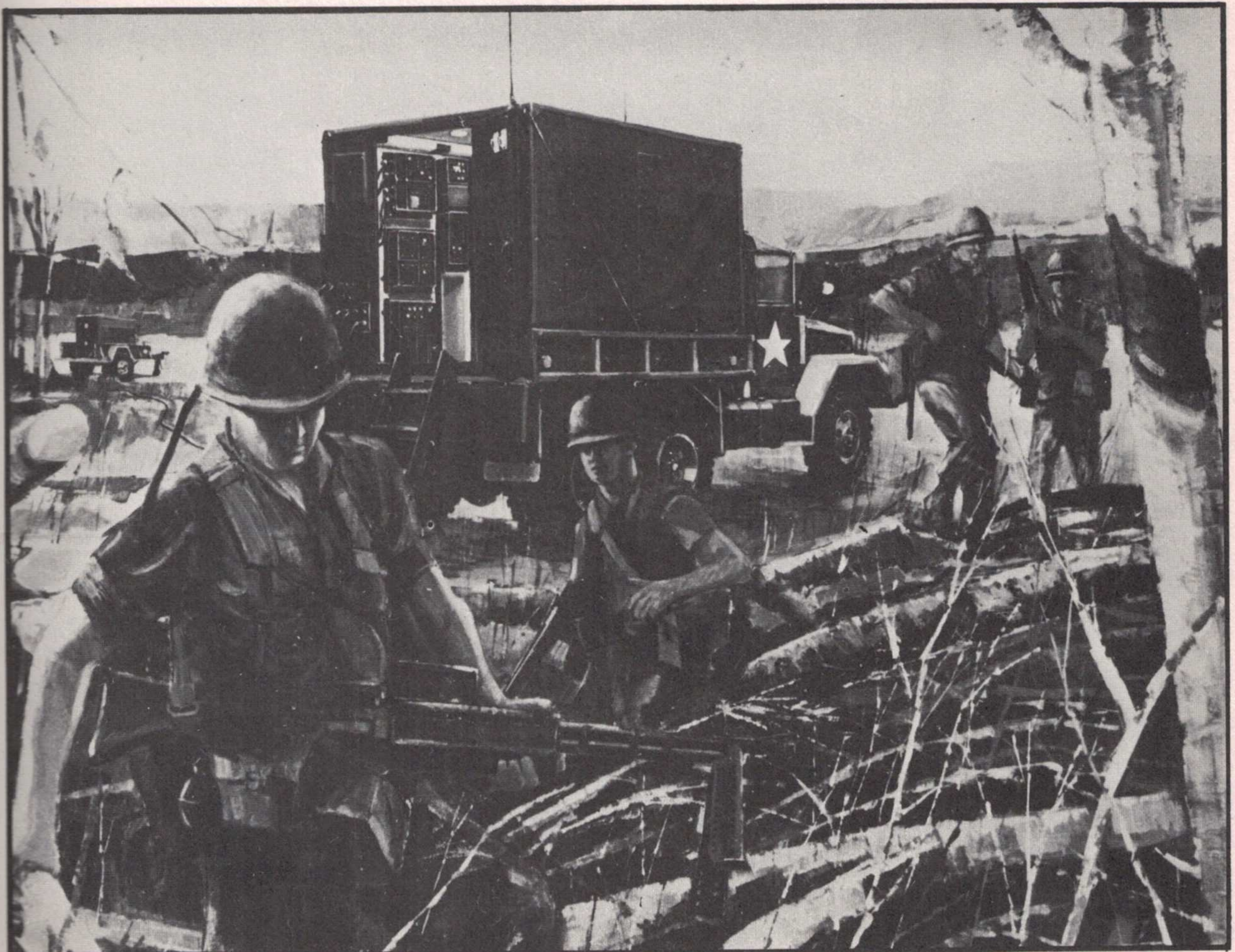


TACFIRE  
TACFIRE  
TACFIRE  
TACFIRE  
TACFIRE

TC 6-1

*OKS*



TACFIRE  
**TACFIRE**

TC 6-1

HEADQUARTERS  
DEPARTMENT OF THE ARMY  
Washington, DC, 15 July 1977

TACFIRE  
TACFIRE  
TACFIRE  
TACFIRE  
TACFIRE  
TACFIRE

Tactical FIRE

Direction

System

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# WHAT IS TACFIRE?

## Chapter 1

---

TACFIRE is an  
automatic data  
processing equipment

---

**TACFIRE is a computerized  
fire support command and  
control system with a  
wide range of capabilities**

---

## TACFIRE:

*Provides rapid  
secure communication*

---

*Correlates target  
intelligence*

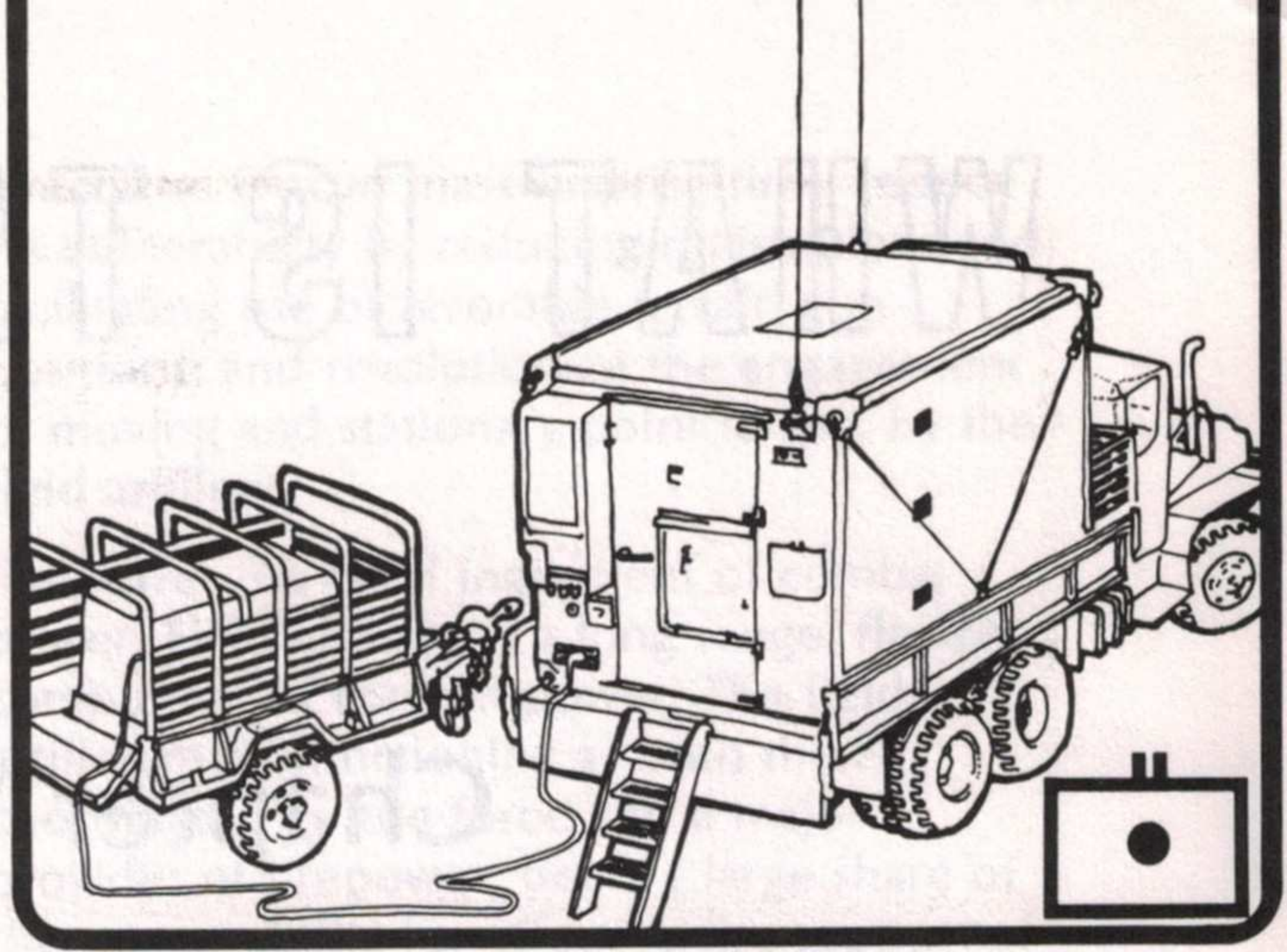
---

*Performs technical  
and tactical fire control*

---

*Provides automated  
consideration of  
commander's criteria*

---



THE FA BATTALION COMPUTER CENTER

---

*Is capable of  
integrating new  
systems*

---

*Automates fire  
planning function*

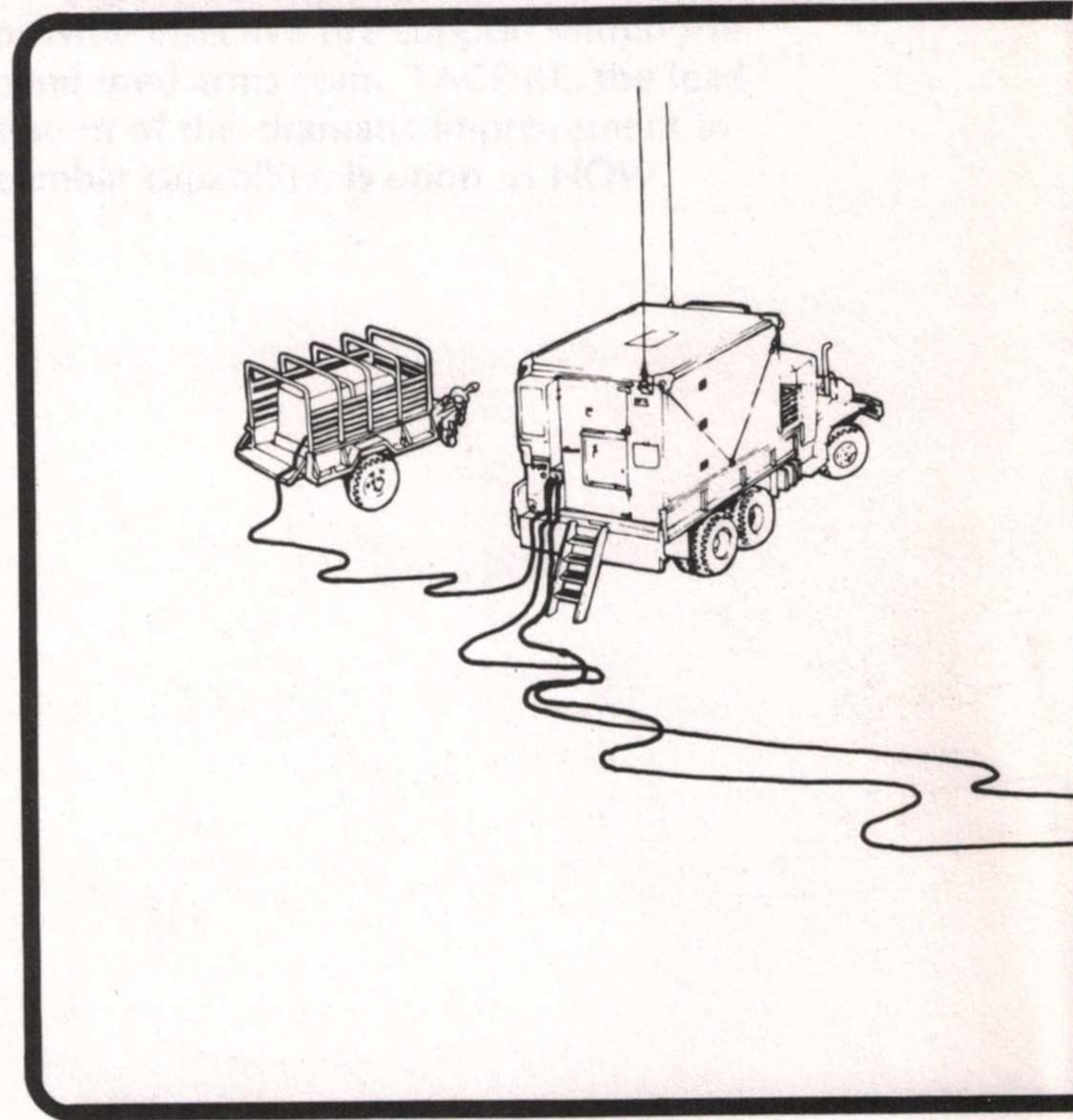
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*Performs nuclear  
and nonnuclear  
target analysis*

---

*Computes and stores  
survey information*

---

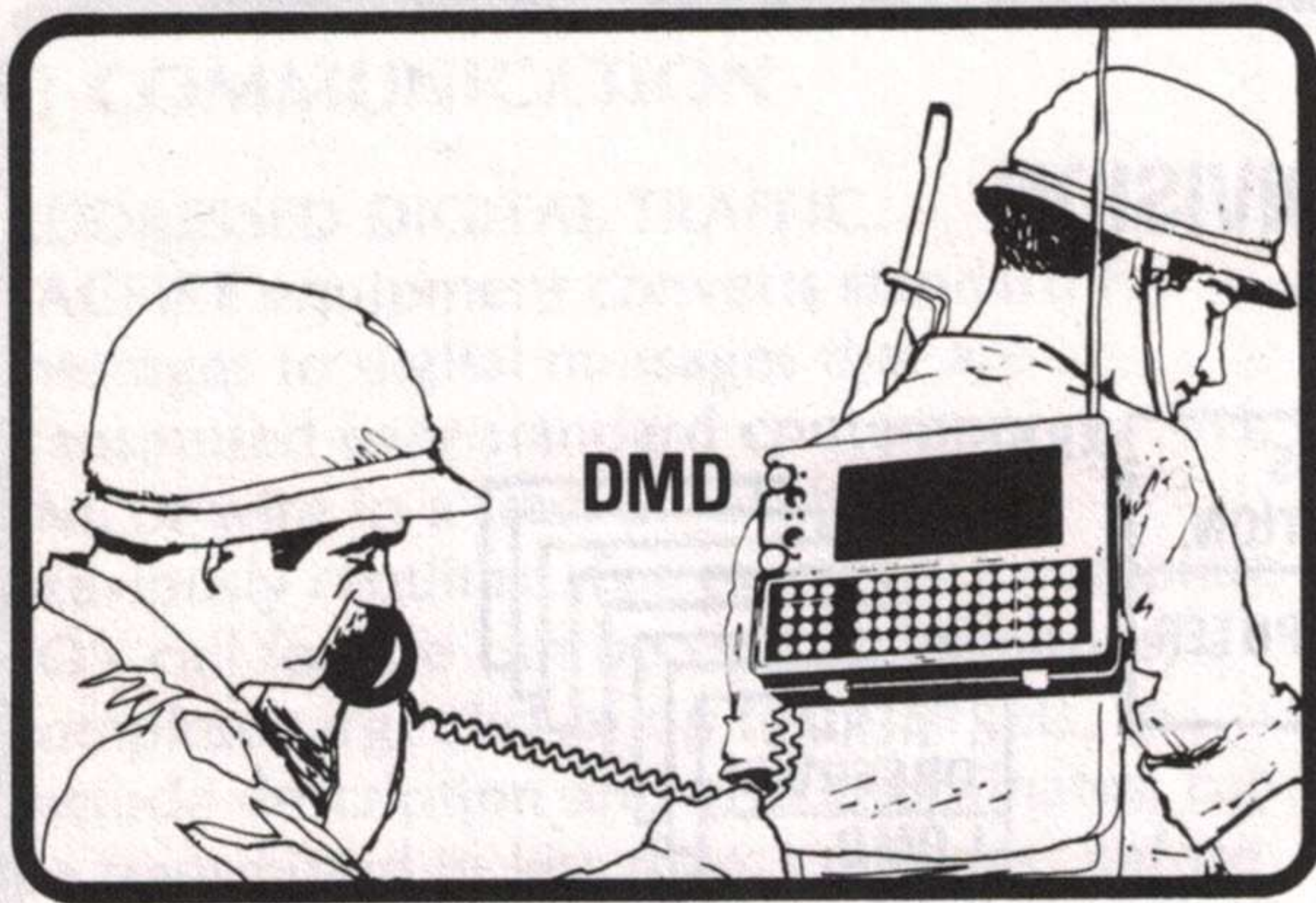


THE DIVISION ARTILLERY COMPUTER CENTER

**□ AUTOMATIC DATA PROCESSING EQUIPMENT**

TACFIRE equipment basically consists of two types of central computers and three types of remote terminals. The principal functions of

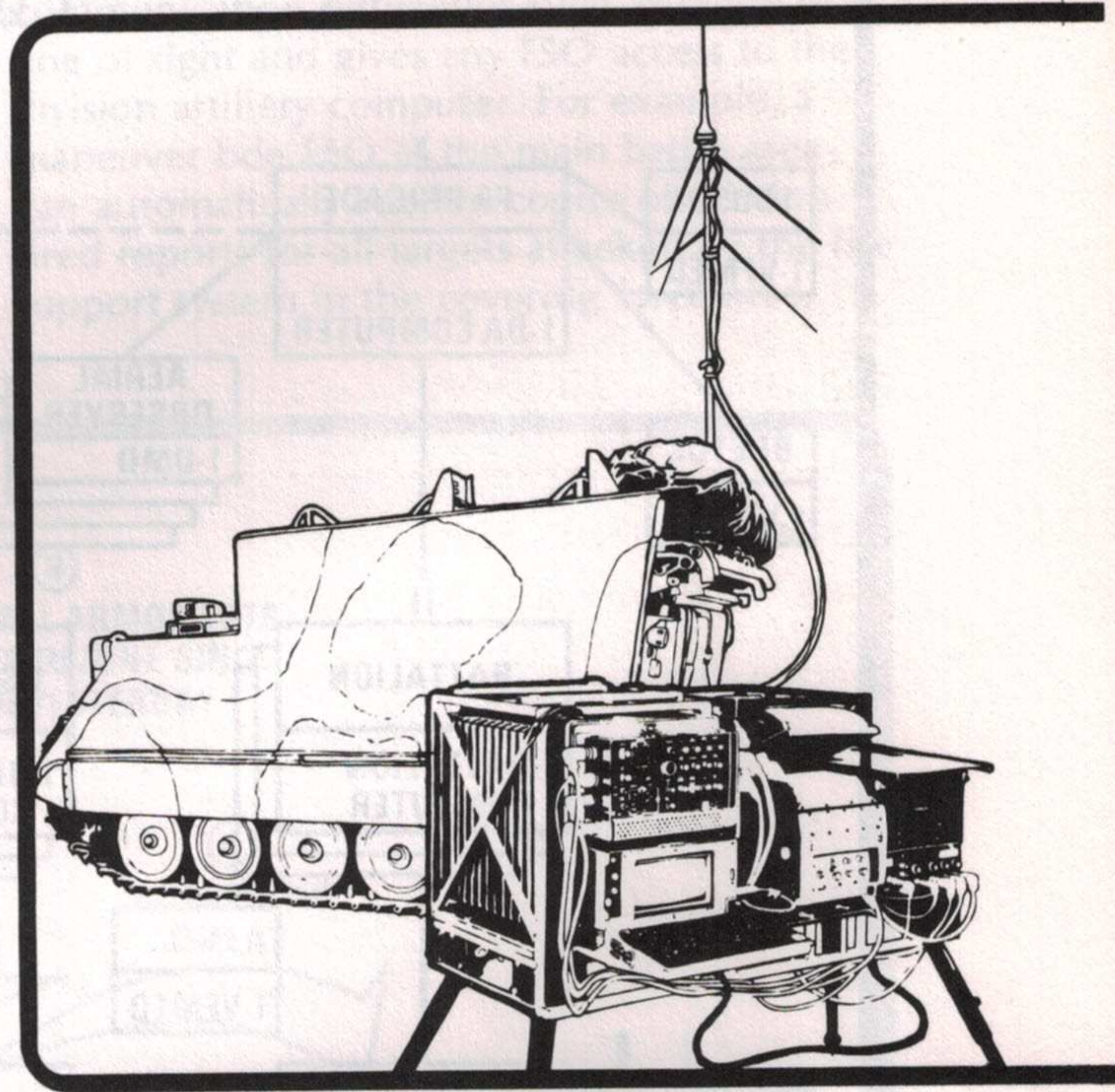
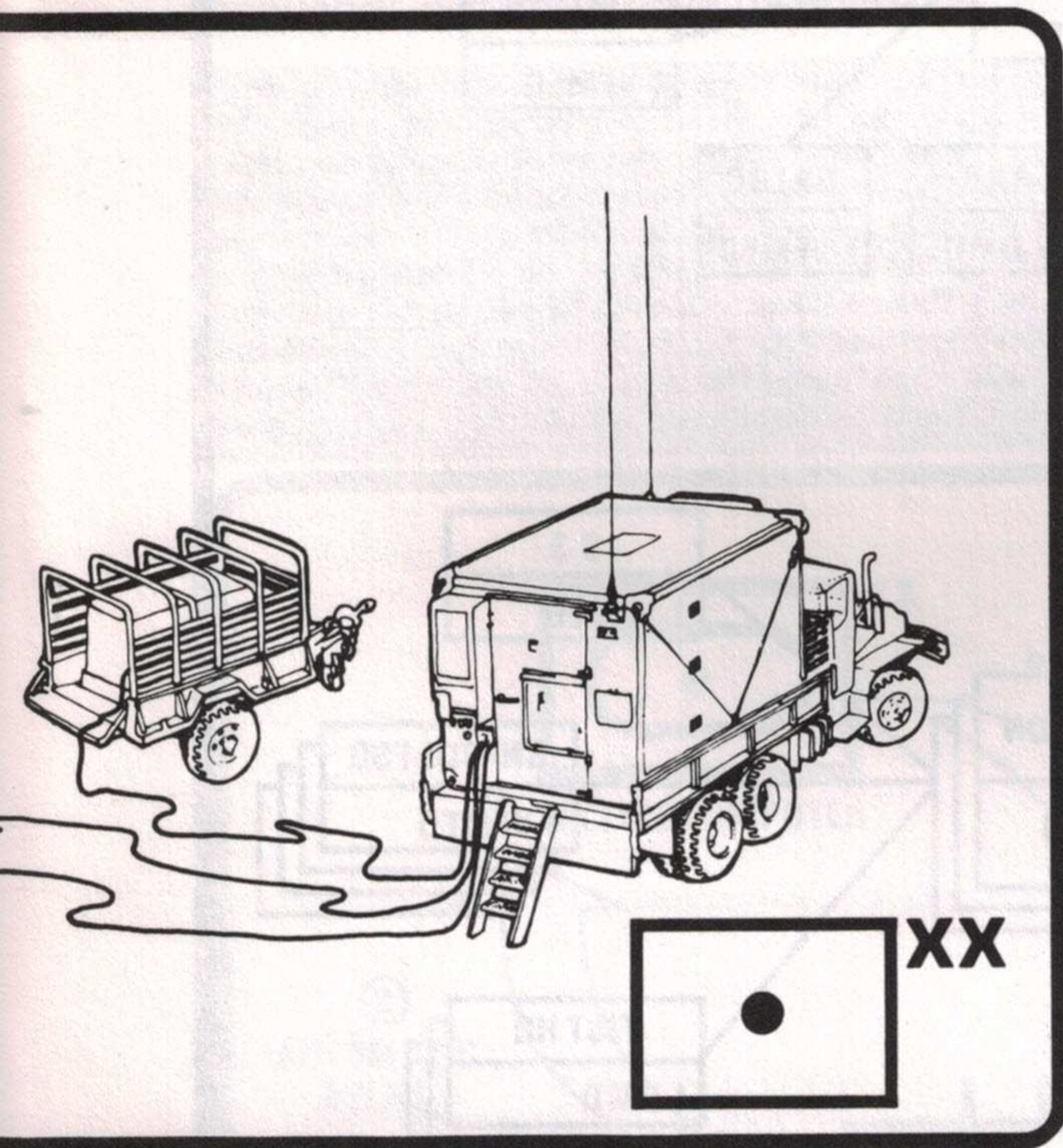
the computers are TACTICAL and TECHNICAL FIRE CONTROL, while the remote terminals are used to communicate with the computers. The term tactical fire control includes evaluating targets, selecting units to fire, munitions to be used, and volume of fire. Technical fire control simply



THE DIGITAL MESSAGE DEVICE

more tactical functions than the battalion computer.

Remote terminals are issued to the elements of the fire support system which require access to computers. The chief of each FIST uses a *digital message device (DMD)* to communicate with the battalion computer. An example of this is transmitting a request for fire and receiving the message to observer. Other remote terminal users (FSE, FSO, and FA S3) have a *variable format message entry device (VFMED)* to transmit and receive digital traffic from the parent computer. A bn FSO, for instance, can request and receive the

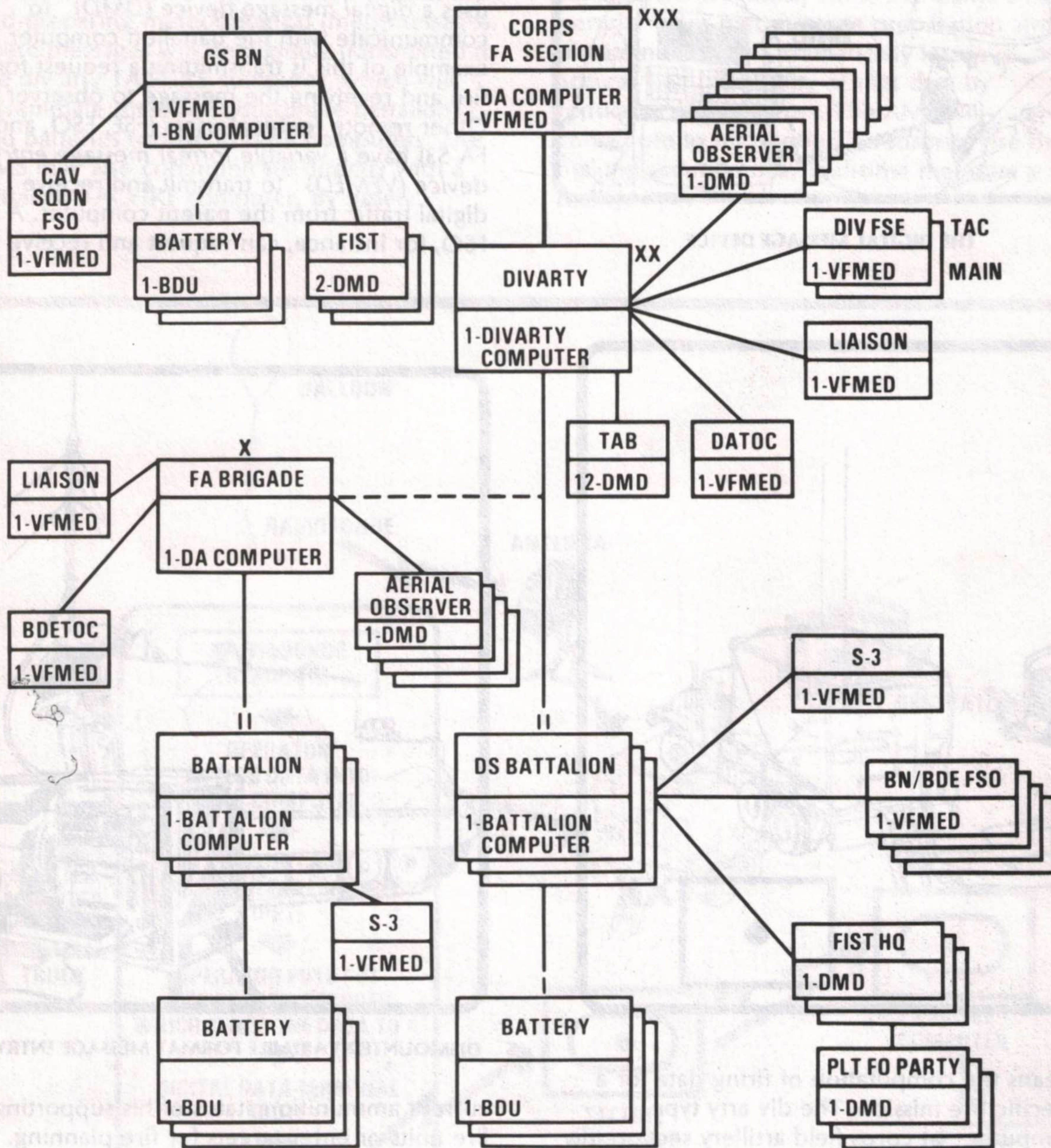


DISMOUNTED VARIABLE FORMAT MESSAGE ENTRY DEVICE

means the computation of firing data for a specific fire mission. The div arty type computer at corps field artillery section, div arty HQ, and FA bde HQ is used for "tactical fire control." The computer issued to FA battalions is oriented on "technical fire control" but possesses a "tactical fire control" capability as well. The div arty type computer has more components and a larger memory and can therefore be programmed to handle

current ammunition status of his supporting fire units or enter targets for fire planning. The *battery display unit (BDU)* is found at each firing battery. This device receives and acknowledges operational data, such as fire commands. Figure 1 shows TACFIRE equipment distributions. A detailed discussion of TACFIRE equipment is found in appendix B.

