attack helicopter and the remote designator.

Ground Designator Weight Summary
(Current Weight/Pounds)

Primary Equipment	LTD	MULE	GLLD
Laser Unit	11.9	15.9	28.8
Battery	4.2	4.2	7.5
Tracking Aid (Tripod/Traversing Unit)	----	16.7	16.1
Back Packs	Note a	Note a	4.1/1.9
Transit Cases	46.0[b]	44/50[b]	N/A
Manuals/Optics Cleaning Kit		Negligible	
Subtotal (w/o Transit Cases)	62.1	130.8	59.4
Night Sight:			
AN/TVS-5 in Case	16		
AN/TAS-4 in Case		29	29
Night Sight Bracket	2	5.8[d]	
Night Sight Bracket and 3 Batteries in Case			39.5
Night Sight Boresight Collimator in Case		16[e]	16[e]
Vehicle Power Conditioner		5[e]	5[e]
Five Night Sight Batteries in Case		12	12
Primary Equipment	**LTD**	**MULE**	**GLLD**
Five Night Sight Coolant Bottles in Case		13	13
Subtotal	18	75.8	109.5
Vehicle Associated Equipment:			
External Power Adapter in Case	35[g]	35[g]	
Filter Box and Cable			6.1[f]
M113A1 Vehicle Adapter Mount			10
Subtotal	35	35	16.1
Total	115.1	241.6	185.0

	LTD	MULE	GLLD
Laser Unit	6	9	2.3
Tracking Aid		10	3.0
Ext Power Adapter	3	3	N/A
Night Sight	1.5	3.8	3.8
Total	10.5	25.8	9.1

Notes.

[a] LTD/MULE carried by shoulder slings.
[b] Transit case required when transported by vehicle. Weight/cubes are engineering estimates only.
[c] Stored in LTD transit case.
[d] Stored in STTM transit case.
[e] Estimated Weight
[f] Stored in backpack battery pouch when required. Replaces battery in LD/R for vehicle operation.
[g] EMI filter assembly replaces battery for vehicle operations.
[h] Cubic feet of storage space required for vehicle operations.

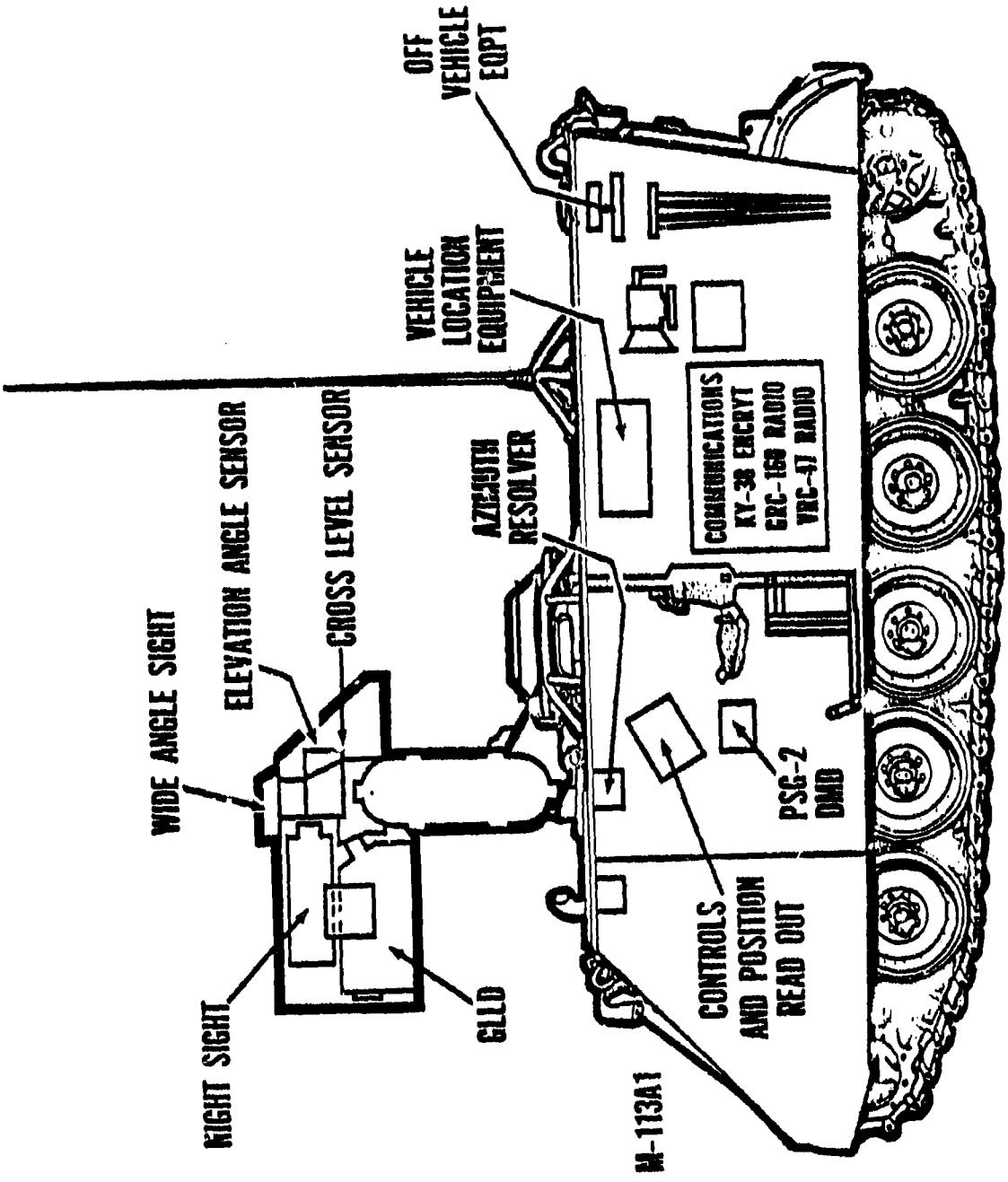


Figure G-1. Proposed FIST V

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