# INF (MECH) DIVISION



BASIS OF ISSUE FOR TACFIRE EQUIPMENT



## □ COMMUNICATION

### ADDRESSED DIGITAL TRAFFIC.

TACFIRE equipment converts standard FA messages to digital messages that are transmitted over standard contemporary AM, FM, or wire in a fraction of the time previously required. For example, a complete FO's call for fire can be sent in 2 seconds; a complete target list of up to 25 targets, to include description and grid coordinates, can be transmitted in less than 3 minutes. Before transmission, a message is "addressed," either automatically or by the operator, so that only the intended elements receive it. Other stations, even if they are on the same frequency, will not receive the message.

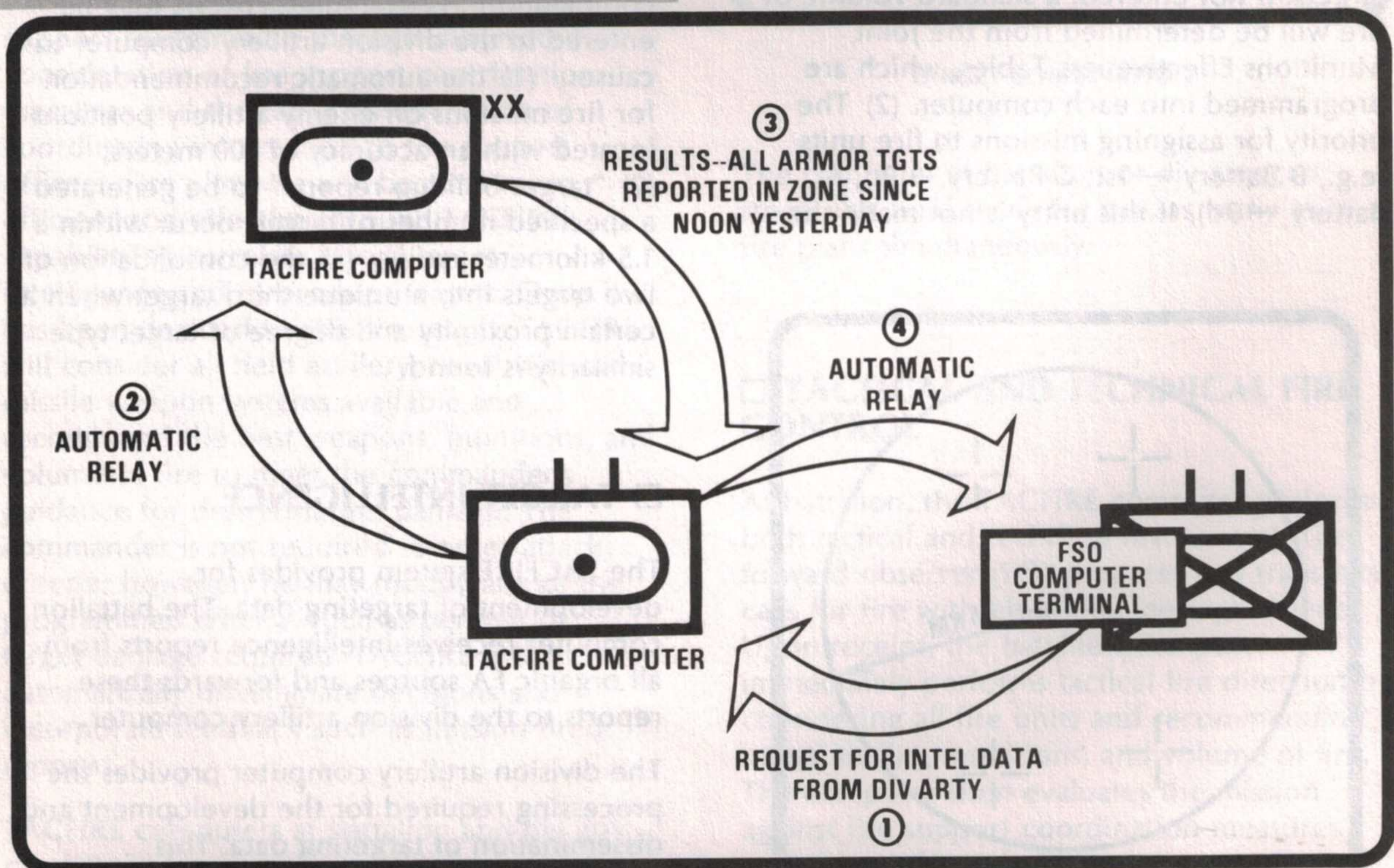
**\*Fire planning information, friendly locations, and other information of value to the enemy must be encrypted for radio transmission. Three methods are available to encrypt this information: use of manual codes such as DRYAD with voice communications; if available, use of KY-38 automatic encryption systems on the DMD links; and last, use of the "free text" message with DRYAD manual encoding prior to transmission. In all cases, all net subscribers must be capable of using the method chosen. (Future references to which this note applies are shaded for quick identification.)**

## AUTOMATIC ENCRYPTION AND DECRYPTION

- \* TACFIRE computers, VFMED's, and BDU's automatically encrypt and decrypt messages using standard Army COMSEC keying generators (KG) attached to each computer and terminal unit. The FO's DMD currently does not have this capability. Messages sent to DMD's are not encrypted.

## AUTOMATIC RELAY OF MESSAGES

Each TACFIRE computer can automatically relay an incoming message to another operator on another communication net. This capability assists in overcoming communication difficulties such as range or line of sight and gives any FSO access to the division artillery computer. For example, a maneuver bde FSO in the main battle area can automatically receive copies of mission fired reports for all targets attacked by the fire support system in the covering force area.



FSO AUTOMATIC RELAY

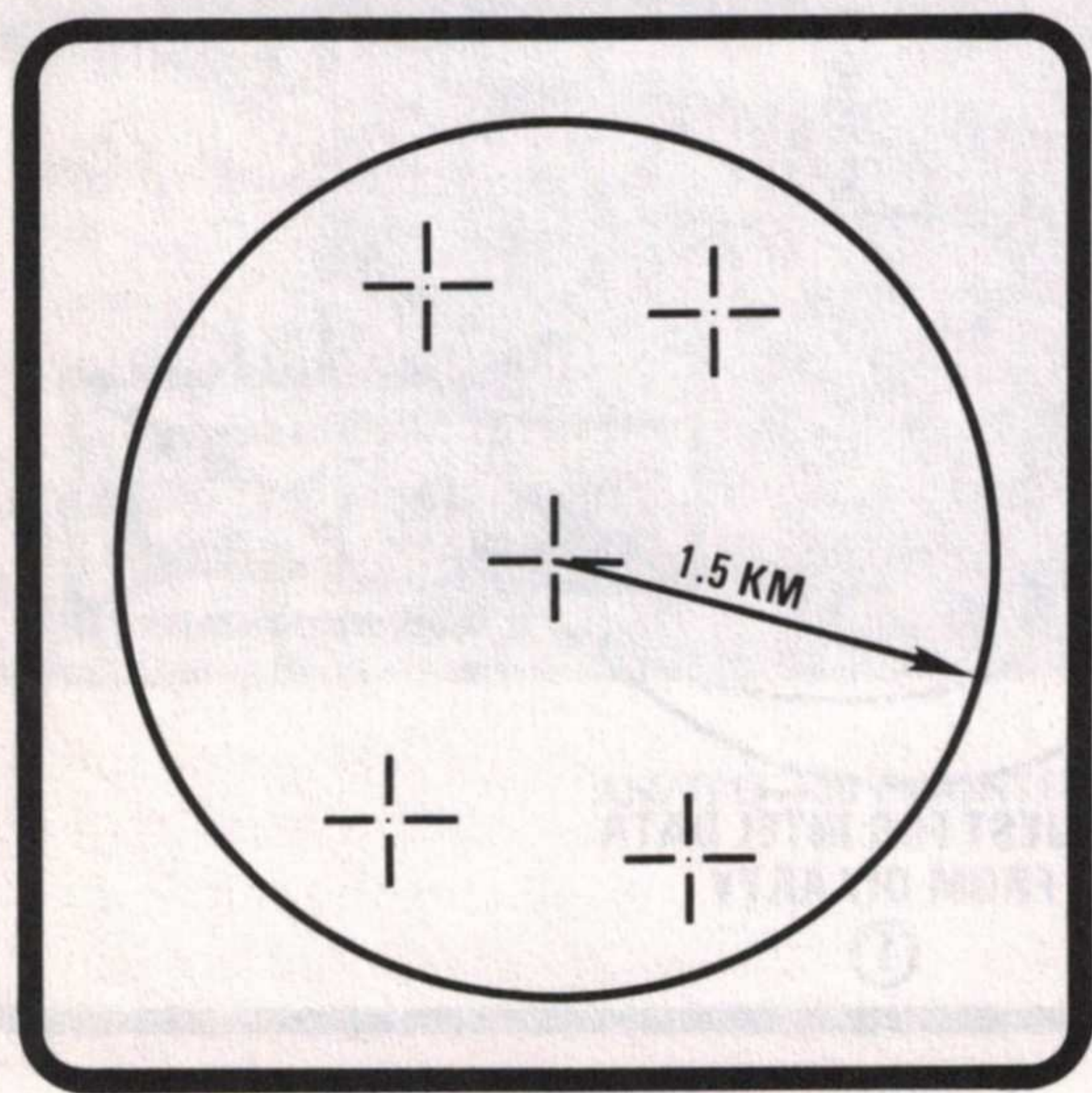
This is done by automatic relay through an FA bn computer at the time the FIST chief requests "End of Mission" on a target. Such information will help the bde FSO read the flow of the battle in the covering force area.

## □ COMMANDER'S CRITERIA

Commander's criteria are specific operational guidelines entered into the computer during planning for use during the battle. This guidance covers the areas of tactical fire control, fire planning, and artillery target intelligence.

### TACTICAL FIRE CONTROL

Commander's criteria statements are normally entered into the computers to control the way fire support is used. Some examples are: (1) The volume of fire or desired percent of damage for different types of targets. If not entered, a standard volume of fire will be determined from the Joint Munitions Effectiveness Tables, which are programmed into each computer. (2) The priority for assigning missions to fire units (e.g., B Battery — 1st, C Battery — 2d, A Battery — 3d). If this entry is not made the



TARGET BUILDUP

computer will use the order in which fire units are entered into the computer as the priority for use. (3) Fire units, munitions, or munitions per fire unit to be excluded from mission assignment. If not excluded, all fire units and munitions found in the computer will be considered.

### FIRE PLANNING

In tactical fire control the commander can establish criteria for the computer to follow when determining the method of attacking targets. In addition to the examples found in tactical fire control, he may desire to add such things as the reservation of fire units.

### ARTILLERY TARGET INTELLIGENCE

Commander's criteria for artillery target intelligence include guidelines for such things as automatic generation of fire missions, target buildup reports, and target combination. As examples, criteria may be entered in the division artillery computer to cause: (1) the automatic recommendation for fire missions on enemy artillery positions located with an accuracy of 100 meters; (2) "target buildup reports" to be generated if a specified number of targets occur within a 1.5-kilometer radius; (3) the consolidation of two targets into a unique third target when a certain proximity and degree of target type similarity is found.

## □ TARGET INTELLIGENCE

The TACFIRE system provides for development of targeting data. The battalion computer receives intelligence reports from all organic FA sources and forwards these reports to the division artillery computer.

The division artillery computer provides the processing required for the development and dissemination of targeting data. This processing includes receiving and storing intelligence data reported by FA elements.

This computer can store up the 1,350 separate

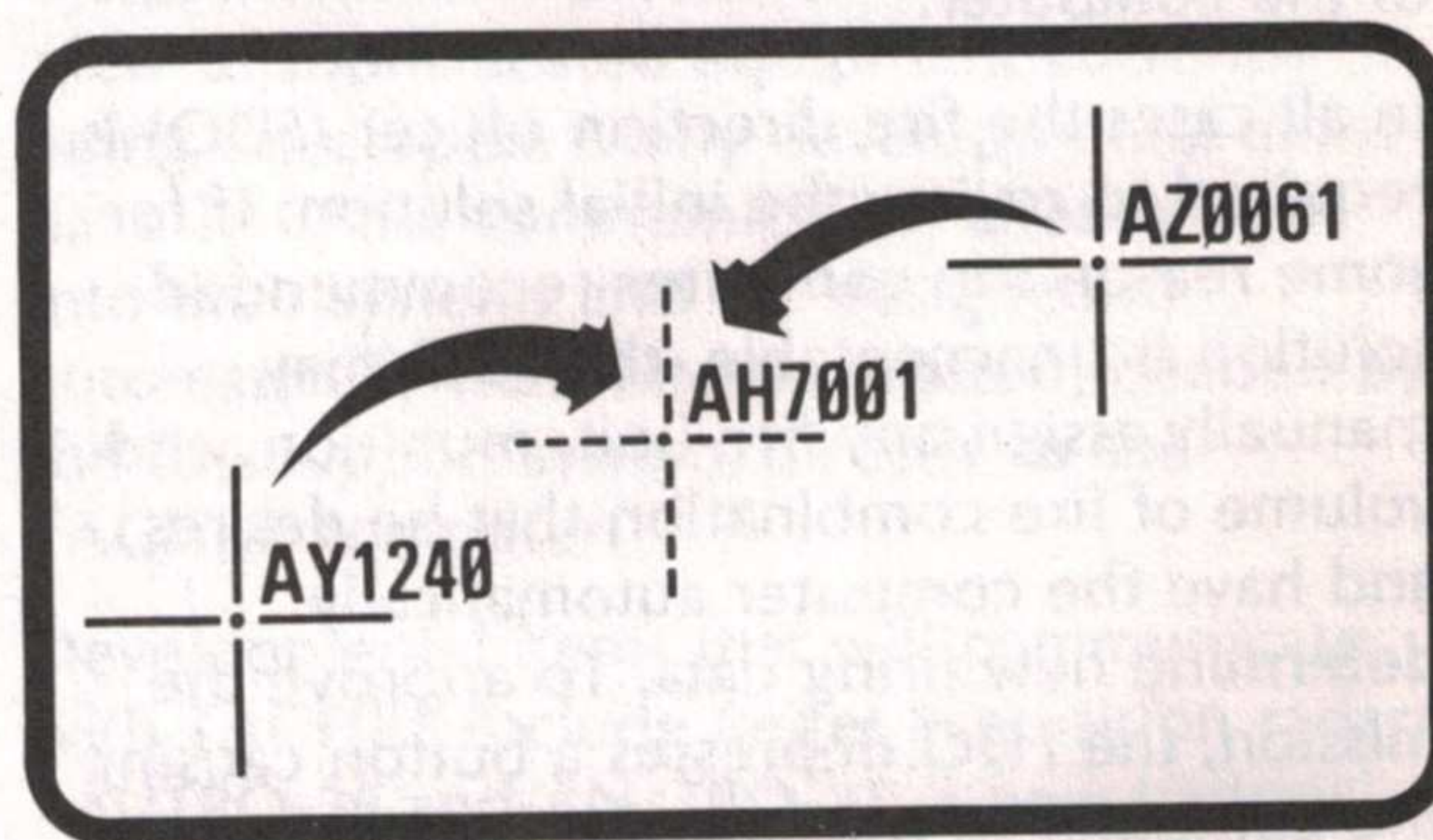
targets, and automatically combines targets by location and nature of target; notifies the FDO of target buildup by area, and recommends fire missions based on intelligence reports where the commander's criteria are satisfied. When required to do so it will search its artillery target intelligence file to retrieve targets for use in fire planning by the div arty TOC, or forward this list to the requester. This system will also process shell reports, sort targets by desired target characteristics (e.g., type, size, location) and will automatically disseminate intelligence information to FA and maneuver organizations through the FSO.

## □ FIRE PLANNING

The TACFIRE system will provide better integration of maneuver and fire support planning by improving the exchange of intelligence and battlefield control measures between fire support and maneuver. This exchange is enhanced by high-speed fire support coordination through automated consideration of fire support coordination measures and the rapid dissemination of coordinating information to fire support officers. Fire planning will become more efficient and effective through TACFIRE's capability to correlate bits of target intelligence and to produce targets. Once it has been decided to attack a target, TACFIRE will consider all field artillery, naval, air, and missile weapon systems available and recommend the best weapons, munitions, and volume of fire to meet the commander's guidance for desired target damage. The commander is not required to enter attack criteria; however, he may modify any of the programmed criteria, such as percent of target damage required. TACFIRE will automatically disseminate decisions and incorporate feedback such as mission fired reports.

TACFIRE computers at battalion and div arty can be used to store target lists, determine methods of attack, and prepare schedules of fires. When the div arty computer develops a

schedule of fire it transmits it to the computers of the selected battalions. DS bns will retransmit the plans to the FSO's for coordination with maneuver elements. Fire commands are prepared and transmitted to the batteries along with the schedule of fires by the battalion TACFIRE computer. At times, battalions may perform autonomous fire planning by preparing target lists, determining methods of attack, computing schedules of fire, and preparing fire commands using their TACFIRE computer.



TARGET COMBINATION

The computer at battalion or div arty can store, and hold ready for use, as many as 30 fire plans simultaneously.

## □ TACTICAL AND TECHNICAL FIRE CONTROL

At battalion, the TACFIRE computer performs both tactical and technical fire control. The forward observer (FO) prepares and transmits calls for fire with his digital message device. Upon receipt, the battalion computer immediately performs tactical fire direction by considering all fire units and recommending unit(s) to fire, munitions, and volume of fire. The computer then evaluates the mission against fire support coordination measures such as unit boundaries and the coordinated fire line. Once tactical fire control is completed, the computer performs technical

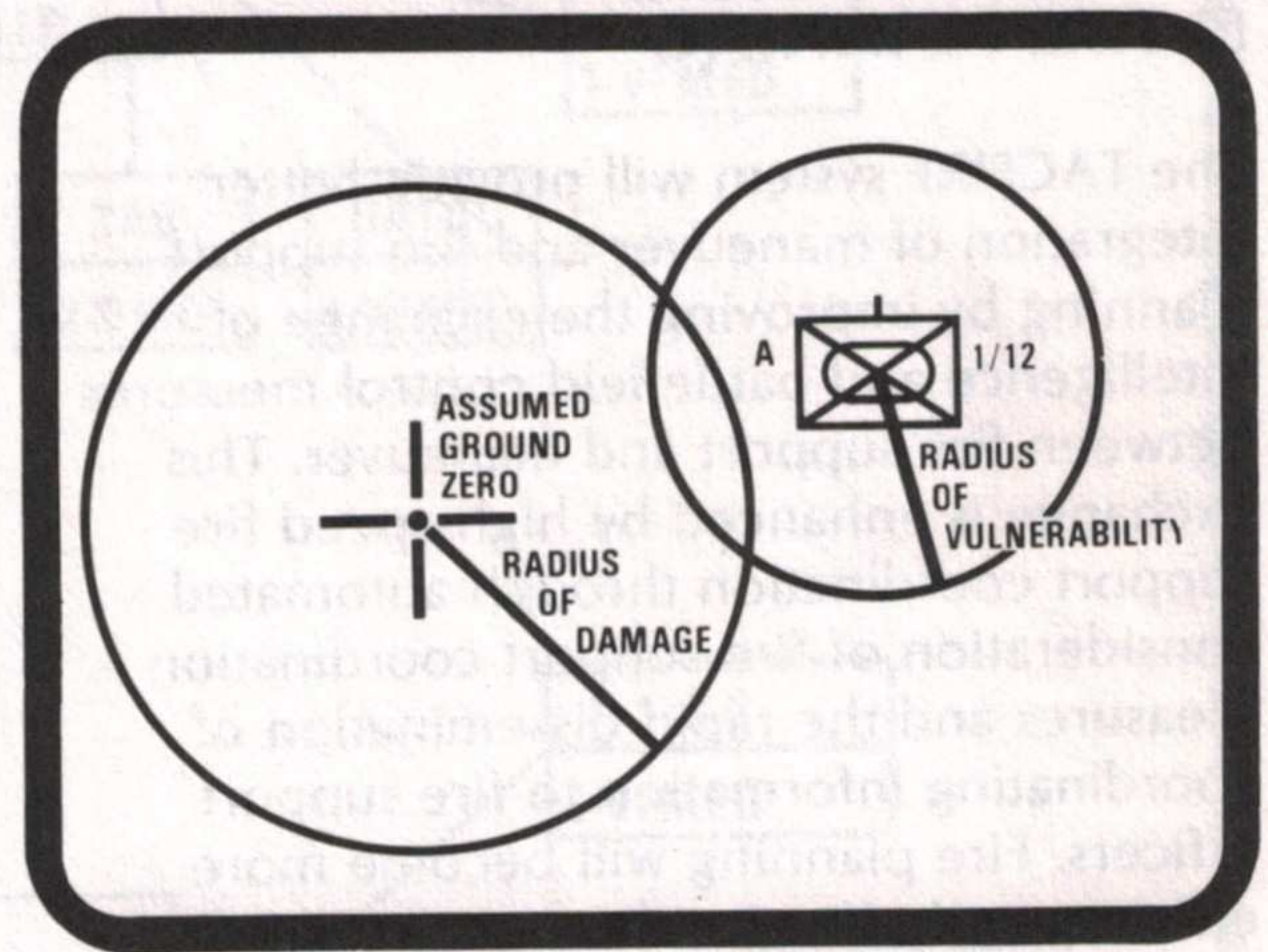
fire control by determining firing data (deflection, fuze setting, quadrant elevation and munitions for the *recommended* fire unit(s)). The computer prepares *recommended* fire commands for each selected unit, munition, volume of fire and ballistic solution. If the volume of fire achievable by the available battalion fire units does not meet the commander's guidance, the computer automatically prepares a request for additional fire (RFAF). When this is done, the request for fire, any fire support coordination warnings, initial solution to include fire commands and the RFAF are shown on a display scope located on the face of the computer.

In all cases the fire direction officer (FDO) is required to review the initial solution. If for some reason the computer-recommended solution is unacceptable, the FDO may manually assign any fire unit, munition, and volume of fire combination that he desires and have the computer automatically determine new firing data. To approve the mission, the FDO depresses a button causing the computer to transmit the fire commands to the fire units; the message to observer, and any RFAF, to supporting artillery.

At division artillery the TACFIRE computer performs tactical fire control. The computer receives requests for additional fires (RFAF) from battalion computers or the division fire support element. Just as at battalion, the target is evaluated with respect to fire support coordinating measures. The computer then recommends additional unit(s), munition, and volume of fire to attack the target, based on unit capability. Fire orders are then prepared for transmission to subordinate battalions as well as requests for additional fire to the division fire support element if naval gunfire or TACAIR is desired. FA firing data is determined by the battalion computer. The FDO must approve the *recommended* tactical fire control solution before it can be sent to a subordinate unit.

## □ TARGET ANALYSIS

Nuclear and nonnuclear target analysis is a major function of the fire support element (FSE) located at its division tactical operations center. The division artillery computer performs all processing required by the FSE. The FSE requests and receives target analysis using its VFMED. The division artillery computer performs HE, nuclear, and chemical target analysis and recommends to the FSE and maneuver G3 appropriate weapon systems, munitions, and volume of fire. It also performs nuclear vulnerability analyses,



NUCLEAR VULNERABILITY ANALYSIS

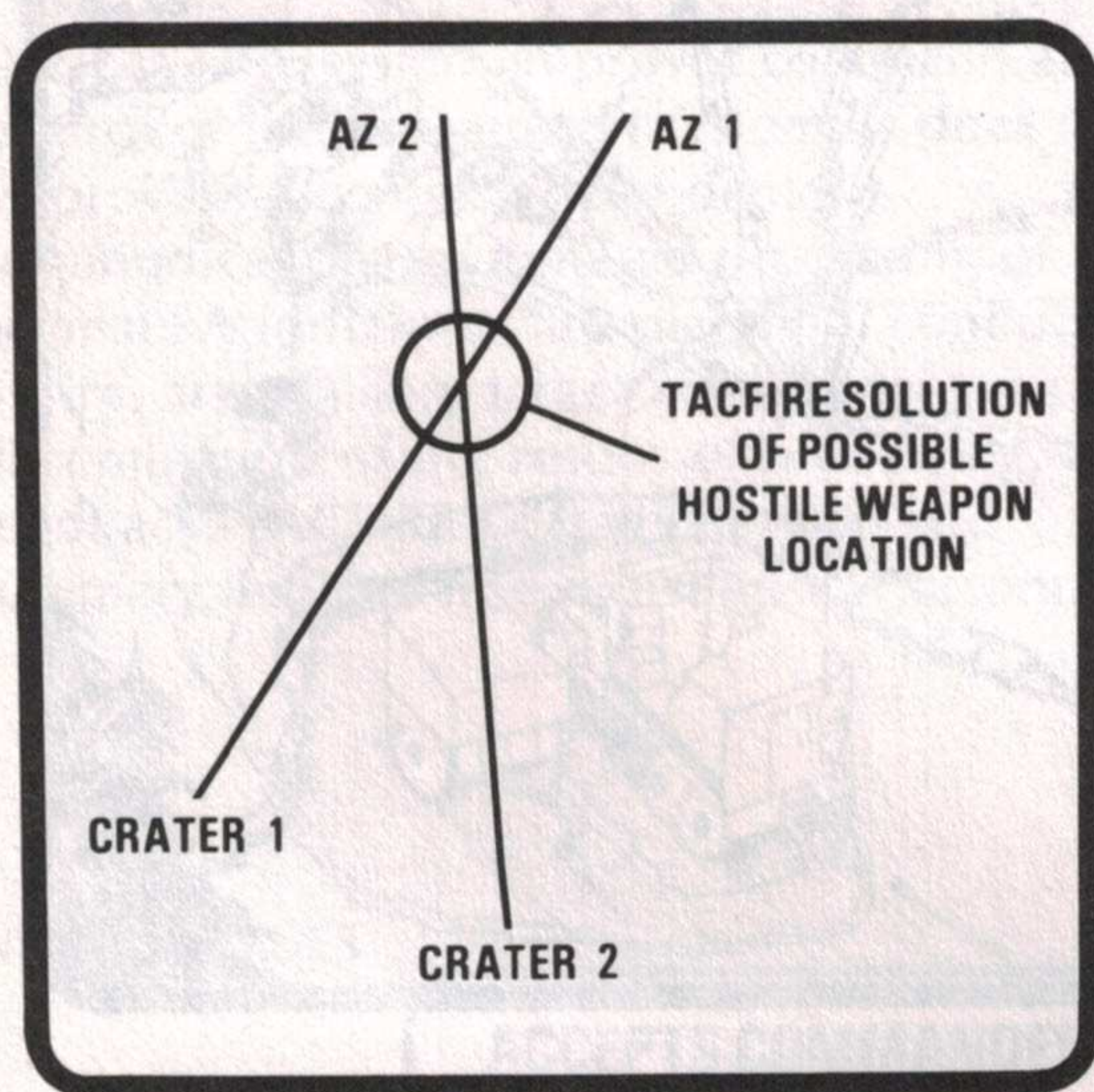
nuclear fire planning, fallout prediction, and effective downwind messages for manual fallout prediction.

Target analysis considers not only FA cannon as a delivery system but also naval gunfire and tactical aircraft as well as rockets and missiles such as Lance, Honest John, and Pershing.

## □ SURVEY COMPUTATIONS

TACFIRE will not reduce the time required to perform the field work of survey operations;

however, it may often perform the necessary computations. The TACFIRE computer at division artillery or battalion stores survey control points lists, transmits survey data to remote subscribers, and solves all forms of survey schemes. Survey control point data, normally entered into the TACFIRE computer from any VFMED terminal, is stored in the computer memories. This data may be transmitted to any other TACFIRE terminal upon request. Since survey personnel have no TACFIRE terminals, they share the use of the FSO's or S3's device to input or request information. They present the raw survey data



**SOLUTION OF SHELLING REPORTS**

or request for information to the operator who enters the required information. The output report is then given to the survey personnel.

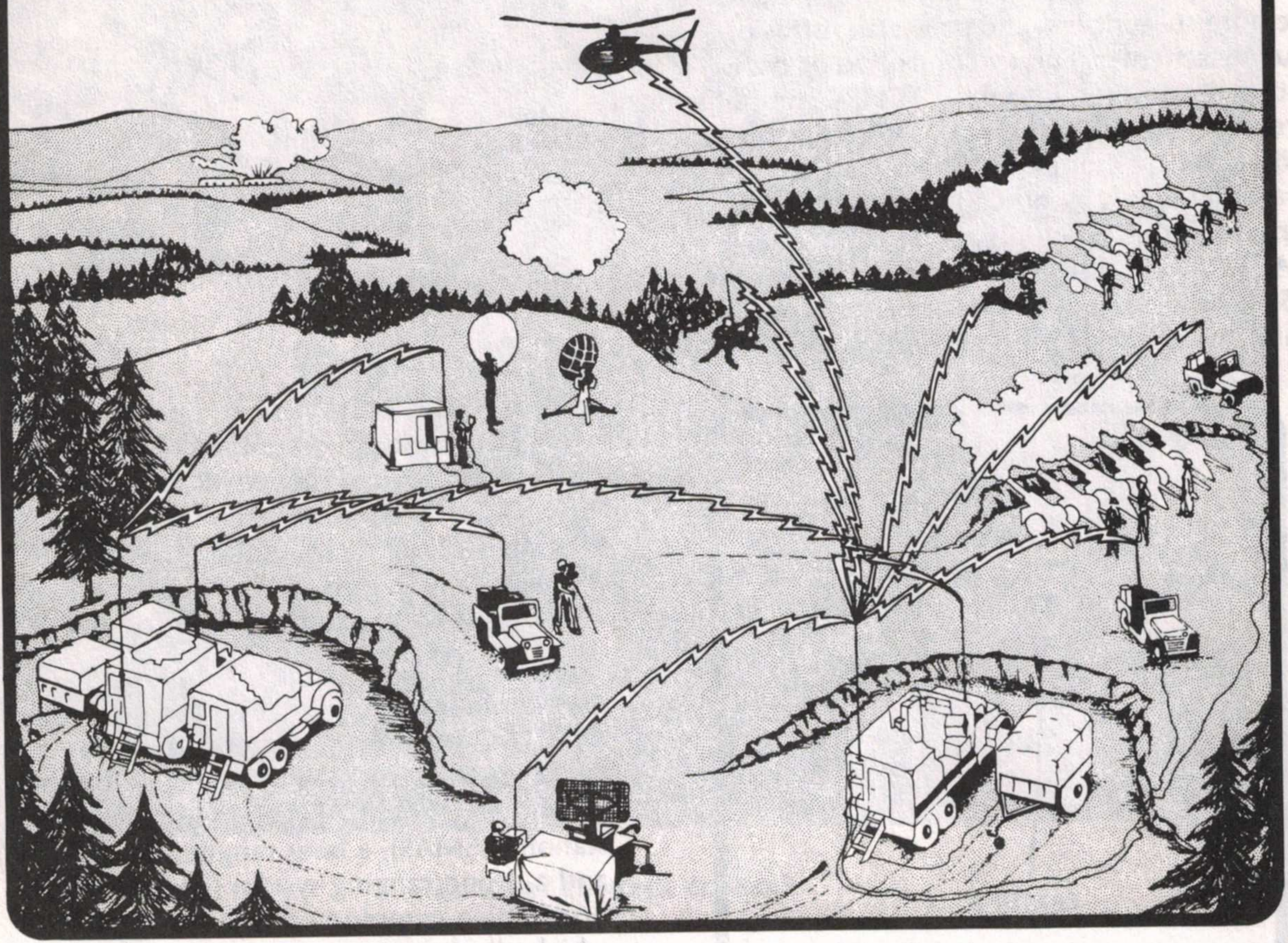
### **□ INTERACTION WITH NEW SYSTEMS**

TACFIRE is much more than a larger, more capable FADAC used to process fire missions. It is an electronically integrated command and control information system as well. TACFIRE furnishes the basis for the complete integration and dissemination of information developed by elements of the fire support

system. This is of particular importance in view of sophisticated equipment currently being developed. Many developmental items have TACFIRE communication already built into their systems and are designed to automatically transmit information, needed by the fire support system, directly to the TACFIRE computer.

Developmental items that will communicate with TACFIRE include target acquisition radars AN/TPQ-36 and AN/TPQ-37, a new battery computer system (BCS), an automated met station (FAMAS), a laser rangefinder (GVLLD) and a sound ranging system (FAALS). By providing a common control system with which all of these systems must and will operate, TACFIRE will integrate them into an effective team. Appendix C covers this subject in greater detail.

# TACTICAL FIRE DIRECTION SYSTEM



which all of these systems must and will  
 occur. TACTIRE will integrate them into an  
 effective team. Appendix C covers the subject  
 in greater detail.

of request for information to the operator  
 who enters the requested information. The  
 output report is then given to the savvy  
 personnel.

## IN INTERACTION WITH NEW SYSTEMS

TACTIRE is much more than a data base  
 capable TADAC used to process the requests.  
 It is an electronically integrated command  
 and control information system as well.  
 TACTIRE furnishes the back for the command  
 interaction and dissemination of information  
 developed by elements of the fire support

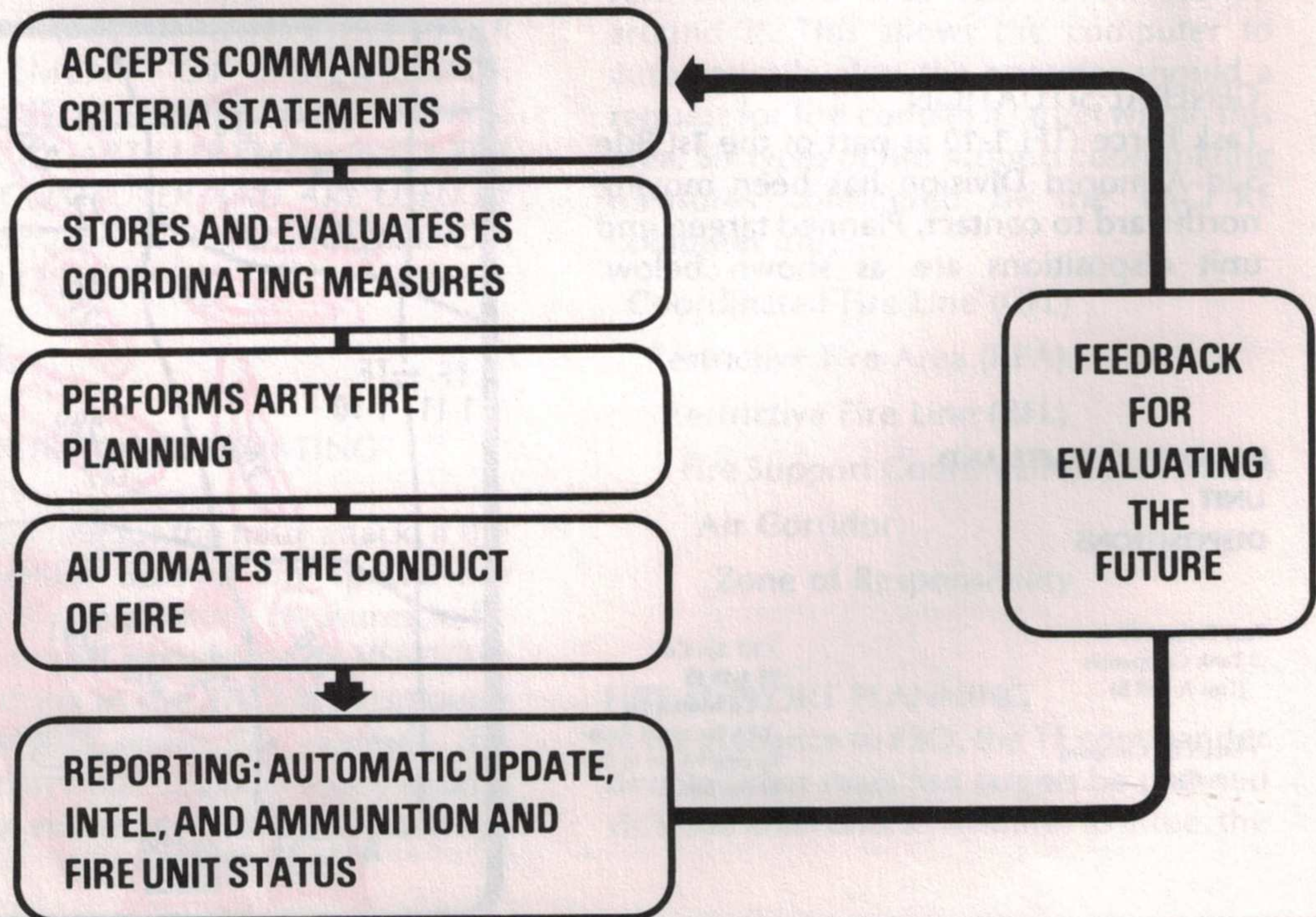
# HOW TACFIRE WORKS

## Chapter 2

The TACFIRE system improves command and control of the fire support system. It does this by providing computerized digital communications, automated processing of normal FA functions (fire planning, conduct of fire, and artillery target intelligence), rapid dissemination of the results of processing, and feedback. TACFIRE's data collection and summary features free fire support personnel

from many tedious, routine, and often error-prone tasks and allow them to concentrate more fully on analyzing alternatives, allocating resources, and determining the best mix of weapon system, munitions, and volume fire for targets.

### WHAT IT DOES



# OFFENSE I. TASK FORCE

EXAMPLES OF HOW IT DOES IT —

**OFFENSE I — TASK FORCE IN HASTY ATTACK**

**OFFENSE II — DIVISION IN THE DELIBERATE ATTACK**

**DEFENSE I — COMPANY TEAM IN THE COVERING FORCE**

**DEFENSE II — DEFENSE IN THE MAIN BATTLE AREA**

**NUCLEAR AND CHEMICAL OPERATIONS**

## OFFENSE I. TASK FORCE IN HASTY ATTACK

The hasty attack can develop whenever a force is unable to bypass an enemy position or fight through it. The primary concern is to react quickly with fire and maneuver to maintain the momentum of an attack and to reduce the resistance. The battalion commander and FSCOORD must be prepared for such contingencies.

### GENERAL SITUATION

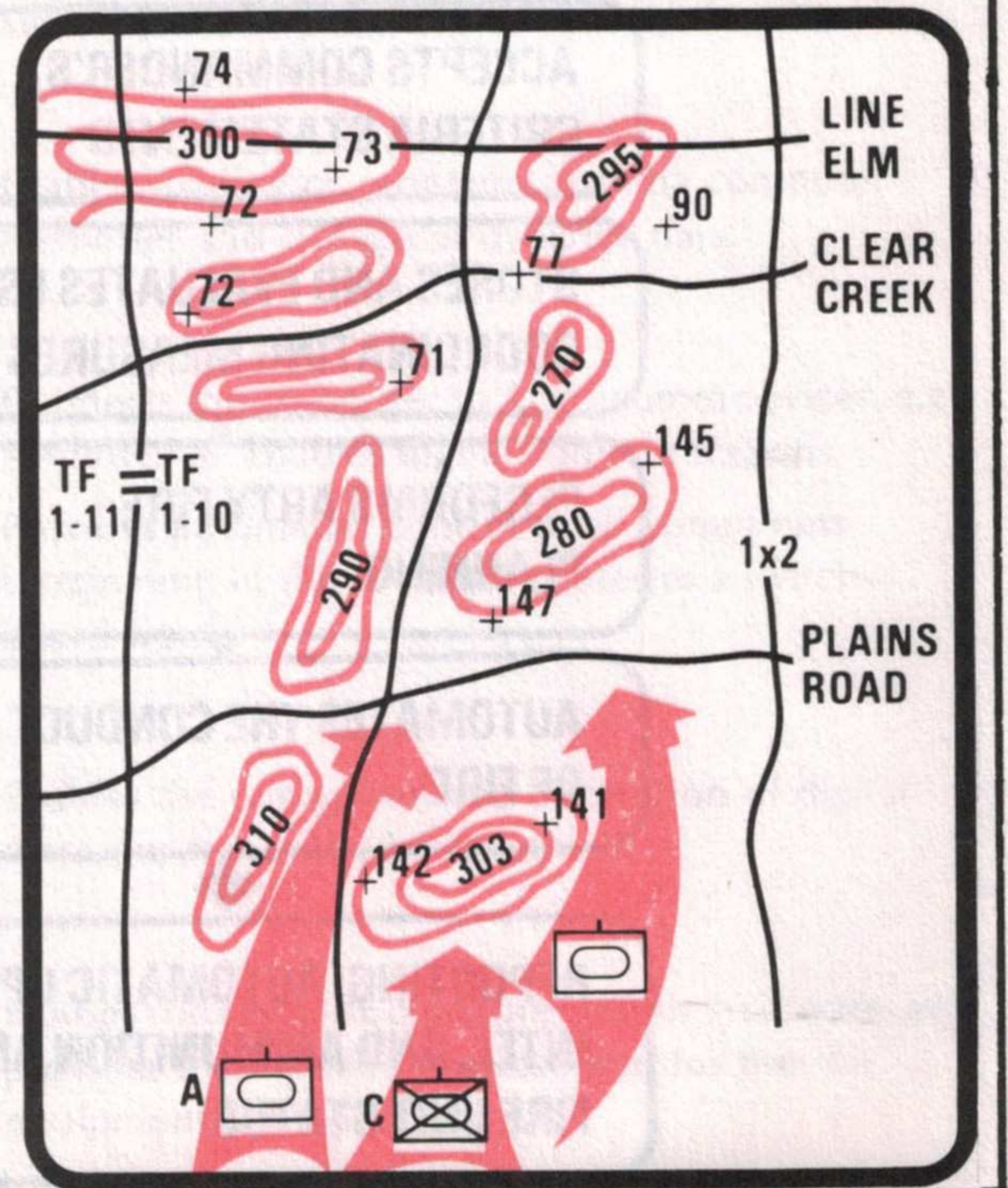
Task Force (TF) 1-10 as part of the 1st Bde 52d Armored Division has been moving northward to contact. Planned targets and unit dispositions are as shown below.

### PLANNED TARGETS AND UNIT DISPOSITIONS

**Task Force 1-10**  
 .2 Tank Companies  
 (Tms A and B)  
  
 .1 Mech Inf Company  
 (Tm C)

.CBT Spt Co  
**TF 1-10 FS**  
 .1 Co Mortar Plt  
 .1 FA Bn and 1 Reinforcing FA Bn in DS of the Bde

Light resistance developed vicinity (vic) hill H303 and was bypassed to the east by Tm B and to the west by Tm A. Tm C mopped up. As Tm B neared T145, it came under heavy attack from H270. The TF commander decided to form a hasty attack to secure H270 and H295 by moving Tm A to an overwatch position on the north portion of H290 and securing H270 and H295 with teams B and C. The task force has consolidated south of H280 for the attack.





# IN HASTY ATTACK

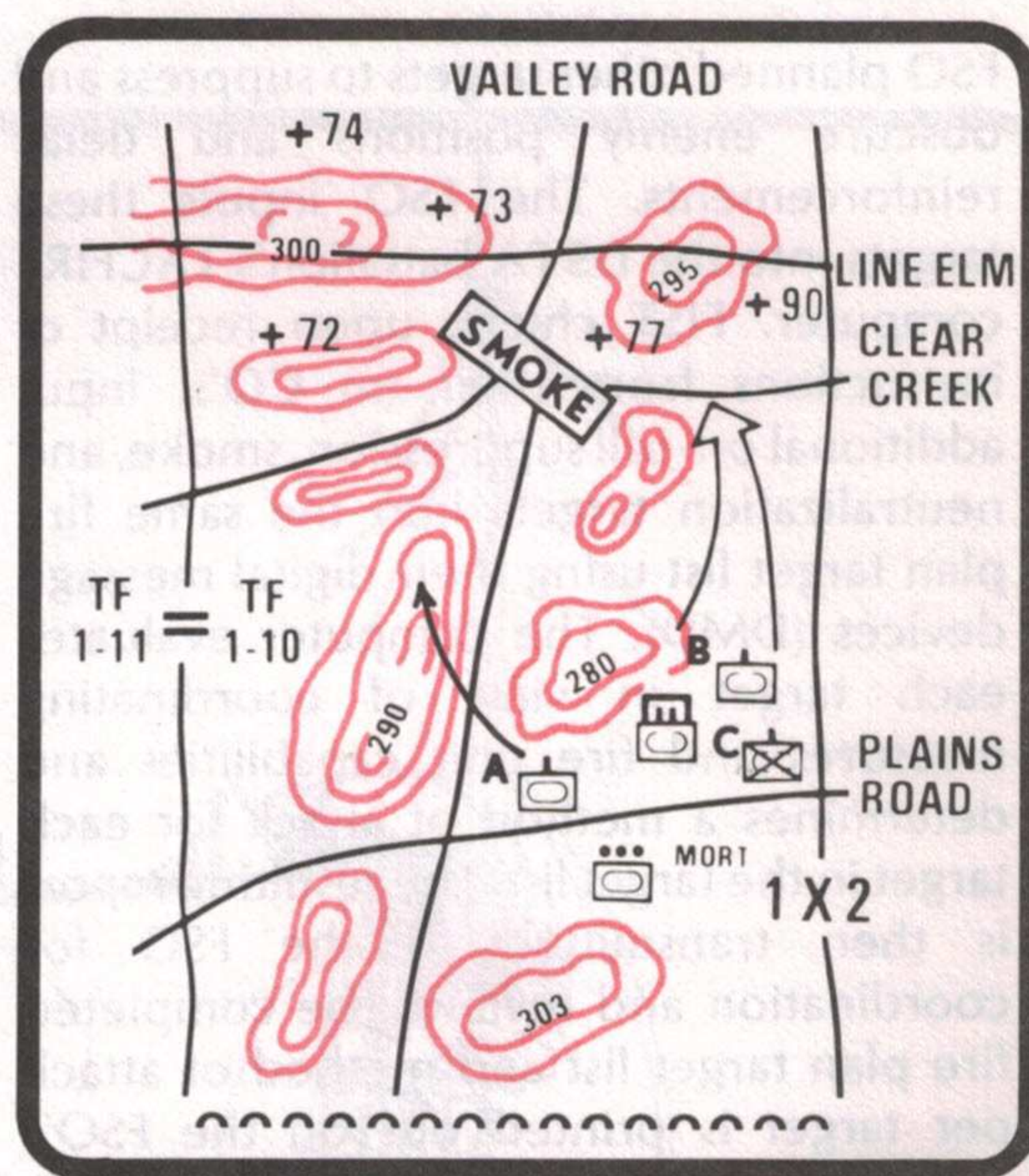
## COMMANDER'S CRITERIA/CONCEPTS

The TF commander provides fire support guidance to his FSO in areas concerning target priorities, areas of concentration, and fire planning. The FSO translates this guidance into statements acceptable for use by the TACFIRE computer and uses his VFMED to enter them into the computer's data base. For example, the FSO might desire that in planning fires to support the hasty attack a standard volume of fire of four volleys of HE fuze variable time (VT) be used by the cannon batteries assigned to fire against each personnel type target. The FSO uses his VFMED to enter these criteria into the TACFIRE computer. Whenever the FSO or his FIST chiefs enter personnel type targets into the computer for the fire plan, the computer will automatically assign four volleys of HE/VT against them.

*COMMANDER'S CRITERIA FOR MANAGEMENT OF FIRE UNITS, MUNITIONS, AND VOLUME OF FIRE ARE ENTERED BY ARTILLERYMEN INTO THE TACFIRE COMPUTER AND ARE USED BY THE COMPUTER IN RECOMMENDING A METHOD OF ATTACK.*

## FIRE SUPPORT COORDINATING MEASURES

During planning for the hasty attack, if the TF commander desired any special fire support (FS) coordinating measures to be observed, the FSO would use his VFMED to establish them in the TACFIRE computer under the plan name. For example, if a bridge across Clear Creek at Valley Road is essential to movement during the attack, a



SCHEME OF MVR AND PLANNED TARGETS FOR HASTY ATTACK

restrictive fire area can be established around it. This allows the computer to automatically alert the operator should a request for fire contain a target within this area. Six types of fire support coordinating measures considered by the TACFIRE computer are:

- Coordinated Fire Line (CFL)
- Restrictive Fire Area (RFA)
- Restrictive Fire Line (RFL)
- Fire Support Coordination Line (FSCL)
- Air Corridor
- Zone of Responsibility

## FIRE SUPPORT PLANNING

In his guidance to FSO, the TF commander directed that mass fire targets be planned vic H300 and H295. In addition to these, the

# OFFENSE I. TASK FORCE

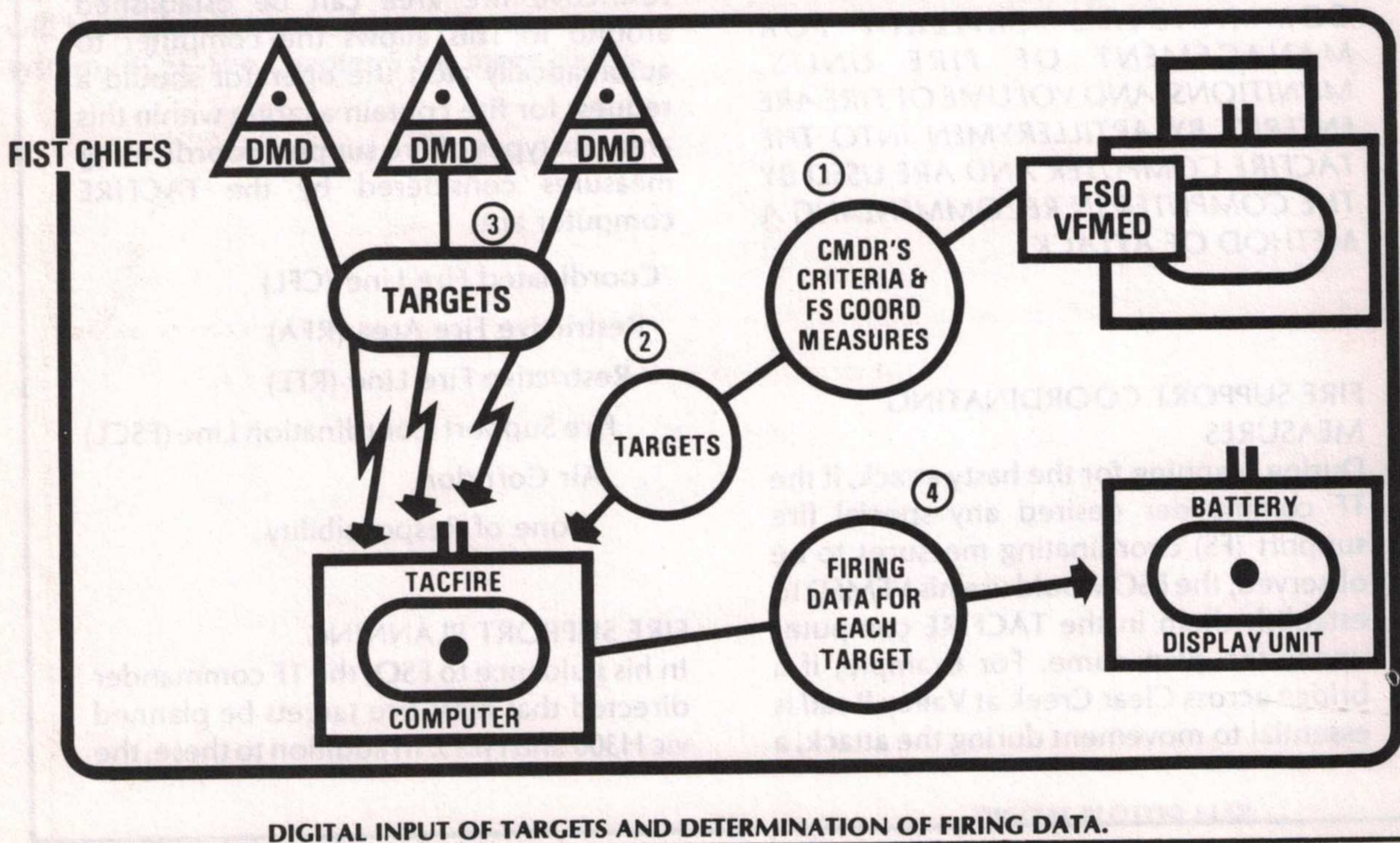
\* FSO planned other targets to suppress and obscure enemy positions and delay reinforcements. The FSO inputs these targets into the DS FA battalion's TACFIRE computer. FIST chiefs, upon receipt of instructions from their tm CO's, input additional on-call suppression, smoke, and neutralization targets into the same fire plan target list using their digital message devices (DMD). The computer evaluates each target in view of coordinating measures and fire unit capabilities and determines a method of attack for each target in the target list. The resulting report is then transmitted to the FSO for coordination and review. The completed fire plan target list and method of attack per target is printed out on the FSO's printer (a part of his VFMED). The FSO initiates determination of firing data and its

dissemination to the batteries by the TACFIRE computer. Mortar targets may also be stored in the TACFIRE fire plan target list although the ballistic solution is manual.

## CONDUCT OF FIRE

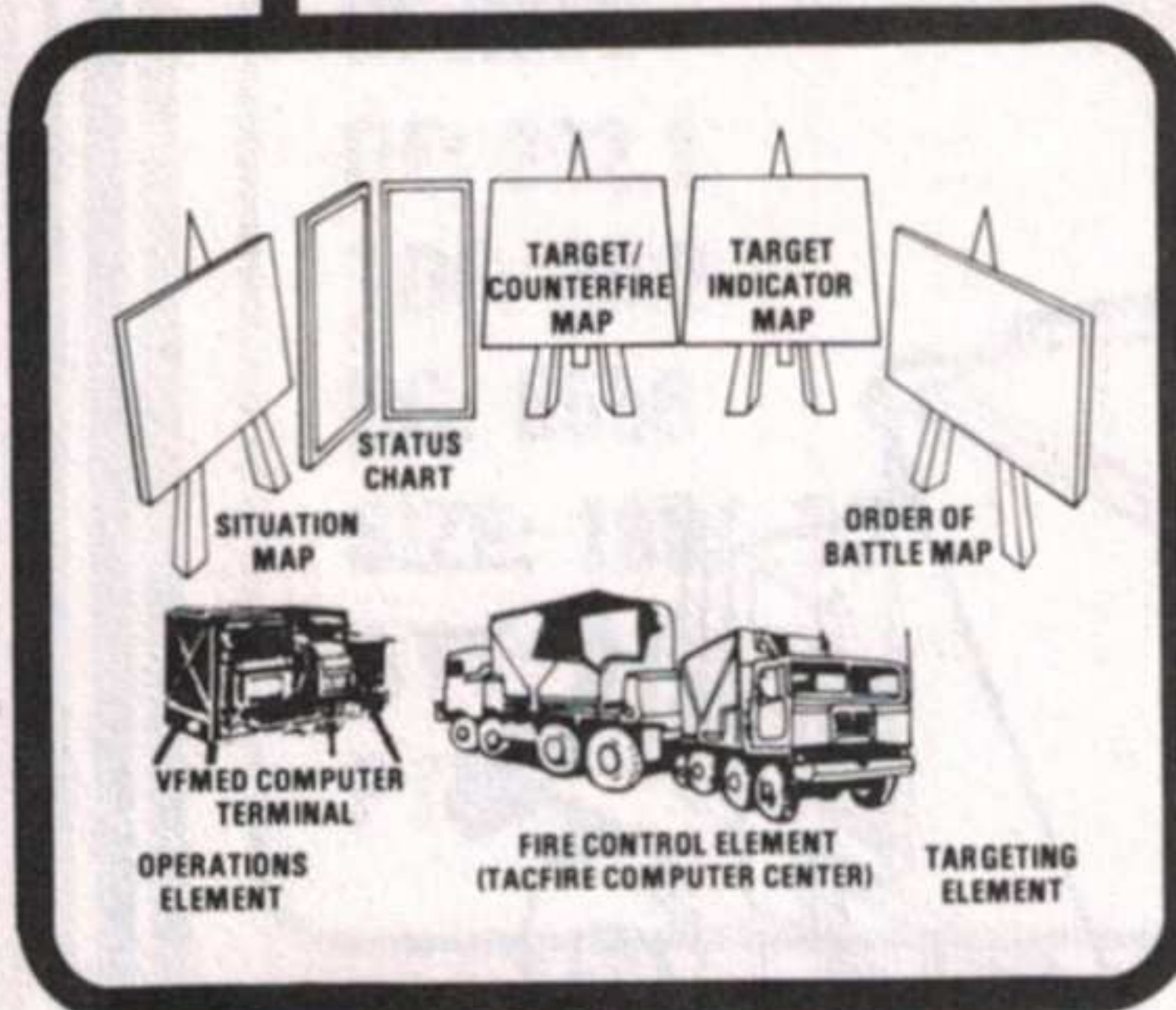
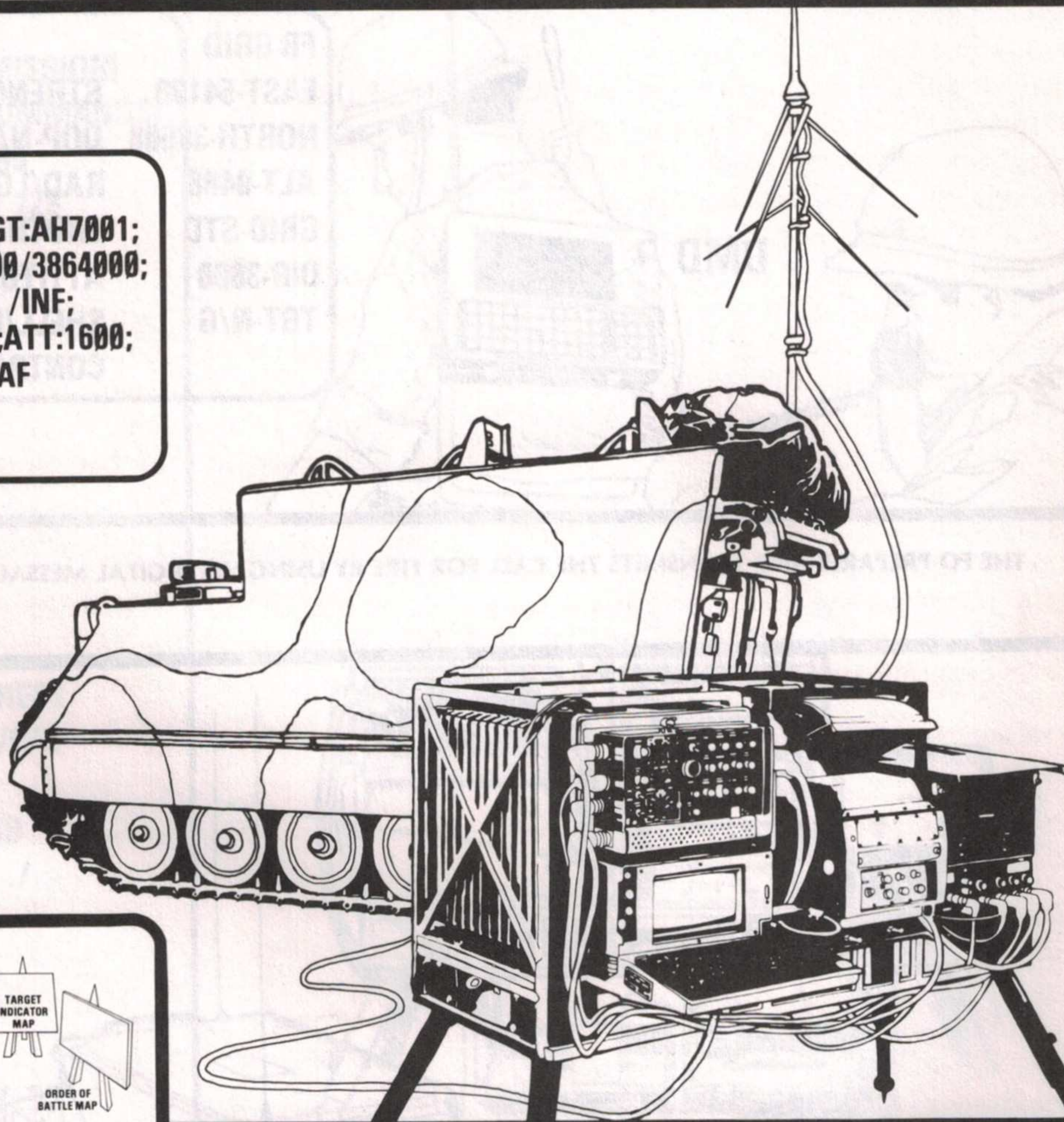
As Tm A moves toward H290, Tm A's FIST chief uses his DMD to request smoke south of line ELM and west of H295 (see preceding map sketch). This call for fire is sent directly to the battalion TACFIRE computer, which selects a battery and determines appropriate firing data. Fire commands are digitally transmitted to the battery. Subsequent corrections from the FO are also sent to the TACFIRE computer, which prepares adjusted firing data.

\*See note on page 5



# IN HASTY ATTACK

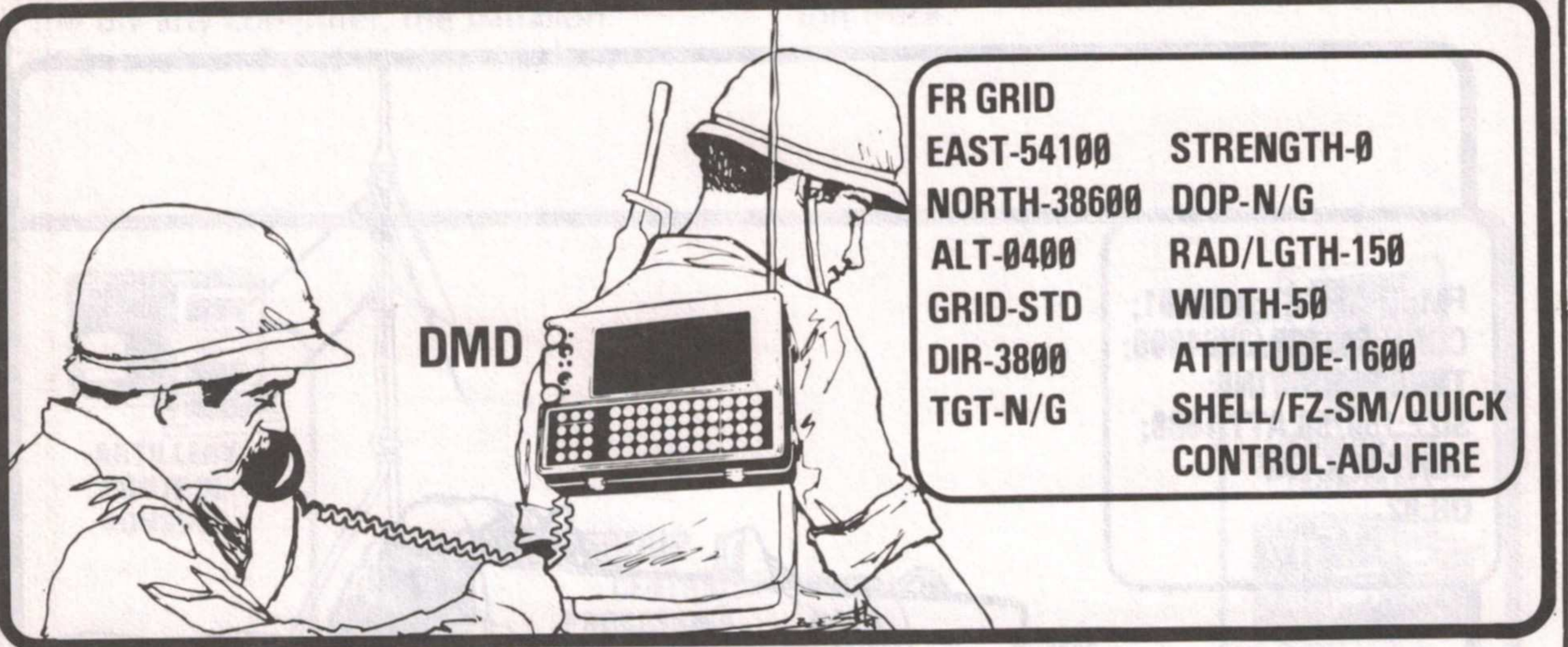
FM;RFAF;TGT:AH7001;  
CORD:541000/3864000;  
TYPE:PERS /INF;  
SIZE:150/50;ATT:1600;  
CONT:WR /AF  
OB:02



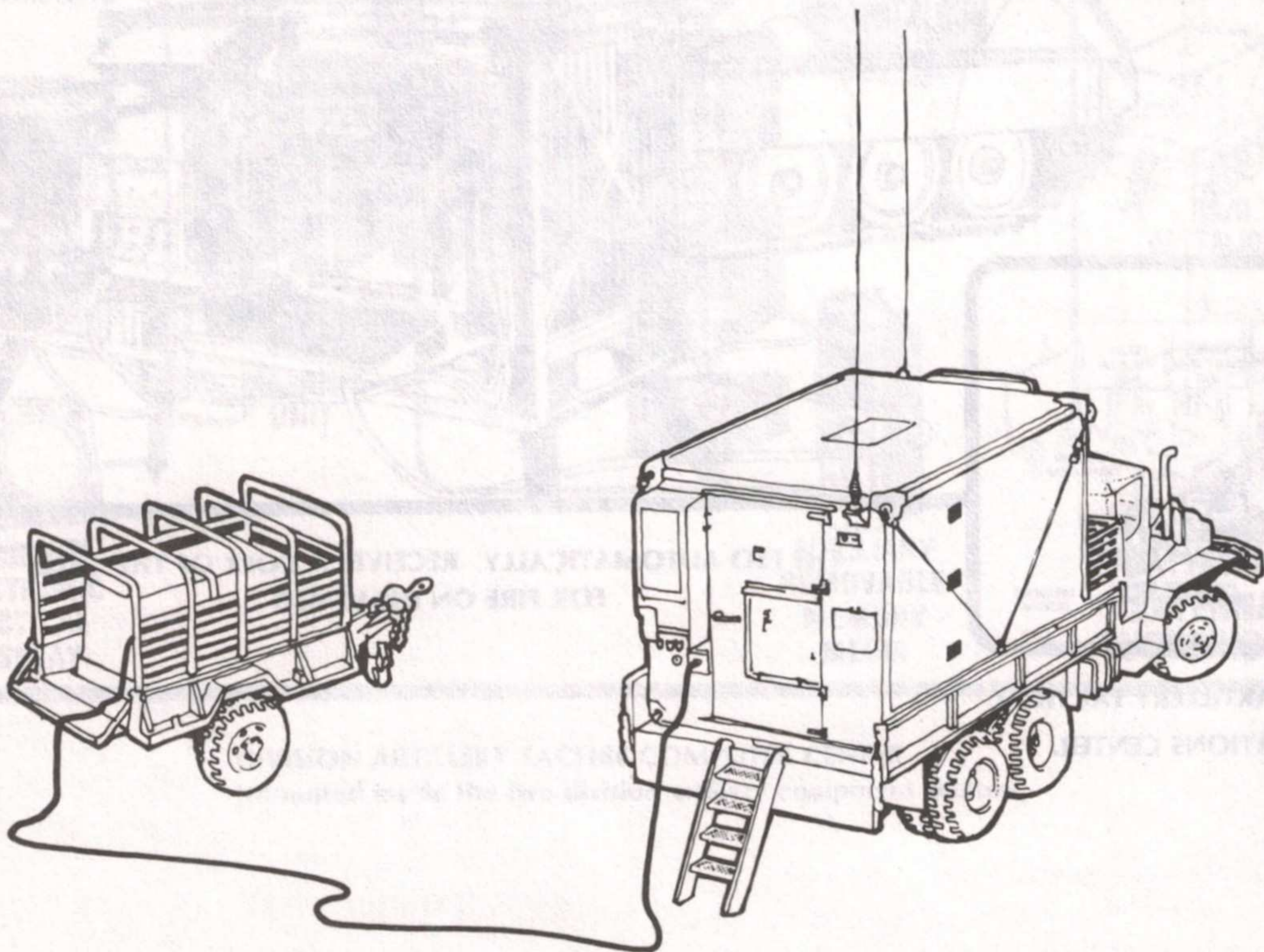
THE FSO AUTOMATICALLY RECEIVES A COPY OF THE CALL FOR FIRE ON HIS VFMED

DIVISION ARTILLERY TACTICAL  
OPERATIONS CENTER.

# OFFENSE I. TASK FORCE



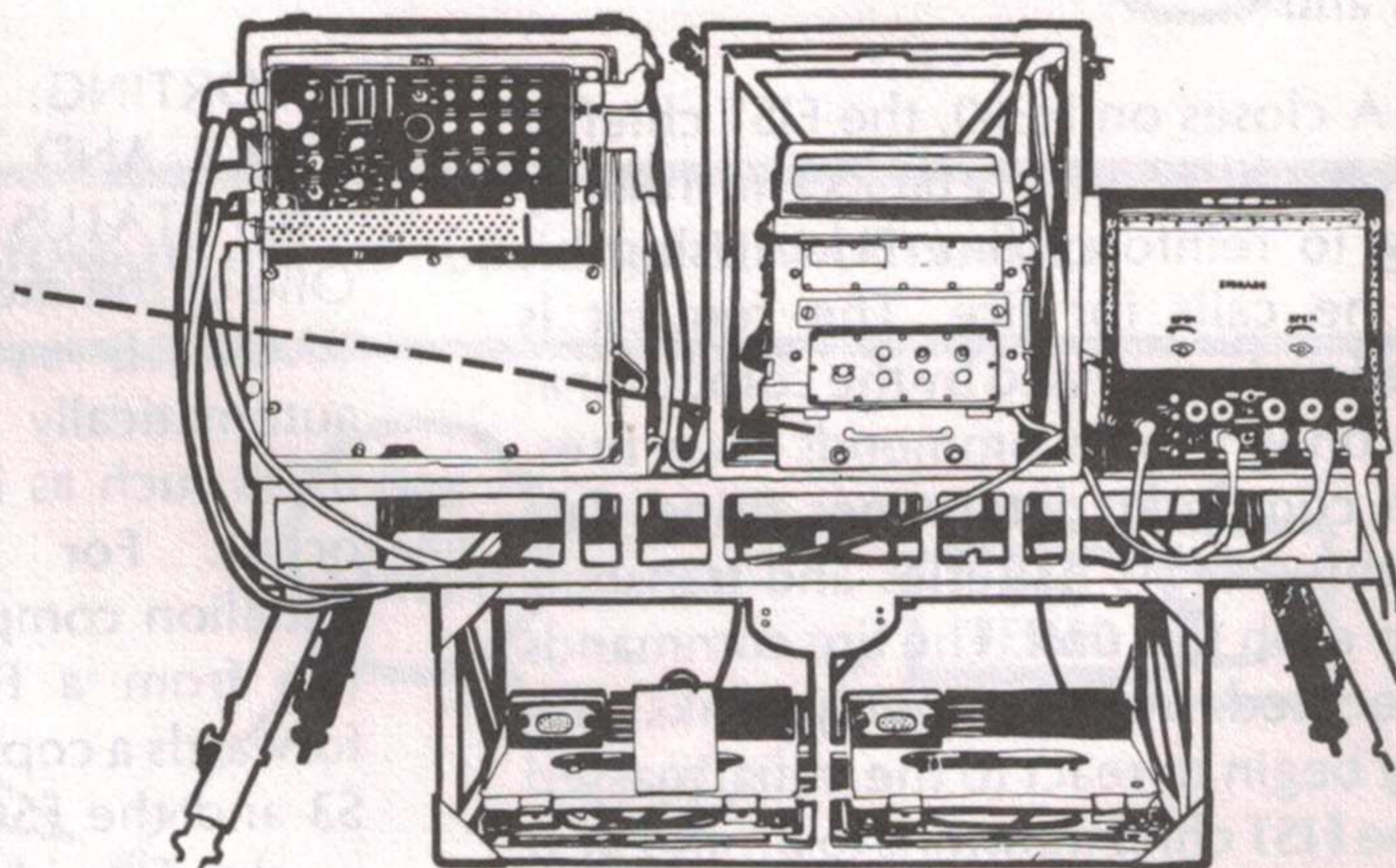
THE FO PREPARES AND TRANSMITS THE CALL FOR FIRE BY USING HIS DIGITAL MESSAGE DEVICE



THE FA BATTALION COMPUTER CENTER RECEIVES THE CALL FOR FIRE FROM THE FIST CHIEF

# IN HASTY ATTACK

**FM (FIRE MISSION)**  
**FC (FIRE COMMANDS)**  
**TGT:AH7005**  
**FU: / /A/1 /29**  
**ADJ:BTRY**  
**SPLINT:**  
**SHL:HEA1**  
**LOT:X/X**  
**CHG:7**  
**FZE:PDA**  
**PTF:CEN**  
**RD: 1**  
**INEFF**  
**RDS: 1/ 1**  
**SH:HEC1/HEC1**  
**LOTS:C/C/C/C**  
**CHGS:7/7**  
**FZ:TIB /TIB**  
**MF:WR / /**  
**DF:2856**  
**QE: 362.1**  
**TOF: 28.2**  
**RG: 8558**  
**SIZE: 100/ 50**  
**ATT: 0**  
**PTM:**

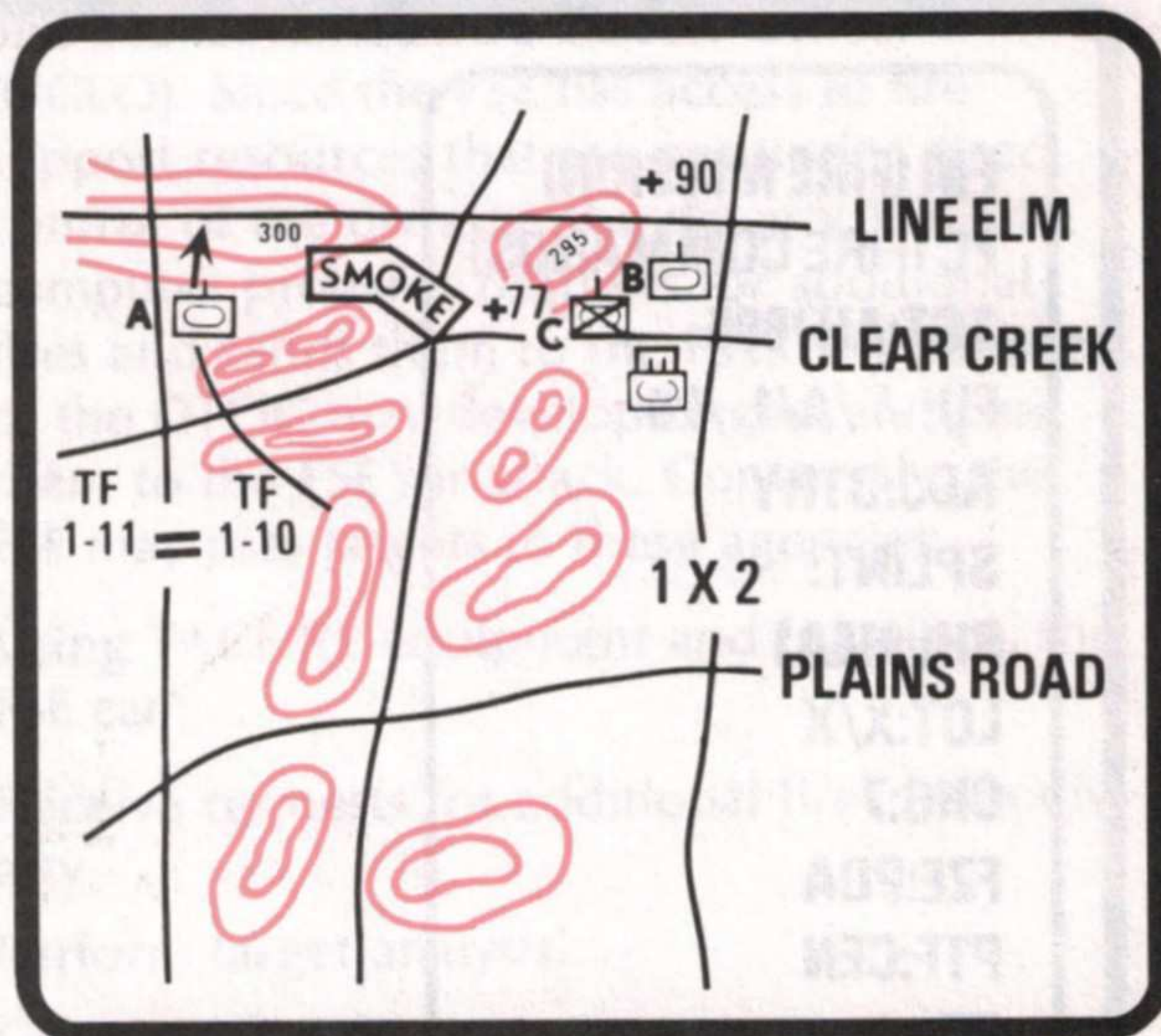


THE BATTERY DISPLAY UNIT RECEIVES FIRE COMMANDS FROM THE TACFIRE COMPUTER.

# OFFENSE I. TASK FORCE

As the smoke dissipates, Tm A receives fire from H295 and H270. The FIST chief requests that mortars fire suppression. He does this by voice. In the near future, the mortars will be issued a mortar fire calculator that will digitally communicate with the FIST chief's DMD. Tm's B and C move out and are engaged from H295. Tm B's FIST chief requests by voice "Fire target 77." The batteries, having already received firing data from the DS bn TACFIRE for the entire on-call fire plan target list, begin firing within 20 seconds. The FIST chief shifts fire to target 90 as B and C close on H295. When the resistance on H295 is overcome, the FSO, using his digital device, initiates smoke south of H300 and Tm A closes on line ELM overwatched by Tm's B and C.

As Tm A closes on H300, the FIST chief of Tm B notes 10-12 enemy tanks and infantry moving to reinforce line ELM. Using his DMD, he calls for fire. The request is received and processed by the computer at the DS bn which recommends mass fires. The bn computer determines firing data for all three of its batteries and transmits them to each fire unit. The fire commands are executed. As the enemy tanks and infantry begin to react to the initial massed fires, the FIST chief transmits to bn and new firing data is computed and transmitted to all three batteries within 10 seconds. The battalion continues to shift its massed fires until the remaining enemy tanks withdraw. To conclude the fire mission, the FIST chief submits an end of mission and target surveillance report using his DMD.

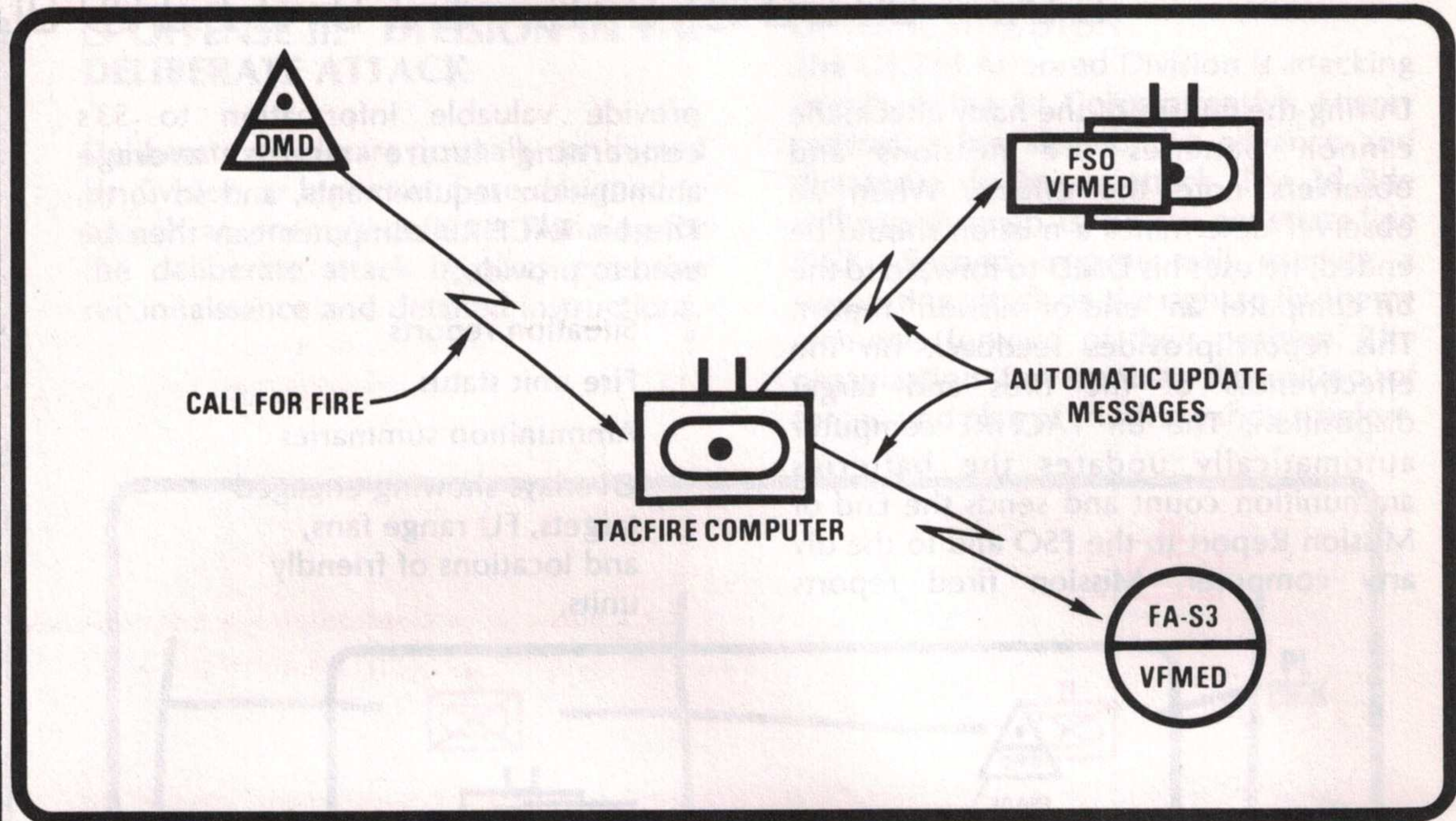


TM A CLOSSES ON H300 AND LINE ELM

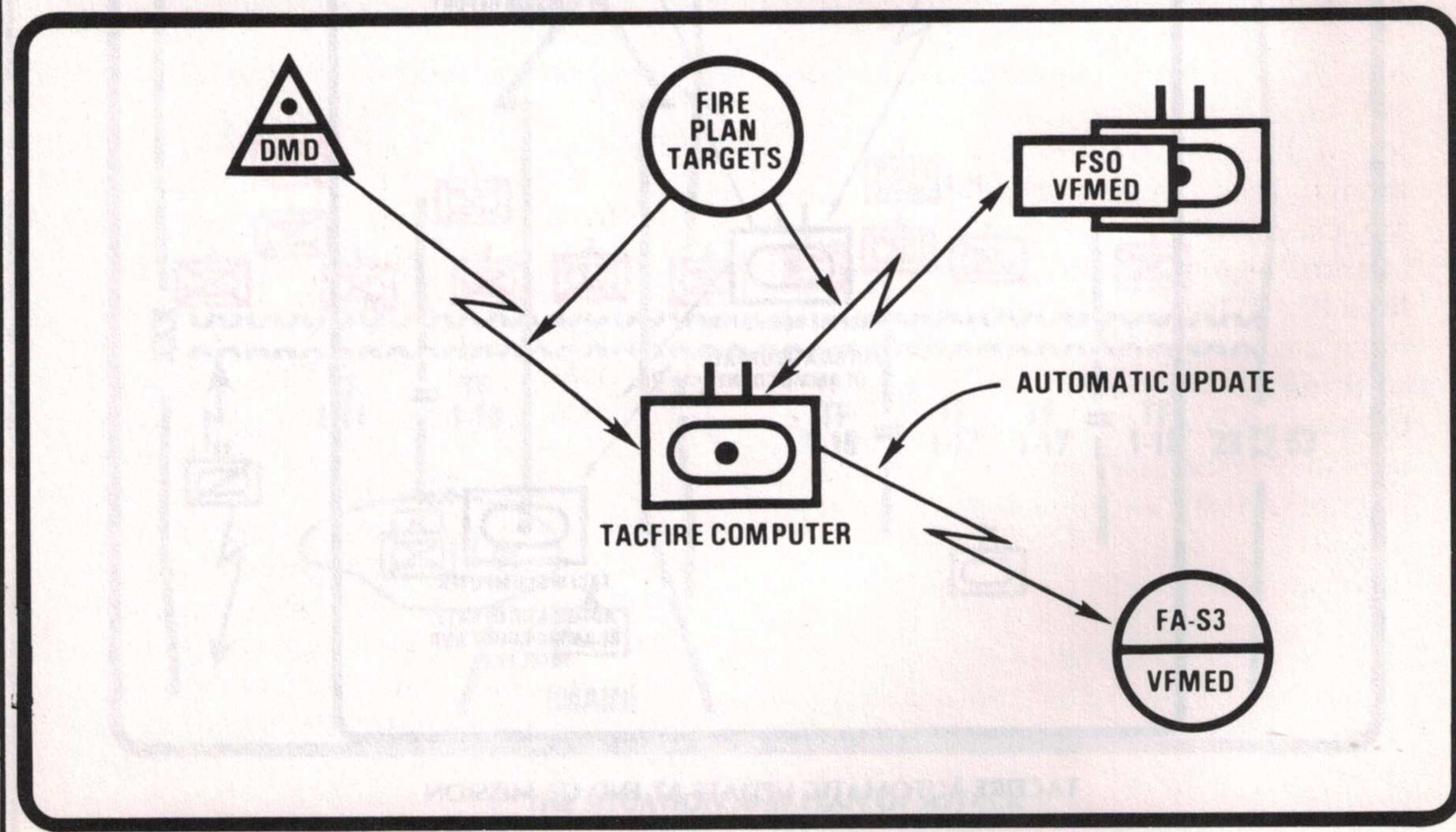
## REPORTING: AUTOMATIC UPDATE/RELAY AND AMMUNITION AND FIRE UNIT STATUS

One of the most important features of the TACFIRE system is its ability to automatically update remote terminal users such as the FSO or FA S3 as events occur. For example, whenever the battalion computer receives a request for fire from a FIST chief, it automatically forwards a copy of the call for fire to the FA S3 and the FSO for whom the FIST chief works. This is accomplished concurrently with determination of firing data. The FSO and S3 are therefore able to provide additional mission guidance or coordination if they desire. If they remain silent, the fire direction officer (FDO) allows the computer to continue with the conduct of fire. The TACFIRE computer's automatic update/relay feature allows the FA S3 to monitor all activities of the FSO's and FIST chiefs during fire planning and the conduct of fire.

# IN HASTY ATTACK



TACFIRE AUTOMATIC UPDATE DURING THE CONDUCT OF FIRE.



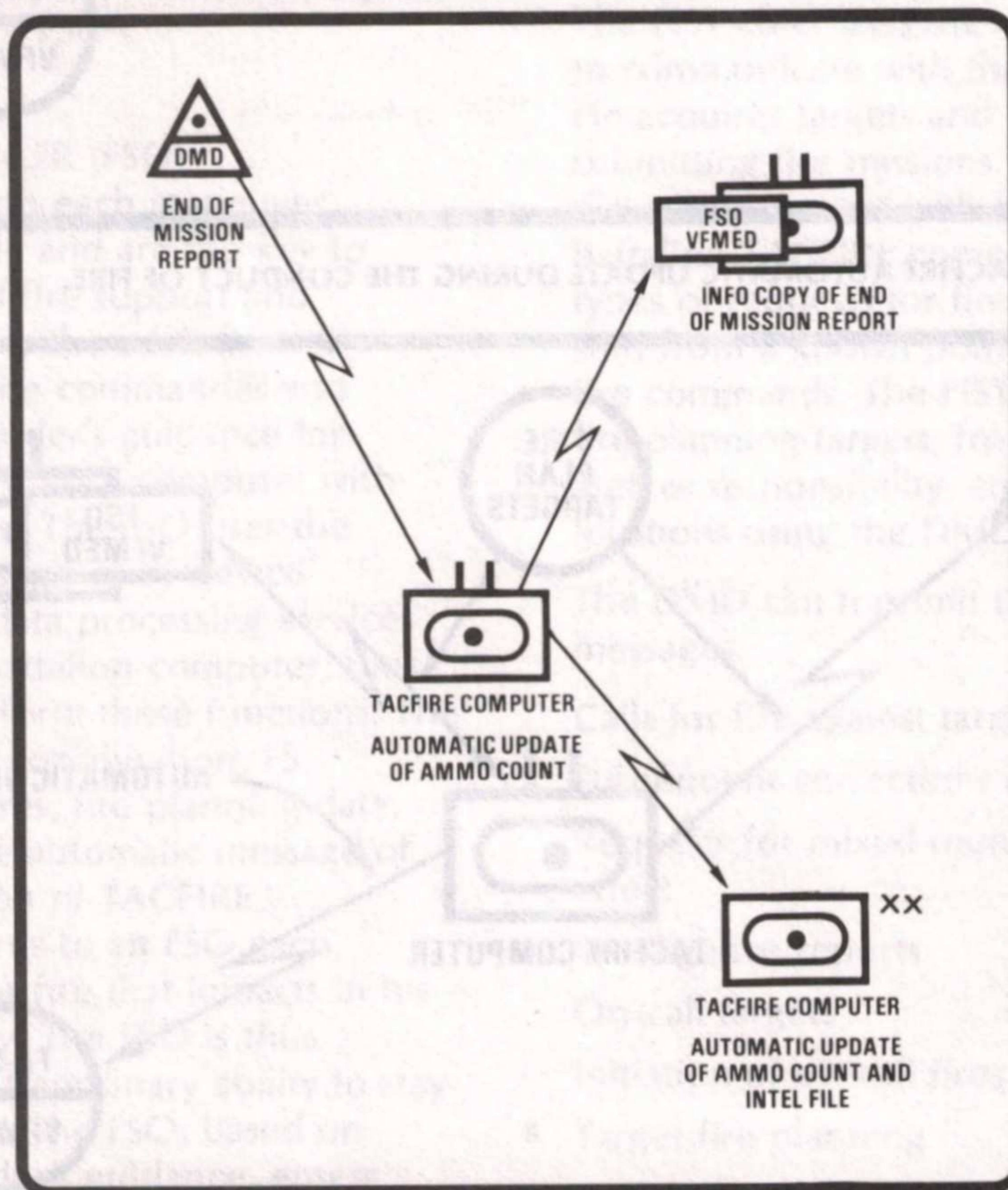
TACFIRE AUTOMATIC UPDATE DURING FIRE PLANNING

# OFFENSE I. TASK FORCE IN HASTY ATTACK

During the course of the hasty attack, the cannon batteries fire missions and observers note the effects. When an observer determines a mission should be ended, he uses his DMD to forward to the bn computer an "end of mission" report. This report provides feedback on the effectiveness of the fires and target disposition. The bn TACFIRE computer automatically updates the batteries ammunition count and sends the End of Mission Report to the FSO and to the div arty computer. Mission fired reports

provide valuable information to S3's concerning future targets, average ammunition requirements, and so forth. The bn TACFIRE computer can then be used to provide:

- Situation reports
- Fire unit status
- Ammunition summaries
- Overlays showing engaged targets, FU range fans, and locations of friendly units.



TACFIRE AUTOMATIC UPDATE AT END OF MISSION



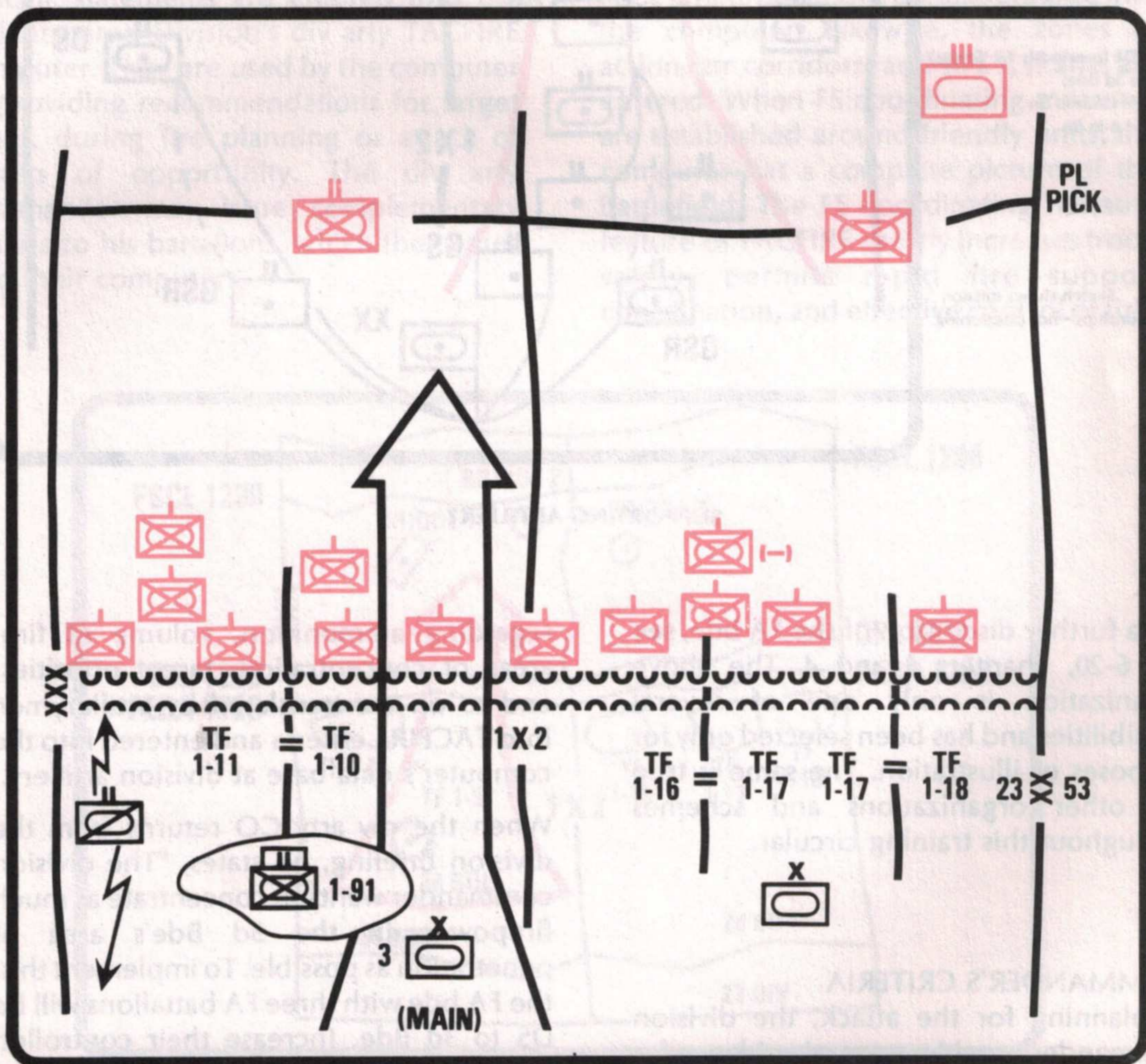
# OFFENSE II. DIVISION

## □ OFFENSE II. DIVISION IN THE DELIBERATE ATTACK

Deliberate attacks are normally conducted by division or higher and are designed to breach an enemy's defense. Planning for the deliberate attack involves extensive reconnaissance and detailed instructions.

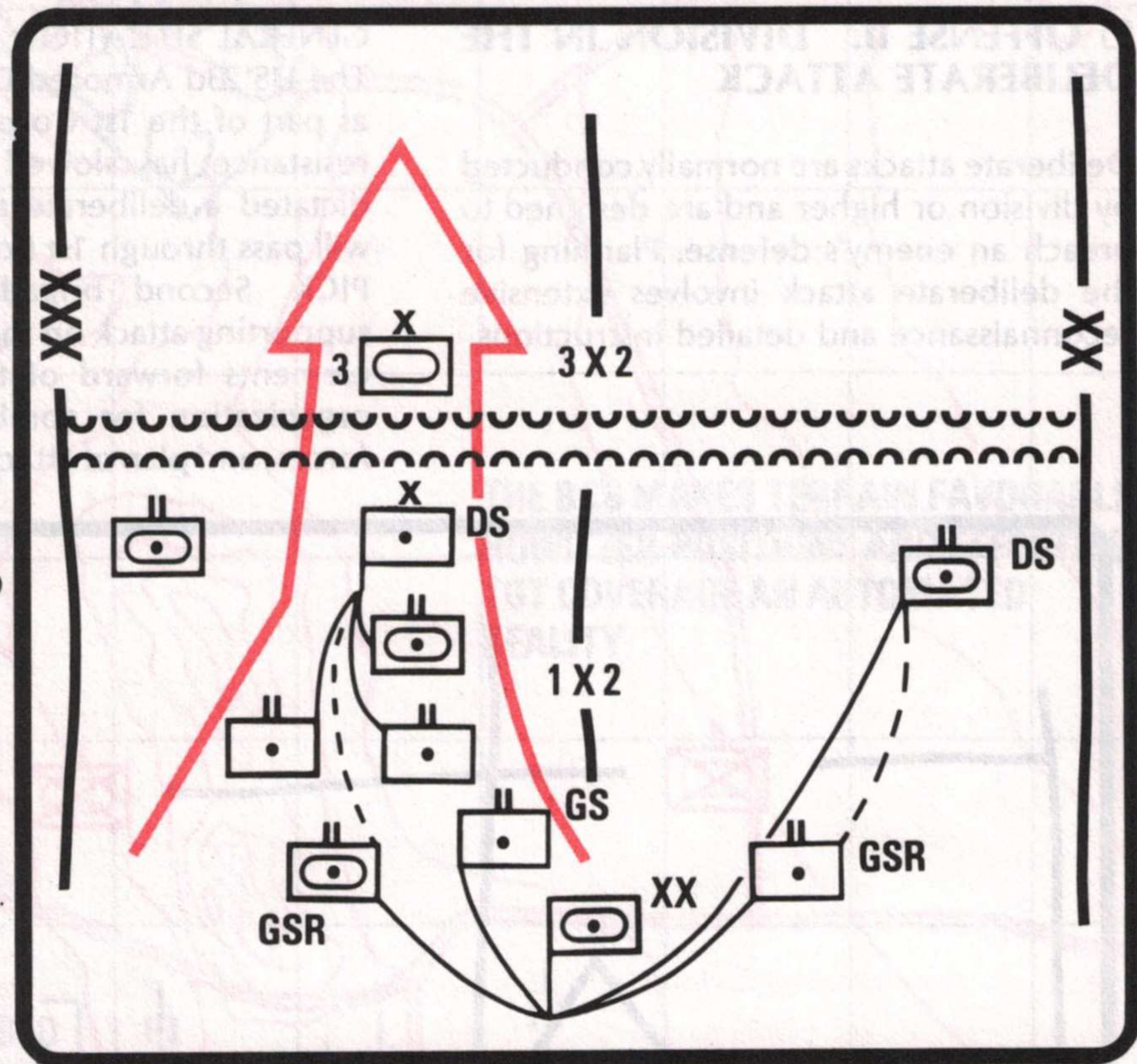
## GENERAL SITUATION

The US 23d Armored Division is attacking as part of the 1st Corps offensive. Enemy resistance has slowed the advance and dictated a deliberate attack. The 3d Bde will pass through 1st Bde to penetrate line PICK. Second brigade will execute a supporting attack on the right to fix enemy elements forward of their position. The organization for combat, disposition of forces, and plan of attack are shown below.



THE SITUATION AND PLAN OF ATTACK

# OFFENSE II. DIVISION



FA BDE (previously FA Group)  
 DS to 3d Bde:  
 2 — 155-mm Bn  
 1 — 8-in Bn

Note. Sketch shows mission relationships—not positioning.

## SUPPORTING ARTILLERY

For a further discussion of the FA bde, see FM 6-20, chapters 3 and 4. The above organization is only one of several possibilities and has been selected only for purposes of illustration. The same is true for other organizations and schemes throughout this training circular.

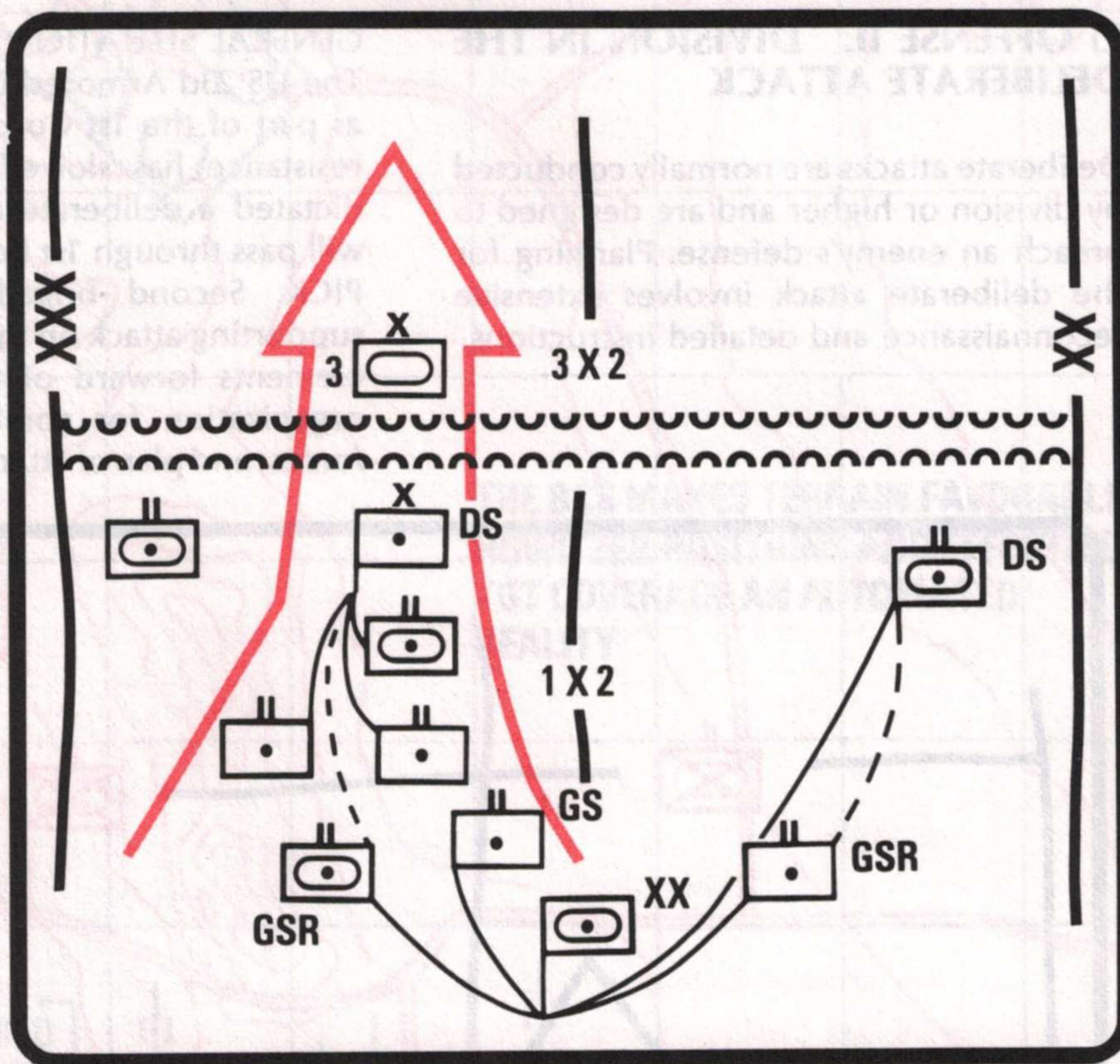
### COMMANDER'S CRITERIA

In planning for the attack, the division commander provides general guidance for use of fire support. These statements

regarding ammunition, volume of fire, areas of concentration, target priorities, and so on are translated by artillerymen into TACFIRE criteria and entered into the computer's data base at division artillery.

When the div arty CO returns from the division briefing, he states, "The division commander wants to concentrate as much firepower in the 3d Bde's area of penetration as possible. To implement this, the FA bde with three FA battalions will be DS to 3d Bde. Increase their controlled supply rate (CSR) to 200 rounds per tube

# OFFENSE II. DIVISION



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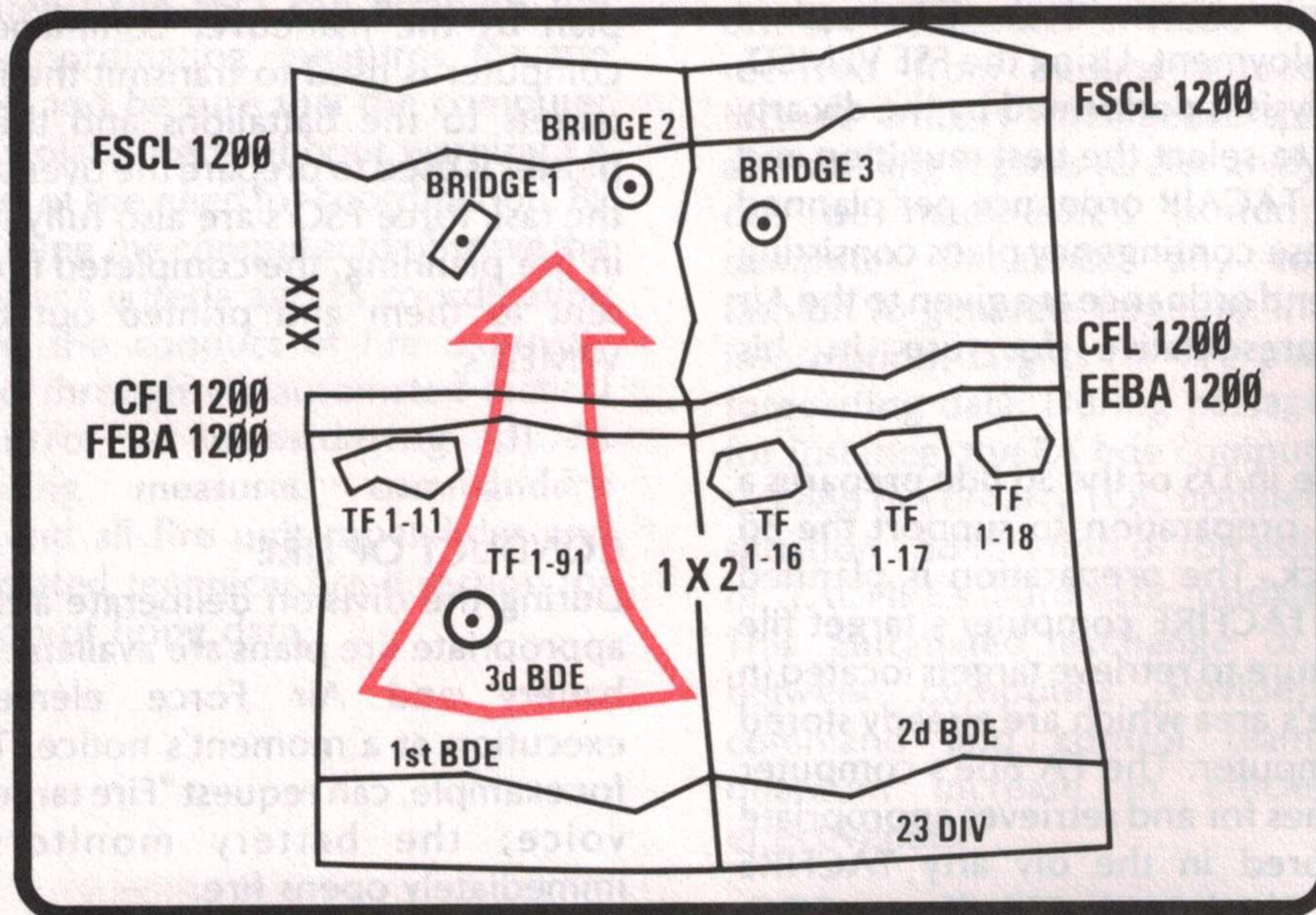
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# DELIBERATE ATTACK

per day for the next 2 days. In fire planning, for all tank type targets plans on using three volleys per battalion with HE/Quick ammunition. Against personnel type targets, use two battalion volleys of HE/VT. Don't use APICM because tall grass has resulted in a high dud rate and a troop safety problem. Develop a fire plan with these criteria and prepare an ammunition requirements summary. We may have to reallocate resources." These and other specific statements are entered into the 23d Armored Division's div arty TACFIRE computer. They are used by the computer in providing recommendations for target attack during fire planning or attack of targets of opportunity. The div arty commander may issue complementary criteria to his battalions, which they enter into their computers.

## FIRE SUPPORT COORDINATING MEASURES

To enable the TACFIRE computer to automatically coordinate fires, field artillerymen input fire support coordinating measures. For example, the division CO might say "Do not fire on any bridges in the axis of advance." Translated, this means establish RFA's around all appropriate bridges and enter these into the div arty TACFIRE computer. The corps FSCL and division CFL are also entered into the computer. Likewise, the zones of action, air corridors, and RFL's, if any, are entered. When FS coordinating measures are established around friendly units, the computer has a complete picture of the battlefield. The FS coordinating measure feature of TACFIRE greatly increases troop safety, permits rapid fire support coordination, and effective control of fires



THE TACFIRE COMPUTER'S PICTURE OF THE BATTLEFIELD

# OFFENSE II. DIVISION

## FIRE SUPPORT PLANNING

Based upon guidance for support of the division's attack, the FSE at the div TOC, using its VFMED, prepares four fire plans: (1) fires on avenues of approach for enemy reinforcements, (2) a plan for CAS, (3) air defense artillery suppression, and (4) a plan for nonnuclear Lance. Planned targets for each are obtained and entered into the div arty TACFIRE computer and four ON-CALL fire plans developed. The targets in each plan, when approved, are digitally transmitted to the appropriate battalions by the div arty computer. Firing data for the batteries are prepared by the battalion TACFIRE computer and transmitted to them. From the moment the div arty computer begins to transmit 20 targets for a single fire plan, only 6-10 minutes elapse before cannon batteries have the firing data.

Since the division has CAS available, the FSE, in conjunction with the G3 air, plans for its employment. Using the FSE VFMED, target analysis is performed by the div arty computer to select the best munition and volume of TACAIR ordnance per planned target. These contingency plans consisting of targets and ordnance are given to the Air Force representative for use in his planning.

The FA bde in DS of the 3d Bde prepares a 10-minute preparation to support the 3d Bde's attack. The preparation is planned using the TACFIRE computer's target file search feature to retrieve targets located in the 3d Bde's area which are already stored in the computer. The FA Bde's computer also searches for and retrieves appropriate targets stored in the div arty TACFIRE computer. The brigade FSE, div arty TOC, and task force FSO's add additional targets

by using their VFMED's. When the target list is complete, the FA bde uses its computer to determine a method of attack and a schedule of fires, and transmits this data to its battalions. The battalion computers receive the plan, compute firing data, and transmit the fire plan through battery display devices for execution.

The FA bde also prepares a fire plan for suppression on the flanks and for the exploitation. Targets for this plan are input to TACFIRE from the FSE at bde TOC and FSO's. As targets are received from FSO's and FSE, the FA bde commander uses the electronic tactical display to show the FS coordination measures, fire unit locations, fire unit range fans, and targets for the fire plan. He can then wargame by moving the batteries or FS coordinating measures to develop the best possible fire plan and positioning scheme. After approval of the plan by the maneuver commander, the computer is used to transmit the fire plan targets to the battalions and the digital plotter is used to prepare the overlay. Since the task force FSO's are also fully involved in fire planning, the completed fire plan is sent to them and printed out by their VFMED's.

## CONDUCT OF FIRE

During the division deliberate attack, the appropriate fire plans are available at each battery and Air Force element for execution at a moment's notice. The FO, for example, can request "Fire target 01" by voice; the battery monitors, and immediately opens fire.

The preparation is executed in accordance

# DELIBERATE ATTACK

with a time schedule to kick off the operation. Once the attack is underway, the battalions engage targets and as necessary submit requests for additional fire to the FA bde via TACFIRE. In response, fires from several battalions can be rapidly concentrated by using the FA bde or the div arty computer's tactical fire control function and high speed digital communication features. As the attack continues, the fire plans are updated to reflect new targets or to remove old ones. Should batteries reposition, the fire plans can be recomputed and redistributed within seconds. The result is that TACFIRE provides the FA, for the first time ever, with the capability for maintaining up-to-the-second fire plans.

In the offense or defense, FSO's or FSE's can obtain massed fire against targets of opportunity within seconds and still insure troop safety. The FSO can establish fire support coordinating measures for the computer and be sure that the computer will not violate them without warning FA personnel of the need for coordination. By programming the computer to observe the commander's criteria and FS coordinating measures, the conduct of fire is greatly improved through (1) automated tactical fire control in considering all FS coordinating measures, commander's criteria, and all fire unit capabilities and (2) automated technical fire direction for generation of firing data.

## REPORTS: FEEDBACK FOR ARTILLERY TARGET INTELLIGENCE

During the attack, as missions are fired, the effectiveness of fires noted, and intelligence generated, the TACFIRE system provides automated reporting. These reports are used to collect and summarize data and to provide feedback for div arty planners. For instance, the div arty computer maintains a running ammunition count that is automatically updated as mission fired reports are received from the battalions. The computer summarizes this information to enable rapid determination of average expenditures per target and the current ammunition inventory both on hand and in supply points. Using this data, the div arty S3 can more accurately forecast ammunition requirements and provide more effective ammunition distribution.

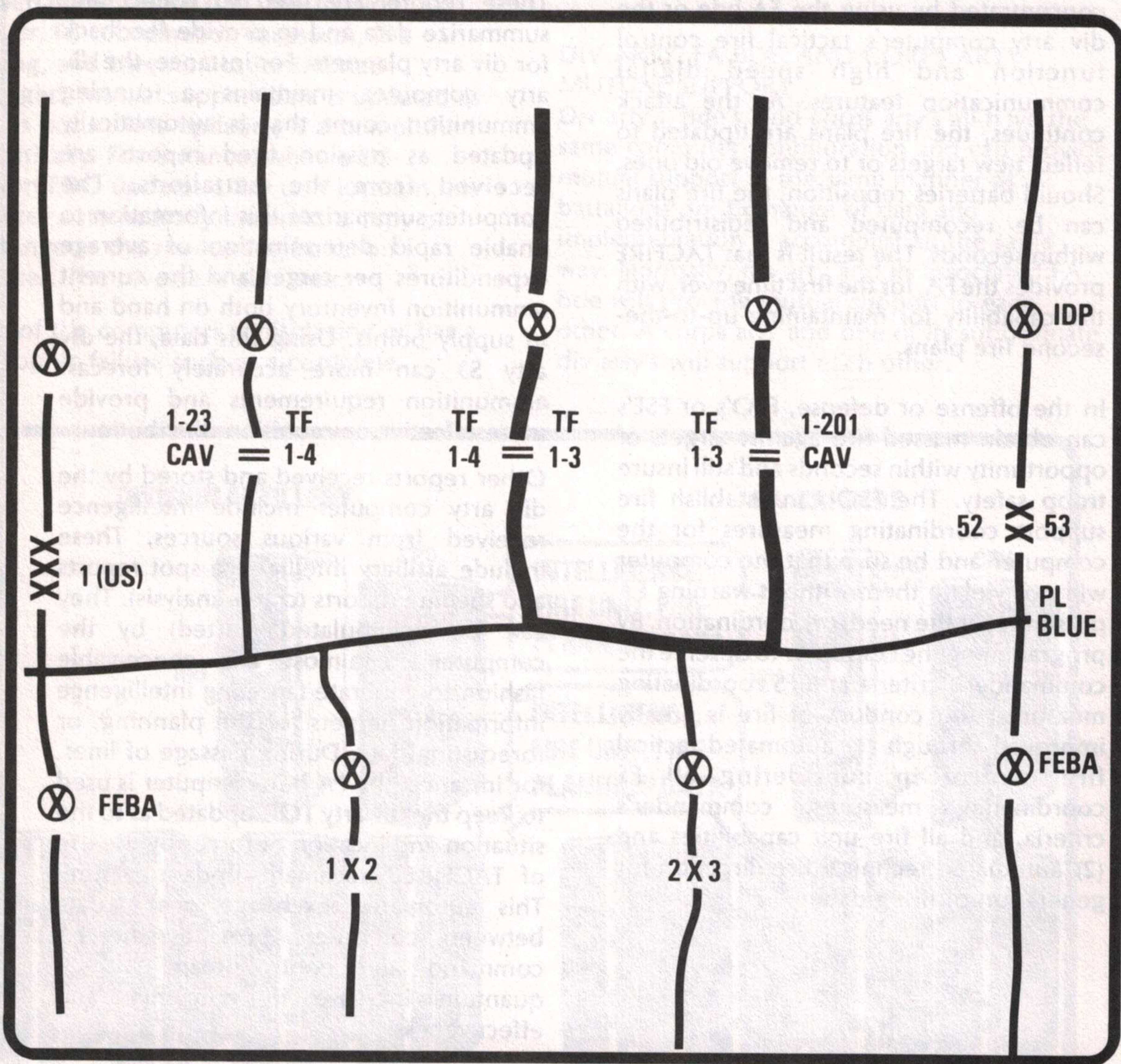
Other reports received and stored by the div arty computer include intelligence received from various sources. These include artillery intelligence spot reports and shelling reports (crater analysis). They can be manipulated (sorted) by the computer in almost any conceivable fashion to generate targeting intelligence information, targets for fire planning, or forecasting data. During passage of lines, for instance, the FA bde computer is used to keep the div arty TOC updated as to the situation and location of forces by the use of TACFIRE's automatic update feature. This automated exchange of FA data between computers provides the FA command and control team with a quantum increase in efficiency and effectiveness.

# DEFENSE I. COMPANY

## □ DEFENSE I. COMPANY TEAM IN THE CFA

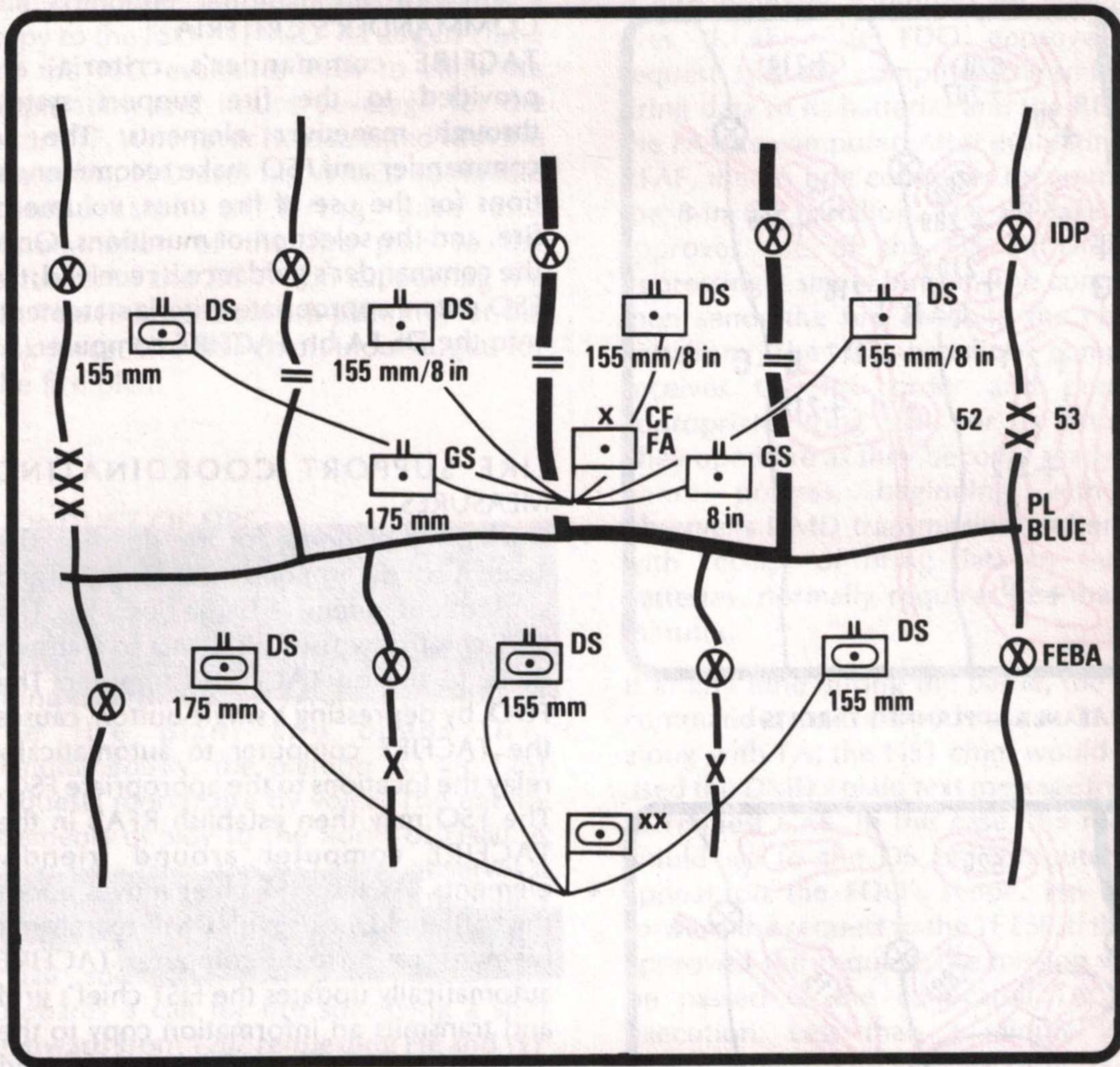
### GENERAL SITUATION

The US 52d Division (Mech) has received the mission to defend in sector. The organization and disposition of forces is shown in the two sketches below.



MANUEVER UNITS IN CFA

# TEAM IN THE CFA



**FA SUPPORT OF THE DIVISION AND THE CFA**

Note: Sketch shows mission relationship—not positioning.

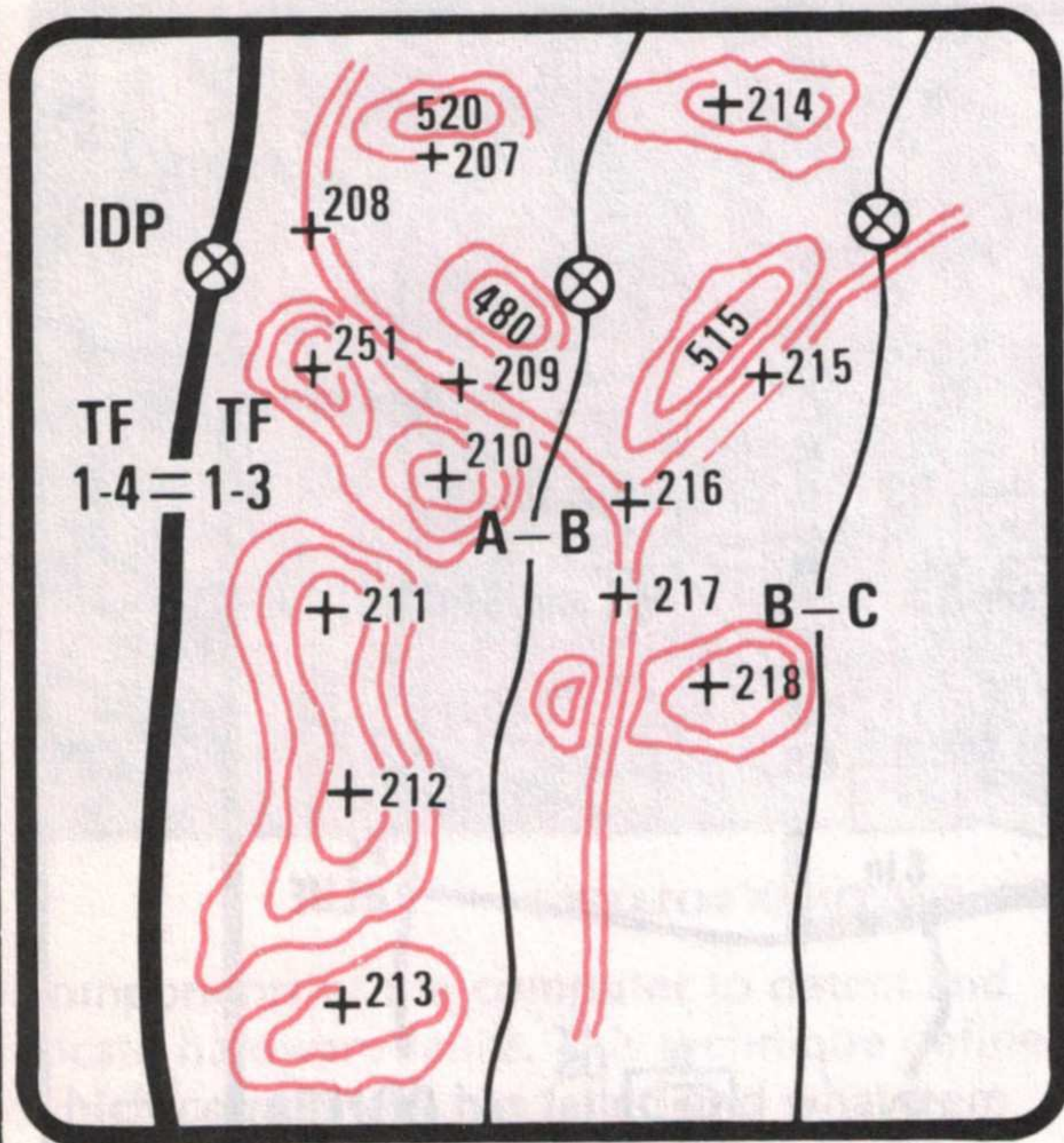
The following example will focus on company Team A (Tm A) as a part of TF 1-3 in the covering force area.

At a meeting with the TF Commander, the team commander was given positioning and mission guidance. In conjunction with his FIST chief, the Tm A cdr developed planned targets to support his scheme of defense. The completed scheme of defense and supporting planned targets are shown in the sketches below.

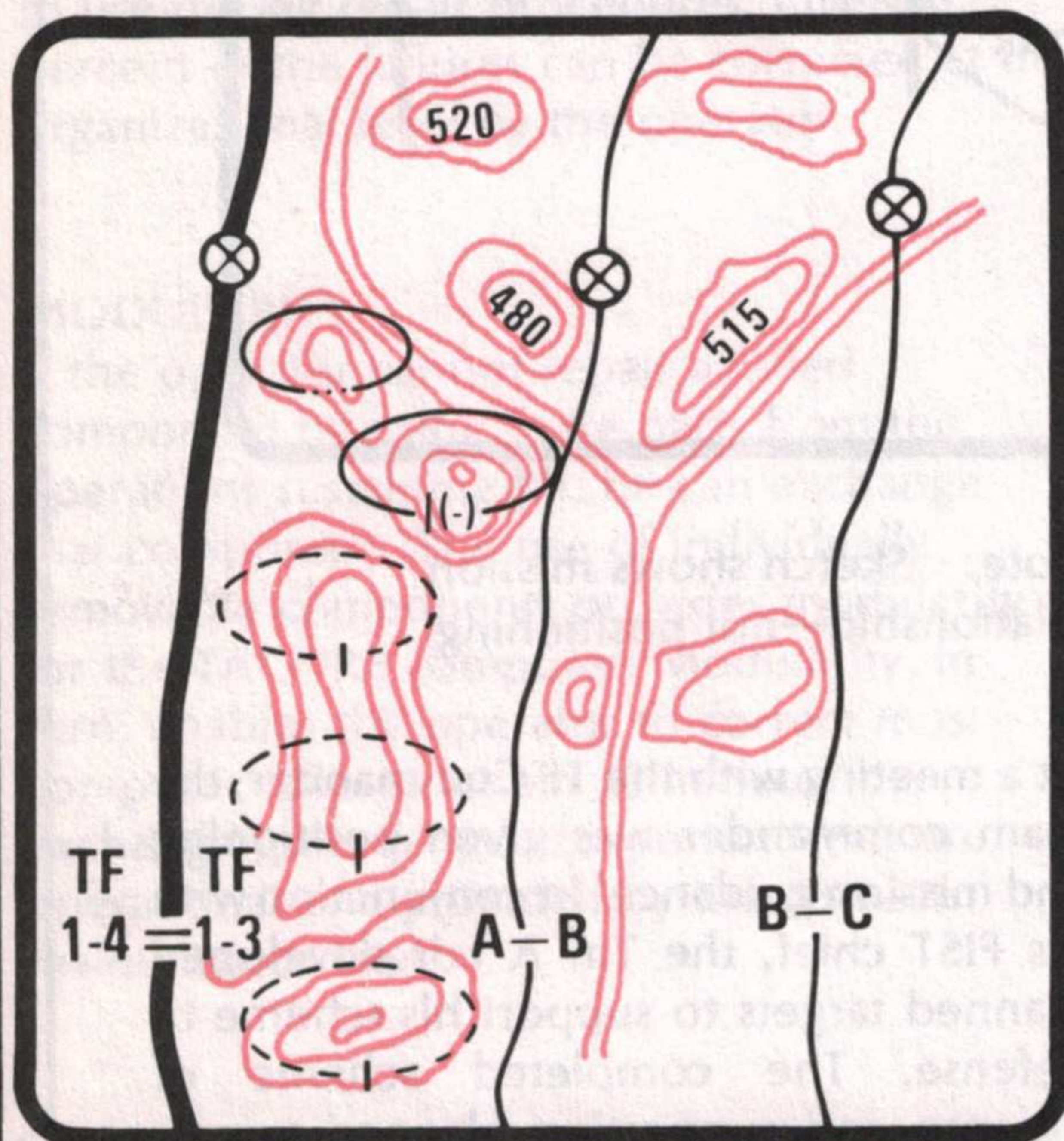


# DEFENSE I.

# COMPANY



TEAM A — PLANNED TARGETS



TEAM A — SCHEME OF DEFENSE AND POSITIONING

## COMMANDER'S CRITERIA

TACFIRE commander's criteria are provided to the fire support system through maneuver elements. The FA commander and FSO make recommendations for the use of fire units, volume of fire, and the selection of munitions. Once the commander's guidance is received, the FSO enters appropriate criteria statements into the DS FA bn TACFIRE computer.

## FIRE SUPPORT COORDINATING MEASURES

- \* During his planning for the defense, the Team A cdr determined areas for initial and subsequent defensive battle positions. The FIST chief now uses his DMD to transmit these to the bn TACFIRE computer. The FDO, by depressing a single button, causes the TACFIRE computer to automatically relay the locations to the appropriate FSO. The FSO may then establish RFA's in the TACFIRE computer around friendly elements. As the FIST chief moves about the battlefield, he uses his DMD to transmit his own location to the computer. TACFIRE automatically updates the FIST chief's grid and transmits an information copy to the appropriate FSO. The FSO is kept informed of the location of his FIST chiefs by use of TACFIRE's automatic update feature.

## FIRE SUPPORT PLANNING

- \* The company commander and the FIST chief continue to analyze the situation and refine their battle plan. The FIST chief uses his DMD to enter planned smoke, HE, and massed fire targets into a fire plan established by his FSO within the TACFIRE computer. As the FIST chief enters targets,

\*See note on page 5

# TEAM IN THE CFA

the computer automatically forwards a copy to the FSO's VFMED. As targets come in, the FSO evaluates each to eliminate duplication and insure coverage for the entire TF. Whenever he is satisfied with the target list, FSO uses his VFMED to initiate computation of firing data and dissemination of the fire plan to the batteries of the DS FA bn supporting the TF. The FSO controls fire planning for the task force. The FIST chiefs input targets for the fire plan.

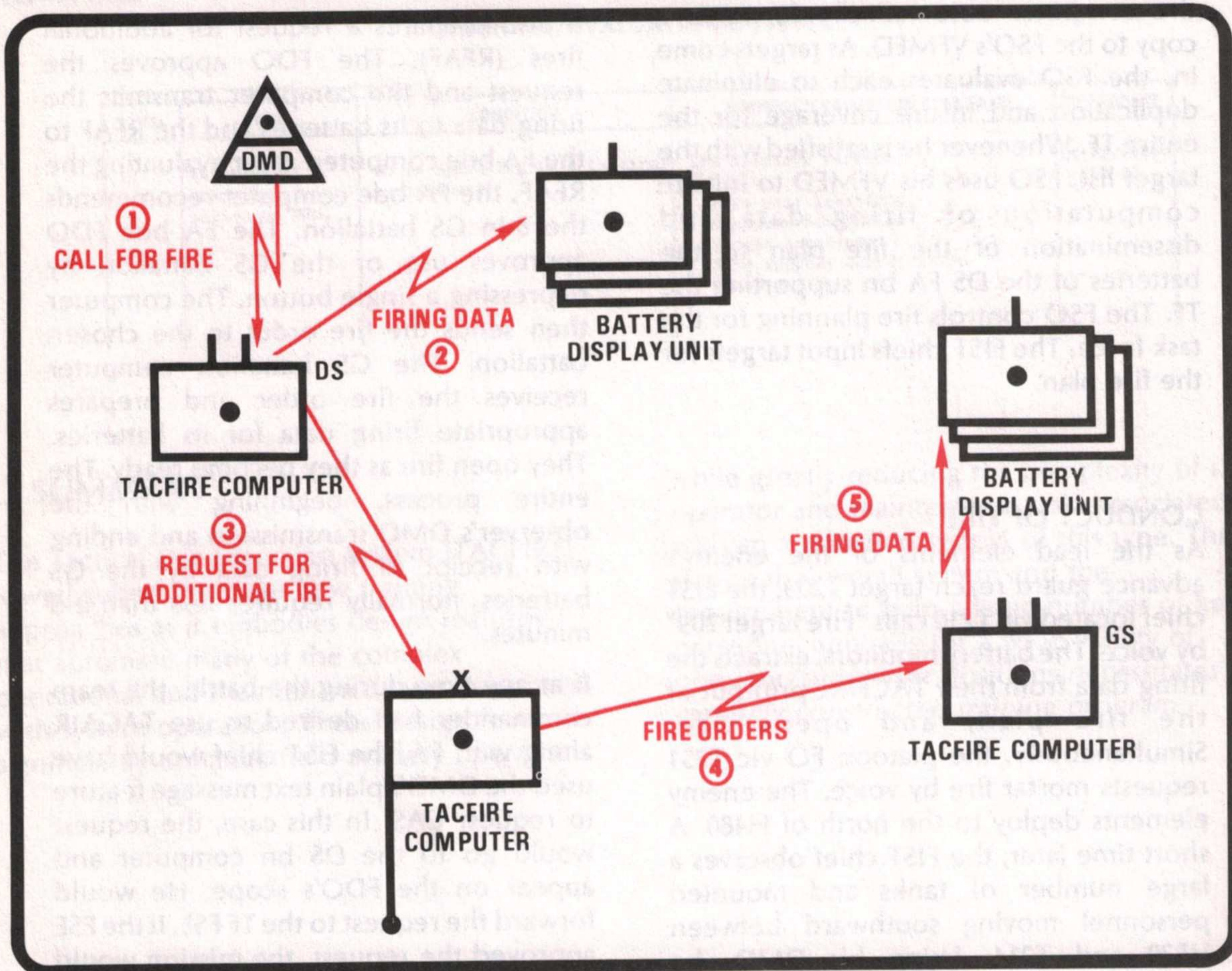
## CONDUCT OF FIRE

As the lead elements of the enemy's advance guard reach target T209, the FIST chief located vic T210 calls "Fire target 209" by voice. The battery monitors, extracts the firing data from their TACFIRE printout of the fire plan, and opens fire. Simultaneously, the platoon FO vic T251 requests mortar fire by voice. The enemy elements deploy to the north of H480. A short time later, the FIST chief observes a large number of tanks and mounted personnel moving southward between H520 and T214. Using his DMD, he prepares a call for fire specifying a shift eastward from T207 requesting HE and WP and transmits it to TACFIRE at the DS FA battalion. The computer receives the call for fire and determines firing data for each of its three batteries for the two munitions.

It also prepares a request for additional fires (RFAF). The FDO approves the request and the computer transmits the firing data to its batteries and the RFAF to the FA bde computer. After evaluating the RFAF, the FA bde computer recommends the 8-in GS battalion. The FA bde FDO approves use of the GS battalion by depressing a single button. The computer then sends the fire order to the chosen battalion. The GS battalion computer receives the fire order and prepares appropriate firing data for its batteries. They open fire as they become ready. The entire process, beginning with the observer's DMD transmission and ending with receipt of firing data by the GS batteries, normally requires less than 2-3 minutes.

If at any time during the battle, the team commander had desired to use TACAIR along with FA, the FIST chief would have used the DMD's plain text message feature to request CAS. In this case, the request would go to the DS bn computer and appear on the FDO's scope. He would forward the request to the TF FSE. If the FSE approved the request, the mission would be passed to the collocated TACP for execution. Less than 1 minute would elapse between the moment the FIST chief transmitted the request until FSE at CF HQ had the call for TACAIR.

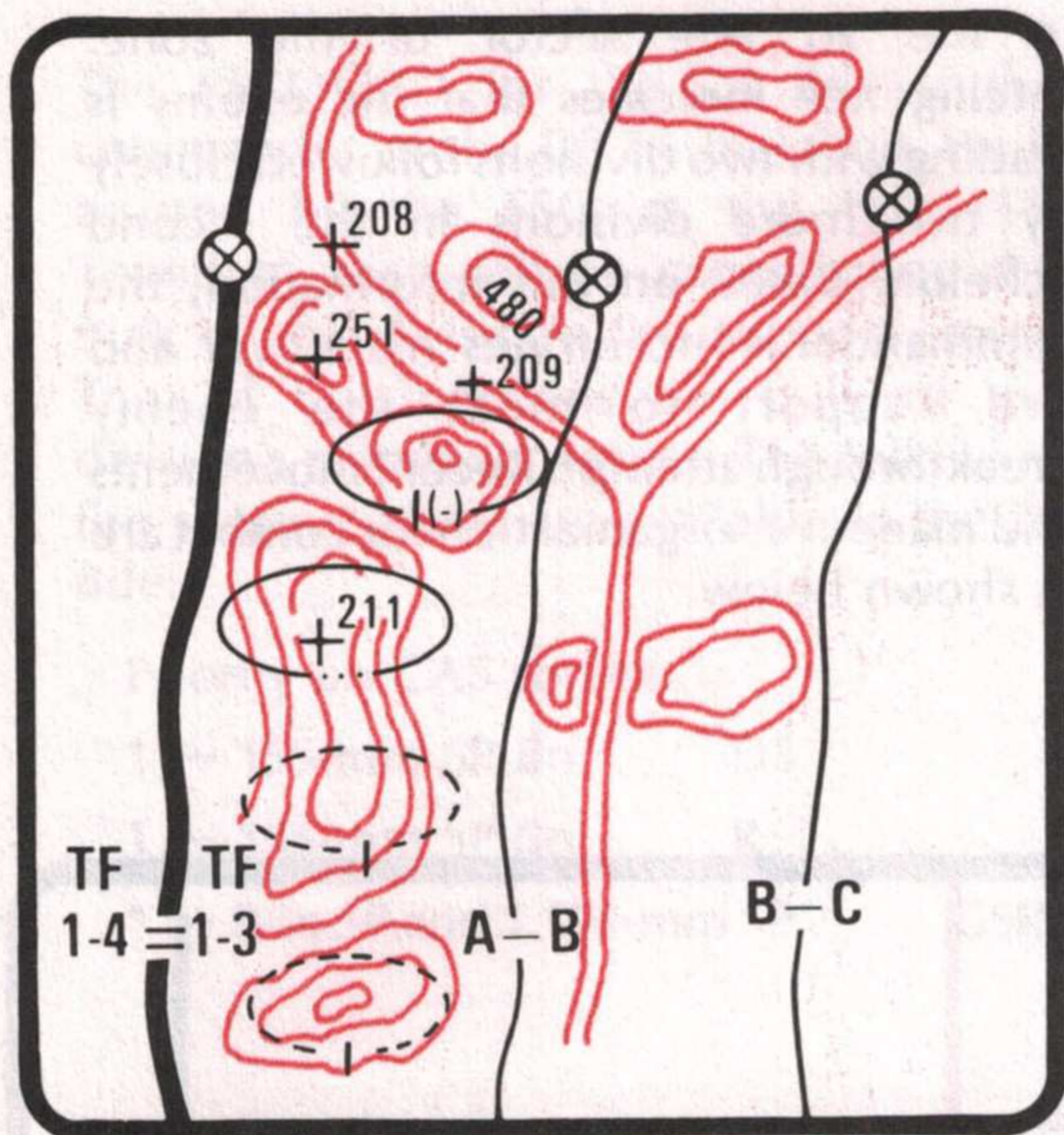
# DEFENSE I. COMPANY



## PROCESSING REQUESTS FOR ADDITIONAL FIRE

With fires from two FA battalions continuing to engage threat elements vic H480 and targets 208 and 209, the platoon withdraws from T251 to T211 covered by Tm A (-).

# TEAM IN THE CFA



WITHDRAWAL TO BATTLE POSITION 211

## REPORTING: INTEL

- \* During the battle, the FIST chief submits intelligence reports using his DMD. These indicate the location and direction of movement of enemy elements. These reports are automatically relayed to the FSO and FA bde by the computer. The FSO or the FSE then eliminates duplications by "killing" the report if it has already been sent in by maneuver elements. End of mission/target surveillance messages are also submitted by the FIST chief to provide valuable feedback information. Intel and end of mission reports are automatically relayed to the div arty computer from FA bde. TACFIRE's automatic update/message relay function permits real-time information exchange and update between all elements of the FA command and control team.

\*See note on page 5

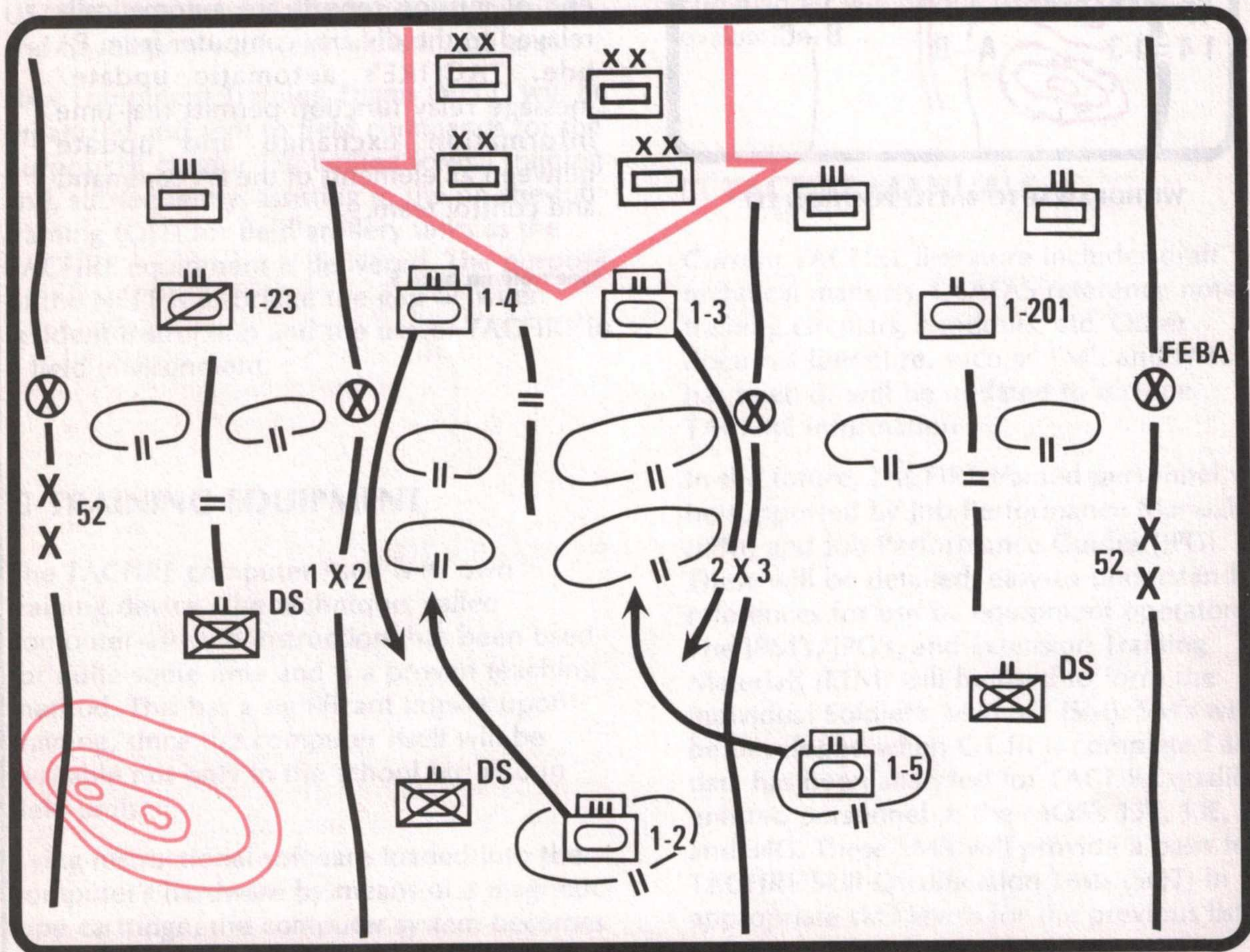
# DEFENSE II. DEFENSE

## DEFENSE II. DEFENSE IN THE MBA

### GENERAL SITUATION

Continuing the example from DEFENSE I, the covering force has been operating for some time and has succeeded in forcing the enemy to mass for a breakthrough attempt in the 52d division sector. The division commander has determined that the enemy's main thrust most likely will be

in the 2d Bde sector of the zone. Intelligence indicates that the enemy is leading with two divisions followed closely by two more divisions in the second echelon. Based on this information, the commander concentrates maneuver and fire support to meet the enemy breakthrough attempt. Recent movements and maneuver organization for combat are as shown below.



RECENT MOVEMENTS AND ORGANIZATION FOR COMBAT

# IN THE MBA

The FSCoord for the 2d Bde is the commander of the DS FA battalion. He is assisted by the FSO at the bde FSE. Together, they will be coordinating the bulk of the division's fire support assets. The 2d Bde contains the bulk of the division's maneuver forces. The following fire support assets are available to the 2d Bde:

#### Priority on CAS sorties

- |                             |      |
|-----------------------------|------|
| 1 — 155-mm SP Bn            | DS   |
| 1 — 155-mm SP Bn            | R    |
| 1 — 8-in SP and 1 155-mm SP | GSR. |

#### COMMANDER'S CRITERIA

Since the MBA DS battalion had been providing fires for the covering force under criteria established by the covering force commander, the DS battalion TACFIRE computer is updated with new engagement criteria developed from guidance from the bde commander. (See Offenses I and II for a discussion of how this is done.) Standard attack volleys and fire unit or ammunition exclusions are input into the computer as appropriate. Through this input of commander's criteria, the DS battalion is capable of automatically tailoring its fires to the needs of the 2d Bde.

#### FIRE SUPPORT COORDINATING MEASURES

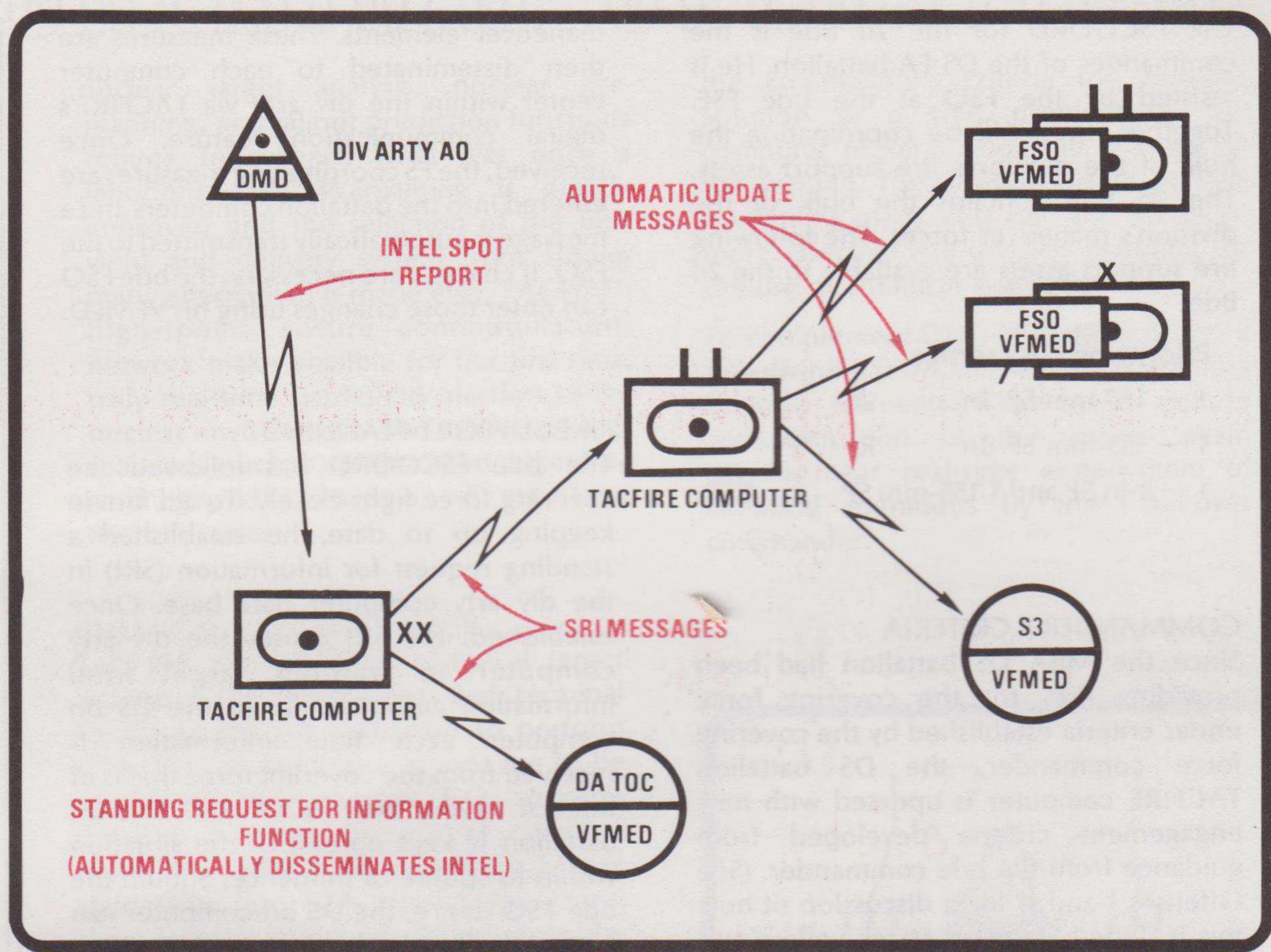
FS coordinating measures such as CFL, RFA's, and air corridors are updated or eliminated based on planning and coordination between fire support and

maneuver elements. These measures are then disseminated to each computer center within the div arty via TACFIRE's digital communication feature. Once received, the FS coordinating measures are entered into the battalion computers and a message is automatically transmitted to the FSO. If changes are necessary, the bde FSO can enter those changes using his VFMED.

#### FIRE SUPPORT PLANNING

The bde FSCoord has followed the covering force fight closely. To aid him in keeping up to date, he established a standing request for information (SRI) in the div arty computer data base. Once established, the SRI causes the div arty computer to transmit target intel information automatically to the DS bn computer each time information is received from the covering force that is of interest to the bde FSCoord. The DS battalion is kept abreast of the situation within its sphere of influence. Should the bde FSO desire, the DS bn computer can automatically relay intel data received as a result of the SRI to him. The bde FSO can then use this data to update his counterprep or other fire plans. Maneuver battalion FSO's get information copies of the report via TACFIRE's automatic update/relay function.

A key point in fire planning for the defense is the oncall counterprep. In the manual system, preparing this type of fire plan is laborious and time-consuming. With TACFIRE, counterpreps are handled as rapidly as any other type of fire plan. The artillery target intelligence file in the div arty computer can be searched and any



**DIV ARTY STANDING REQUEST FOR INFORMATION FUNCTION**

targets found can be transmitted back to the battalion computer. During a highly fluid situation, the counterprep can be rapidly updated by inputs from the FIST teams using DMD's, FSO's using VFMED's, or at the TACFIRE computer by fire direction personnel.

Counterfire (CF) is managed by the div arty TOC (DATOC). TACFIRE supports the mission and functions of the DATOC by facilitating CF target development, CF fire planning, and engagement of CF targets.

The DATOC, using their VFMED, receives targeting information from the div and corps FSE's, the TAB assets, the div arty aerial observers, and from subordinate battalions via the DA computer's automatic update/relay function. For example, if an aerial observer detects some activity of interest, he uses his DMD to input it into the DA computer. The computer knowing that the message is an intel report automatically forwards it to the DATOC's VFMED.

\*See note on page 5

# IN THE MBA

To perform CF management, the DATOC uses the DA computer's target combination, sorting, and retrieval functions to develop CF target lists. These target lists are then entered into a CF fire plan stored within the DA computer. The fire plan is developed and transmitted to the subordinate battalions where it is stored. CF firing data is determined by the bn computers and sent to the appropriate batteries. The plan can be easily and very rapidly updated by the DATOC as the situation develops. During defense in the MBA, CF is extremely important and requires detailed planning. Transmission of even the briefest fire plan in the current manual system is time-consuming and error-prone to say the least. With TACFIRE these transmission problems are overcome, update of the plan, and recalculation of firing data after a met change are routinely and easily accomplished.

TACFIRE greatly improves the responsiveness of the FA by facilitating implementation of the CF fire plan. In the defense, as the enemy approaches MBA positions, US forces are engaged by enemy indirect fire. The FIST chief prepares a very brief message on his DMD indicating that he is receiving fire and the direction from which it appears to be coming. He transmits the message to the FA bn computer where the FDO depresses two buttons to transmit the call for CF to div arty. The message appears on the scope of the DATOC's VFMED only 15-20 seconds after transmission by the FIST chief. The DATOC examines the report and selects CF targets from the ON-CALL CF plan. A message to fire the selected targets from the plan is transmitted from the DATOC's VFMED to the appropriate FA battalion via

\*See note on page 5

TACFIRE. The battalion relays the message to its batteries who extract the firing data from their TACFIRE printouts and open fire. The message from the DATOC to the firing batteries requires no more than 15 seconds.

TACFIRE greatly facilitates counterfire through its target combination, sorting, and retrieval functions. TACFIRE fire planning and high speed digital communication features make real-time fire planning and execution a reality.

Positioning of fire units is a critical task in this defensive example. To aid in developing the best plan, the div arty commander and the 2d Bde FSCOORD make use of the capabilities of the div arty computer. The electronic tactical display (ETD), located only at div arty and FA bde, is a device that provides an electronic display scope, similar to a TV screen, which depicts fire support coordination graphics, enemy and friendly units, targets, and enemy and fire unit capabilities fans.

The div arty commander uses the ETD to wargame division fire support defense plan alternatives. He displays each defensive plan graphically, and, by manipulating fire unit locations on the scope, determines the best position for each to effectively support the plans. As target information and unit position updates come into the div arty computer these are automatically displayed on the ETD to give the commander the current picture. Whenever he desires, the div arty commander or S3 can have the computer draw an overlay of the complete plan including FS coordinating measures, units, and planned targets using the digital plotter map.



# DEFENSE II. DEFENSE IN THE MBA

## CONDUCT OF FIRE

Fire missions are processed and executed in the same manner as previously discussed in the Offense I and II scenarios. A key aspect of this defense, however, is that the DS bn has several other FA battalions it can receive responsive fires from. In the current FS system, this presents a communication problem of some magnitude. To aid in control and coordination, the communication control unit (CCU), found at bn and div arty TACFIRE computer centers is used to increase communication speed and flexibility. It does this by allowing the FA S3 or FDO to monitor or talk on any net by turning a single switch to the appropriate position. The CCU, itself a small computer, allows a single operator to control up to eight nets carrying both digital data and voice traffic.

To illustrate, the DS bn commander may wish to send a voice message to all of his fire units and to the reinforcing bn commander. He has wire established with two of his fire units, FM radio with the third, and AM radio with the reinforcing Bn. The CCU is used to link the units into a conference call. This is accomplished by the CCU operator and requires approximately 1 minute to set up.

## REPORTING: INTELLIGENCE

Reporting, done continuously and automatically by the TACFIRE computer, enables the div arty commander to keep a close watch on the fight by providing timely and accurate information on which to base decisions. The TACFIRE standing request for information feature enables agencies such as a DS bn or the DATOC to obtain real-time targeting and intelligence data.

By providing high speed information collection, summary, and processing, the TACFIRE system will make a revolutionary contribution to success on the battlefield. The FA can effectively double its combat power by fully using the capacity of existing weapons. No longer will six to eight requests for fire bog down the FS system by inundating the FDC. No longer will fire planning be slow and unresponsive. Near real-time reaction by the fire support system will be reality.

# NUCLEAR AND CHEMICAL OPERATIONS

## □ NUCLEAR AND CHEMICAL OPERATIONS

To show the enemy that our nuclear and chemical fires are selective and restrained and to minimize the chance of escalation to high intensity nuclear warfare, tactical nuclear employment will be in preplanned packages. A package consists of a discrete grouping of nuclear weapons by yield for employment in a specific area during a specific time period. Corps is the focal point for nuclear package planning. A package may consist of subpackages allocated to each division. The divisions plan targets for the subpackage, update targets with the flow of the battle, and employ the weapons. Upon release by the National Command Authority, the corps initiates release of the nuclear or chemical package and subpackages. The corps field artillery section develops the plan for nuclear weapons employment in coordination with the corps NBCE and operations personnel.

At division, the FSE conducts nuclear and chemical fire planning using the VFMED and FSE support features of the div arty TACFIRE computer. In this regard, the FSE establishes commander's criteria in the data base, performs prehostility subpackage fire planning, updates subpackages, retransmits nuclear subpackage release and firing messages, and performs chemical target analysis.

### COMMANDER'S CRITERIA

Before conducting nuclear target analysis (NTA), the FSE enters into the DA computer commander's criteria for NTA. Such parameters might include:

A standard degree of damage  
The standard for troop safety, e.g., negligible risk unwarned exposed troops.  
The maximum yield to be used.  
Preclusion of collateral damage to selected areas.

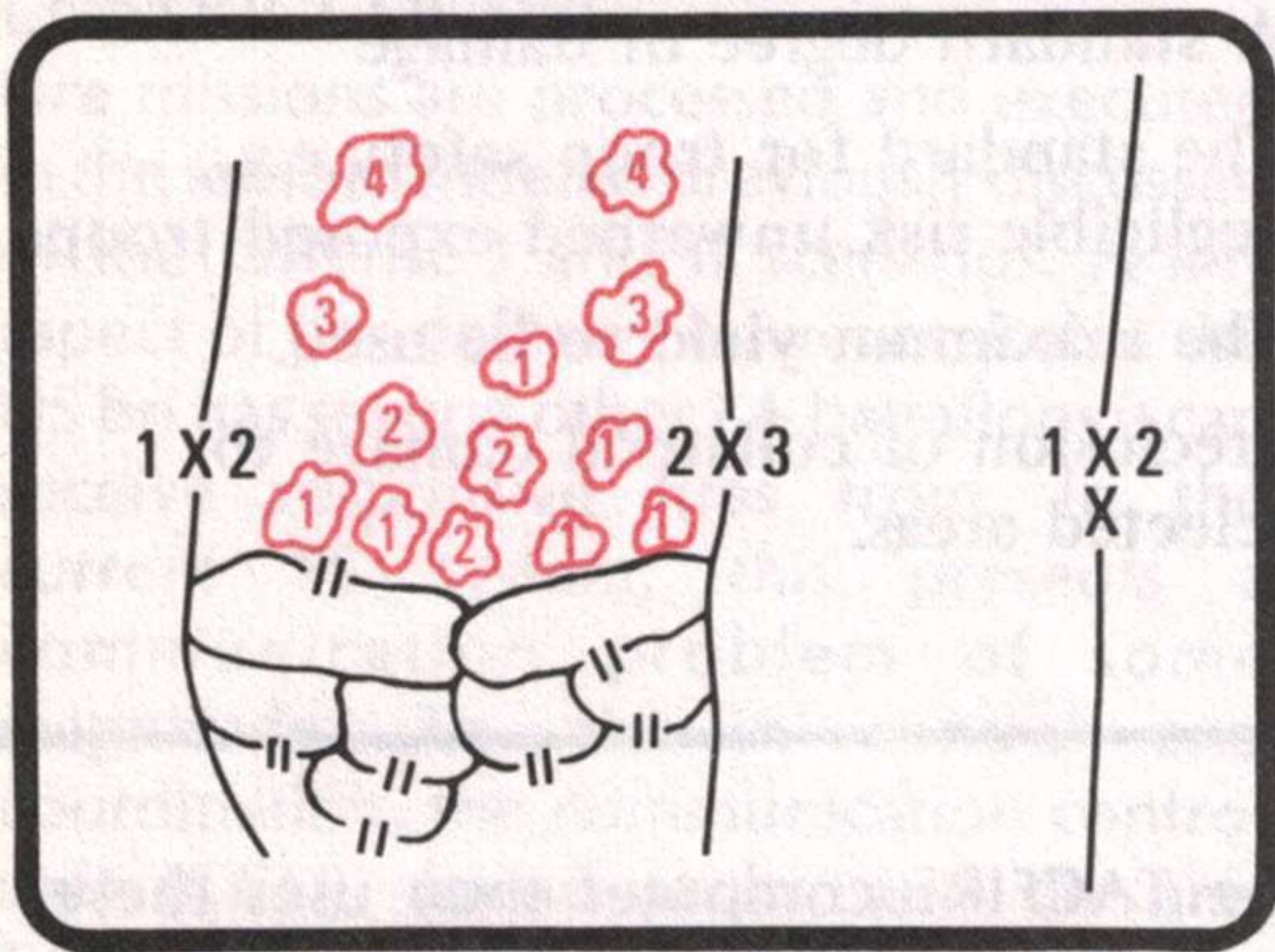
The TACFIRE computer then uses these parameters during NTA. Once the criteria are established, the FSE causes the computer to wargame possible alternatives and to generate data for the division's nuclear subpackage.

### PREHOSTILITY SUBPACKAGE PLANNING

Before hostilities begin, corps prepares the anticipated opposing force overlay. The GS prepares a preclusion overlay to outline the towns, population centers, etc. to be avoided. These documents are made available to the divisions. The division FSE uses its VFMED to access the div arty computer to perform nuclear target analysis for the preliminary nuclear fire plan target list. The results of the computer's analysis are printed on the VFMED's printer and include collateral damage and minimum safe distances (CDD and MSD) per yield per target. Based upon TACFIRE determination of CDD, MSD, and the manual preparation of the composite overlay, the FSE uses the VFMED to store the final nuclear target list in the DA

# NUCLEAR AND DEFENSE

TACFIRE computer's data base. The targets (aimpoints) are thus ready for instant dissemination to the appropriate firing unit.

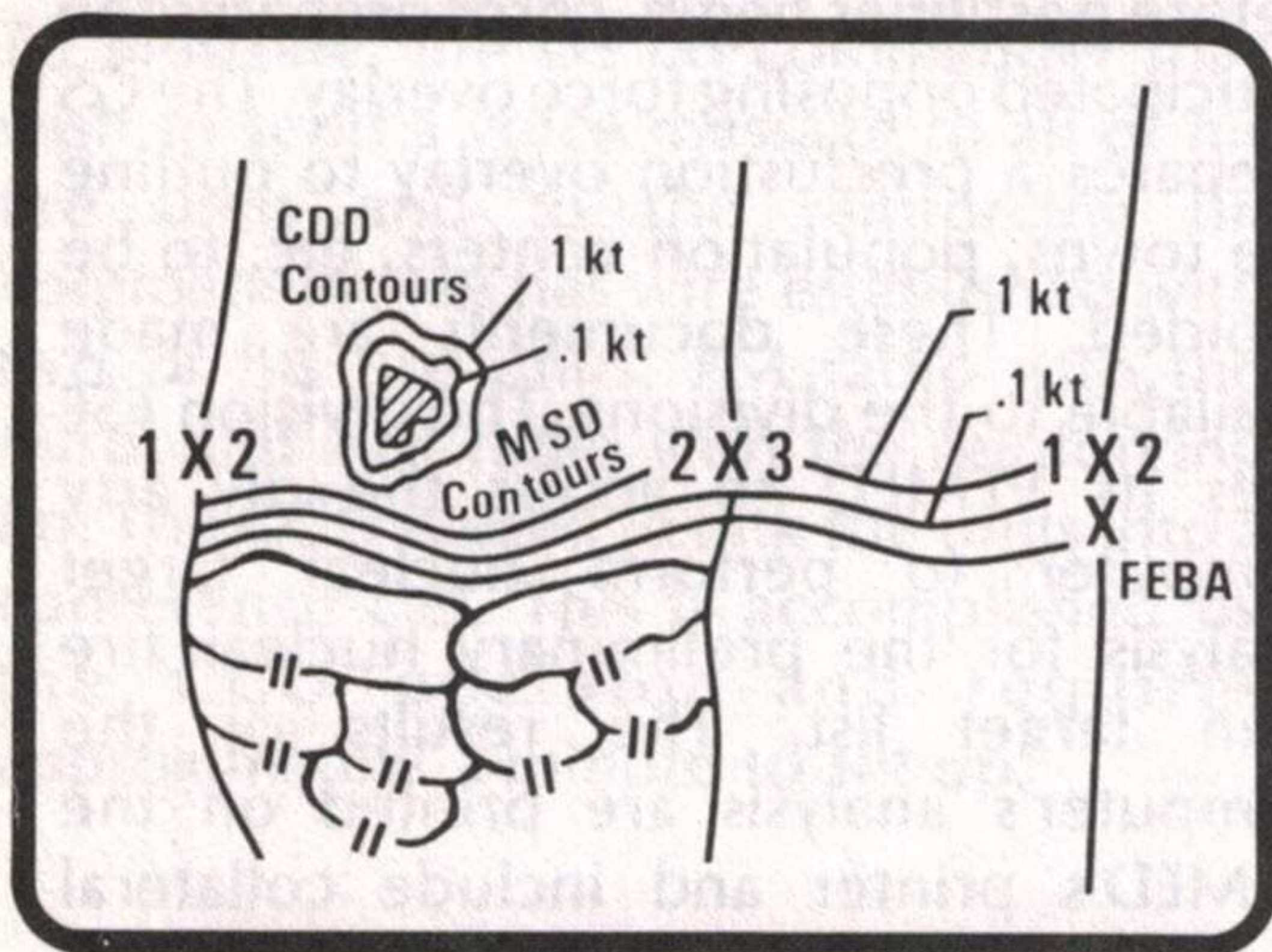


**OPPOSING FORCE OVERLAY**

**Legend:**

**Type Units:**

- 1. Tank Co
- 2. Rifle Co
- 3. Bn CP
- 4. Div CP



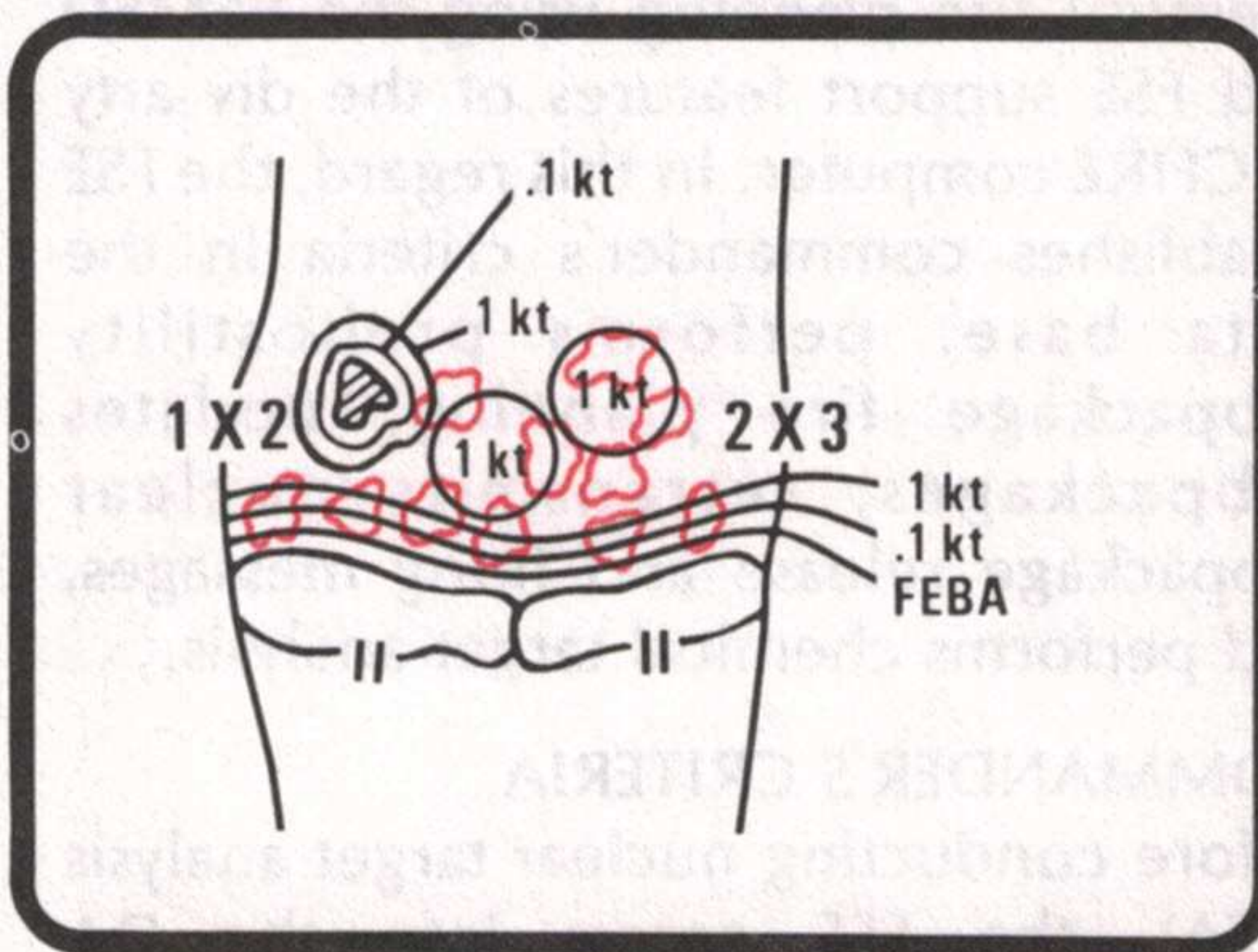
**CDD AND MSD CONTOURS OVERLAY**

**Legend:**

- Hashed Area-Preclusion
- Lines-CDD and MSD Contours  
(Entered by FSE based upon TACFIRE NTA)

## UPDATE OF THE NUCLEAR SUBPACKAGE TARGET LIST

As the situation changes, the division FSE uses the VFMED terminal to access the DA computer for NTA. New contingency targets are developed and analyzed by the TACFIRE computer. The results of the analysis are printed out on the VFMED's printer and specify several alternatives. Each alternative includes the best munition, yield, delivery system, and new CDD and MSD data. If the FSE decides to incorporate the target into the subpackage, the TACFIRE VFMED is again used to transfer the target into the nuclear fire plan in the div arty computer's data base. The div arty computer automatically sends an update to the corps computer. The CDD and MSD are used to update the subpackage composite overlay in the FSE. After hostilities begin and nuclear release is granted, the FSE can rapidly disseminate targets from the plan stored in the div arty computer to any selected fire unit within the division's area and continually update the nuclear fire plan.



**COMPOSITE OVERLAY WITH AIMPOINTS**

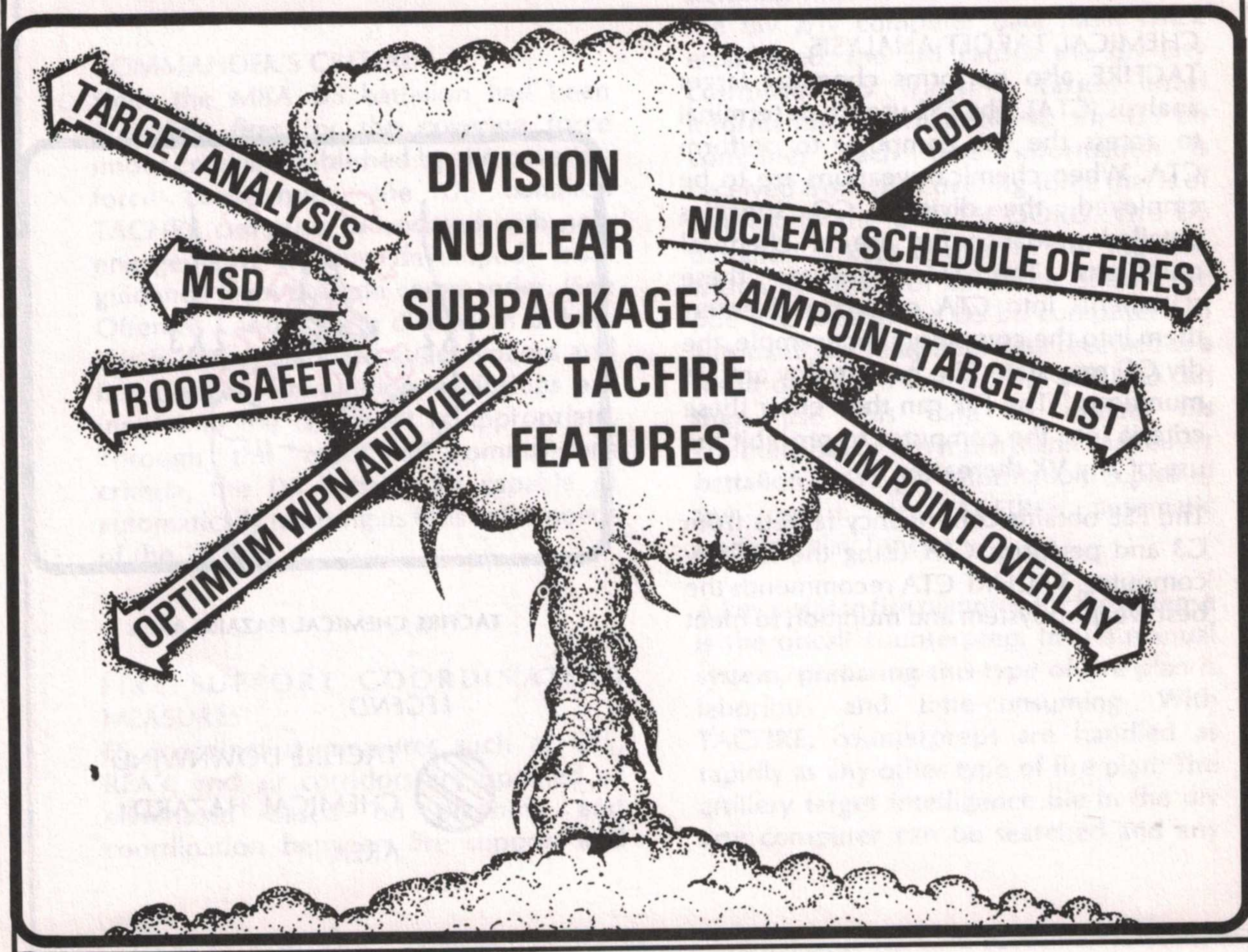
# CHEMICAL OPERATIONS

## SUBPACKAGE RELEASE AND FIRING

After release, the division commander, based upon the recommendation of FSE, initiates firing. FSE using their VFMED instructs the DA computer to transmit the appropriate target to the chosen battalion. The secure, high-speed, and error-free features of the TACFIRE system greatly relieve the communications system loading during this critical period. In the meantime, the FSE uses the DA computer to prepare a prestrike fallout prediction to all FSE's and batteries. The STRIKEWARN is also sent out. This entire process requires only seconds of computer time and about 3

seconds per battalion to disseminate the fallout prediction.

When the battalion receives the nuclear fire mission, their TACFIRE computer prepares fire commands and transmits them to the battery and appropriate weapon section. The fallout prediction is received by all FSO's and batteries 6 seconds after transmission by div arty. When the time for firing arrives, the weapons are loaded and fired. This entire process can require less than 5 minutes depending on the state of readiness of the howitzer crew. The TACFIRE computer's



# NUCLEAR AND CHEMICAL OPERATIONS

nuclear target analysis, nuclear fire planning, and fallout prediction functions reduce to seconds what was once a laborious task. Wargaming is greatly improved and the selection of the best yield and delivery system from among many alternatives is made easy. TACFIRE's high-speed, secure communications network make possible for the first time, truly real-time battlefield reaction to the nuclear environment. The result is a vastly reduced nuclear preparation signature and greatly improved nuclear responsiveness.

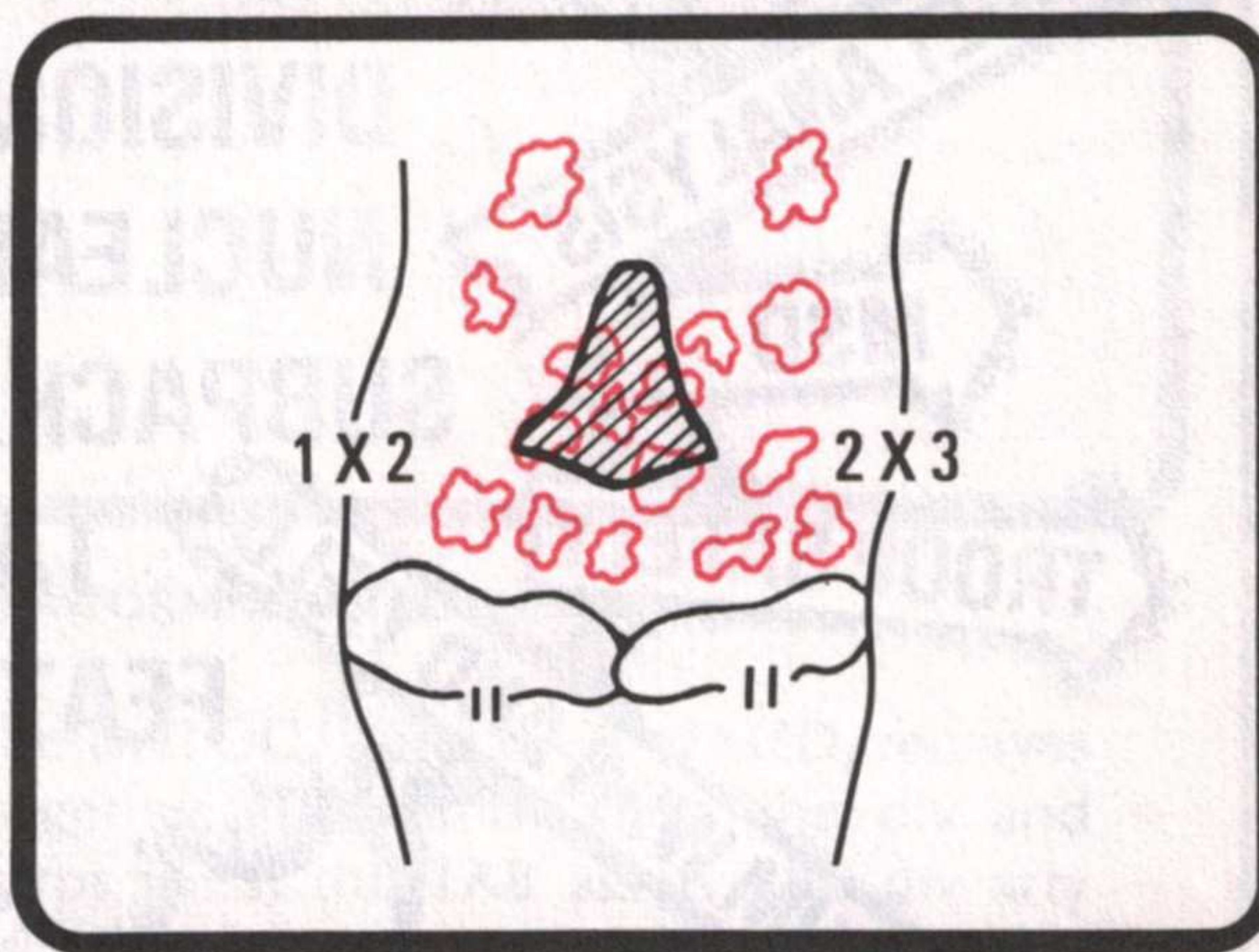
the commander's criteria for damage. Solution of a CTA problem by the computer requires about 10 seconds on the average. The speed of results permits wargaming many situations and therefore more effective and detailed planning for the use of chemical munitions.

To complement CTA, TACFIRE prepares a downwind hazard area report for warning friendly elements. High-speed, secure communication of the results again permits near real-time employment of chemical munitions by the maneuver commander.

## CHEMICAL TARGET ANALYSIS

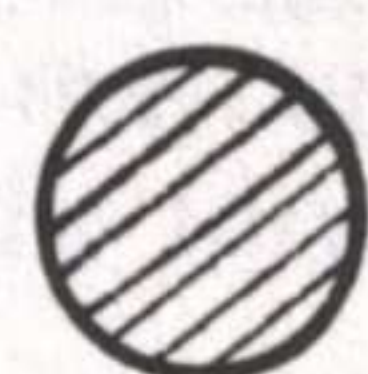
TACFIRE also performs chemical target analysis (CTA). The FSE uses their terminal to access the DA computer to perform CTA. When chemical weapons are to be employed, the division CO specifies detailed guidance for use of chemical munitions. The FSE translates these statements into CTA criteria and enters them into the computer. For example, the div CG may state "Do not employ any VX munitions." The FSE can then enter these criteria into the computer to prohibit the use of any VX thereafter.

The FSE obtains contingency targets from G3 and performs CTA using the div arty computer. TACFIRE CTA recommends the best weapon system and munition to meet



TACFIRE CHEMICAL HAZARD AREA

### LEGEND:

-  TACFIRE DOWNWIND CHEMICAL HAZARD AREA

# TACFIRE TRAINING

## Chapter 3

TACFIRE is a complex system that requires many skills for its operation. The skills are perishable; that is, if these skills are not used and practiced by the operators, they atrophy and are quickly forgotten. TACFIRE training focuses on the development of individual skills, integration of team skills, and the export of training materials from USAFAS to field units for both individual and team training. The training both at Fort Sill and in the field capitalizes on the hands-on concept.

Who will be TACFIRE trained? Training is based upon the schedule of division artilleries and field artillery brigades to receive TACFIRE. USAFAS has already trained those soldiers who will test and help train the 1st Cavalry Division Artillery for Operational Test III (OT III). In 1977 the 1st Cavalry Division Artillery will receive TACFIRE instruction both at USAFAS from resident instructors and at Fort Hood from a new equipment training team (NETT). Following a favorable decision of the Army Systems Acquisition Review Council (ASARC) in May 1978, the remaining division artilleries will receive training in TACFIRE as they are equipped. Key TACFIRE personnel will continue to be trained at USAFAS while the remainder will be trained at their units.

How will the training be done? Presently, TACFIRE is taught from the "platform." In the future, training will be self-paced, both at

USAFAS and with materials that are exported to field units. Exported training reinforces what was learned in the school and helps develop skills, building one lesson upon another. The materials will be in the form of guidance packets, programed texts and computer assisted instruction, the latter using the TACFIRE computer already at the unit. A solid base of training literature, aimed at teaching soldiers what to do and how to do it, step-by-step, is being prepared. TACFIRE also has its own ARTEP, usable by the commander to guide his day-to-day training.

### □ PRESENT TRAINING

The most comprehensive TACFIRE course being taught at USAFAS is 10 weeks long. This course covers the full range of training from duties of the fire direction officer to duties of the operator, and from fire planning to organizational maintenance. Additionally, there are courses, ranging in length from 2 to 4 weeks, oriented toward the commander and his staff, the fire support officer, and FSE, and the direct support maintenance specialist. These courses, which will be taught at Fort Sill through 1977, have had great success. About 180 students ranging in rank from lieutenant colonel to E2 have been trained.

## □ FUTURE TRAINING

The broad spectrum of courses, now being taught, will be decreased by the time division artilleries and field artillery brigades begin to receive equipment. Students who attend resident USAFAS courses will receive specialized training. Fire direction officers, artillery console operators, and fire support sergeants will receive USAFAS training followed by on-the-job training in their units.

Many members of the TACFIRE team (e.g., FO's, survey personnel, and RTO's) will receive training within the unit, through Technical Extension Courses (TEC) and on-the-job training. This will reinforce the skills learned at USAFAS and build new skills through OJT. The benefit derived from exported training is shortened time at USAFAS, thus maximizing hands-on training and development of team skills in the unit.

New Equipment Training Teams (NETT) will be organized and sent to field commands for the purpose of conducting limited formal training and, subsequently, assisting in the on-the-job training (OJT) for field artillery units as the TACFIRE equipment is delivered. The purpose of the NETT is to bridge the gap between resident instruction and the use of TACFIRE in a field environment.

## □ TRAINING EQUIPMENT

The TACFIRE computer itself is its own training device. The technique, called computer-assisted instruction, has been used for quite some time and is a proven teaching method. This has a significant impact upon training, since the computer itself will be available not only in the school but also in field units.

Using instructional software loaded into the computer's hardware by means of a magnetic tape cartridge, the computer system becomes a dynamic learning center capable of

presenting lessons about itself. Through data automation the student progresses at his own pace; incorrect responses are diagnosed and the lesson branches to remedial areas, returning the student to the main topic upon completion of the remedial lesson. The programed goal is to achieve one hundred percent comprehension of the items found in the training objectives.

The computer may also be used for collective or unit training. Through the use of team training scenarios currently being developed by the Army Research Institute, a battalion or div arty commander will be able to exercise and evaluate his key TACFIRE elements, through a series of simulated tactical situations. By comparing the actions, response times, and knowledge of the evaluated FDC with a school solution/recommendation the commander will have a ready tool for evaluation.

## □ TACFIRE MANUALS

Current TACFIRE literature includes draft technical manuals, USAFAS reference notes, training circulars, handouts, etc. Other doctrinal literature, such as TM's and FM's, has been or will be updated to include TACFIRE information.

In the future, TACFIRE trained personnel will be supported by Job Performance Manuals (JPM) and Job Performance Guides (JPG). These will be detailed, easy-to-understand references for use by equipment operators. The JPM's, JPG's, and Extension Training Materials (ETM) will be used to form the individual Soldier's Manuals (SM). SM's will be developed when OT III is completed and data has been analyzed for TACFIRE qualified enlisted personnel in the MOS's 13Y, 13E, 13F, and 34G. These SM's will provide a basis for TACFIRE Skill Qualification Tests (SQT) in the appropriate skill levels for the previous listed MOS's.

## □ ARMY TRAINING AND EVALUATION PROGRAM (ARTEP)

Although TACFIRE automates command and control for the field artillery, it does not change the mission. The training objectives in current field artillery ARTEP's are generally

adequate to train a unit equipped with TACFIRE. However, some standards require modification and some new tasks are added.

The following examples illustrate the kinds of ARTEP changes that TACFIRE necessitates.

### EXAMPLE 1

#### CURRENT ARTEP (6-165)

#### TRAINING/EVALUATION OUTLINE

LEVEL	TASK	CONDITION	TRAINING/EVALUATION STANDARD	REFERENCE
1,2,3	(12) COMPUTE data for an adjust fire, high angle mission.	An observer has requested an adjust fire, high angle mission (or the FDO has identified an intervening crest). The target is located by shift from known point. The FDO decides to include site.	Initial round data computed within 45 sec after the FDC receives the complete call for fire.  Subsequent data computed within 25 sec after FDC receives the subsequent corrections.  Drift corrections applied.	FM 6-40 FM 6-40-3 FM 6-40-5

#### TACFIRE ARTEP (6-865(T))

#### TRAINING/EVALUATION OUTLINE

LEVEL	TASK	CONDITION	TRAINING/EVALUATION STANDARD	REFERENCE
1,2,3	(11) COMPUTE data for a high angle, adjust fire mission.	An observer has requested a high angle, adjust fire mission (or the FDO has identified an intervening crest). The target is located by shift from a known point.	Compute and pass data to fire unit for initial round within 30 sec after BOC receives complete call for fire.  Compute and pass subsequent data to fire unit within 10 sec after BOC receives subsequent corrections.	FM 6-40 FM 6-40-5 TM 11-7440-240-10

### EXAMPLE 2

#### TACFIRE ARTEP (6-865(T))

#### TRAINING/EVALUATION OUTLINE

LEVEL	TASK	CONDITION	TRAINING/EVALUATION STANDARD	REFERENCE
155-mm 1	(41) COMPUTE data for an immediate suppression mission.	An observer requests immediate suppressive fires on a target located by grid coordinates. (Target of opportunity)	From the time the target location is received, firing data is computed and sent to a cannon platoon within:  20 sec if the battery is dedicated. 25 sec if the battery is not dedicated.	FM 6-40 FM 6-40-3 FM 6-40-5

#### CURRENT ARTEP (6-165)

#### TRAINING/EVALUATION OUTLINE

LEVEL	TASK	CONDITION	TRAINING/EVALUATION STANDARD	REFERENCE
1	(39) COMPUTE data for an immediate suppression mission.	An observer requires immediate suppressive fires on a target of opportunity.	From the time the target location is received, compute and send firing data to a cannon platoon within 25 sec.	FM 6-40 FM 6-40-5 TM 11-7440-240-10



EXAMPLE 3

6-165—NO TASK

6-865—#4 TASK

TRAINING/EVALUATION OUTLINE

LEVEL	TASK	CONDITION	TRAINING/EVALUATION STANDARD	REFERENCE
1	(4) DISPLAY graphical information on DPM.	Bn is operating in a tactical environment.	DPM displays current:  Fire unit locations Maneuver boundaries Target locations Fire support coordination measures.	TM 11-7440-240-20

□ SUMMARY

The Tactical Fire Direction System (TACFIRE) is well suited for these new training approaches as it embodies design features that automate many of the complex operational and maintenance tasks associated with system operation. These design features significantly enhance field artillery operations

while greatly reducing the complexity of the operator and maintenance tasks associated with an automated system of this type. The size of the overall system and the requirement to train a large number of key personnel annually for a wide variety of operator/supervisor positions necessitates a carefully constructed training program.

# CONTINUITY OF OPERATIONS

## Chapter 4

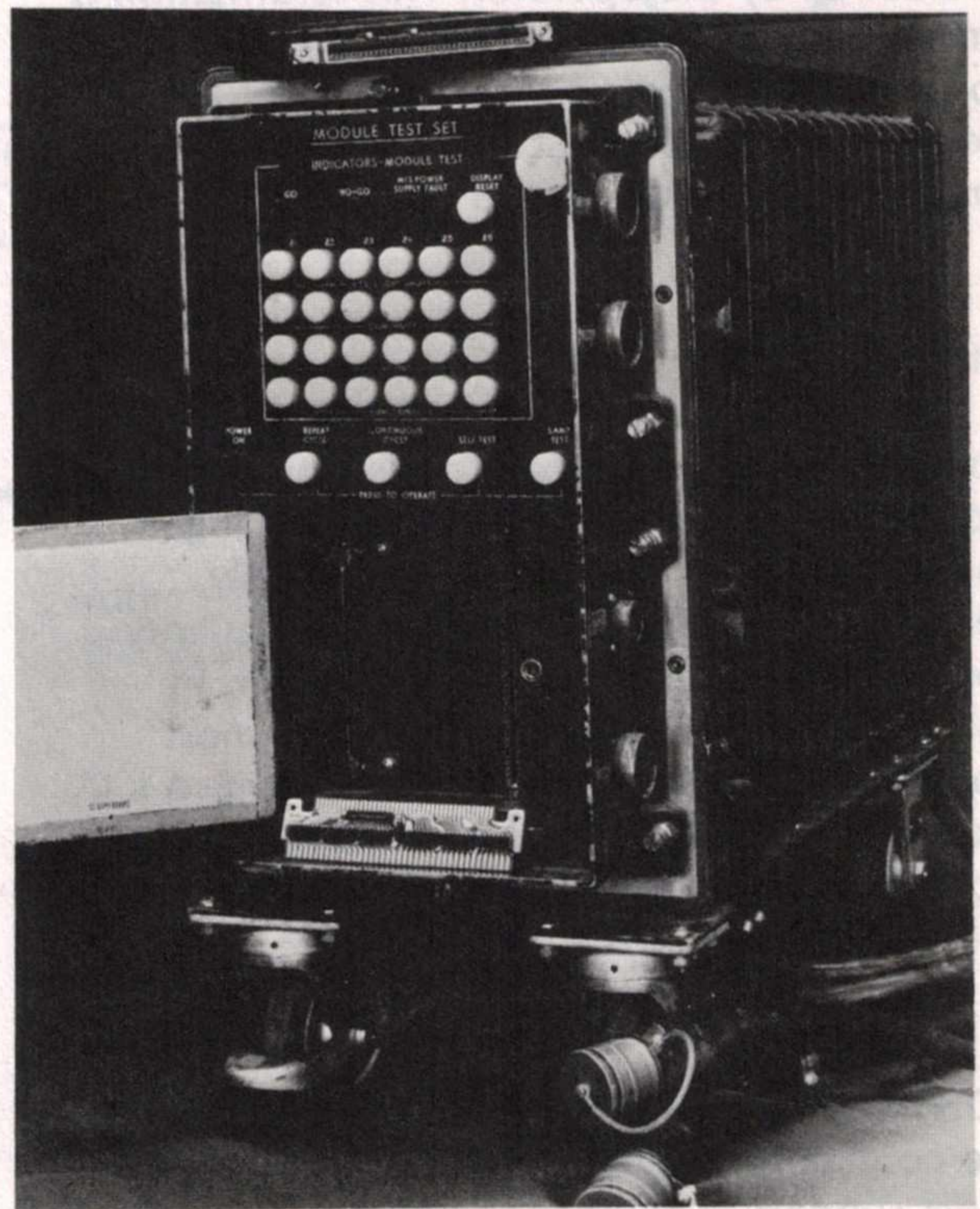
Continuous support of combined arms operations demands a high degree of reliability from the fire support command and control system. TACFIRE enhances this reliability due to the ease with which it is maintained at organizational level and because of a feature known as mutual support. This simple maintenance concept, coupled with the ability of one TACFIRE computer to perform its own duties as well as those of another system during mutual support operations, insures that continuous command and control is provided for the fire support system and that operational continuity is maintained.

### □ MAINTENANCE

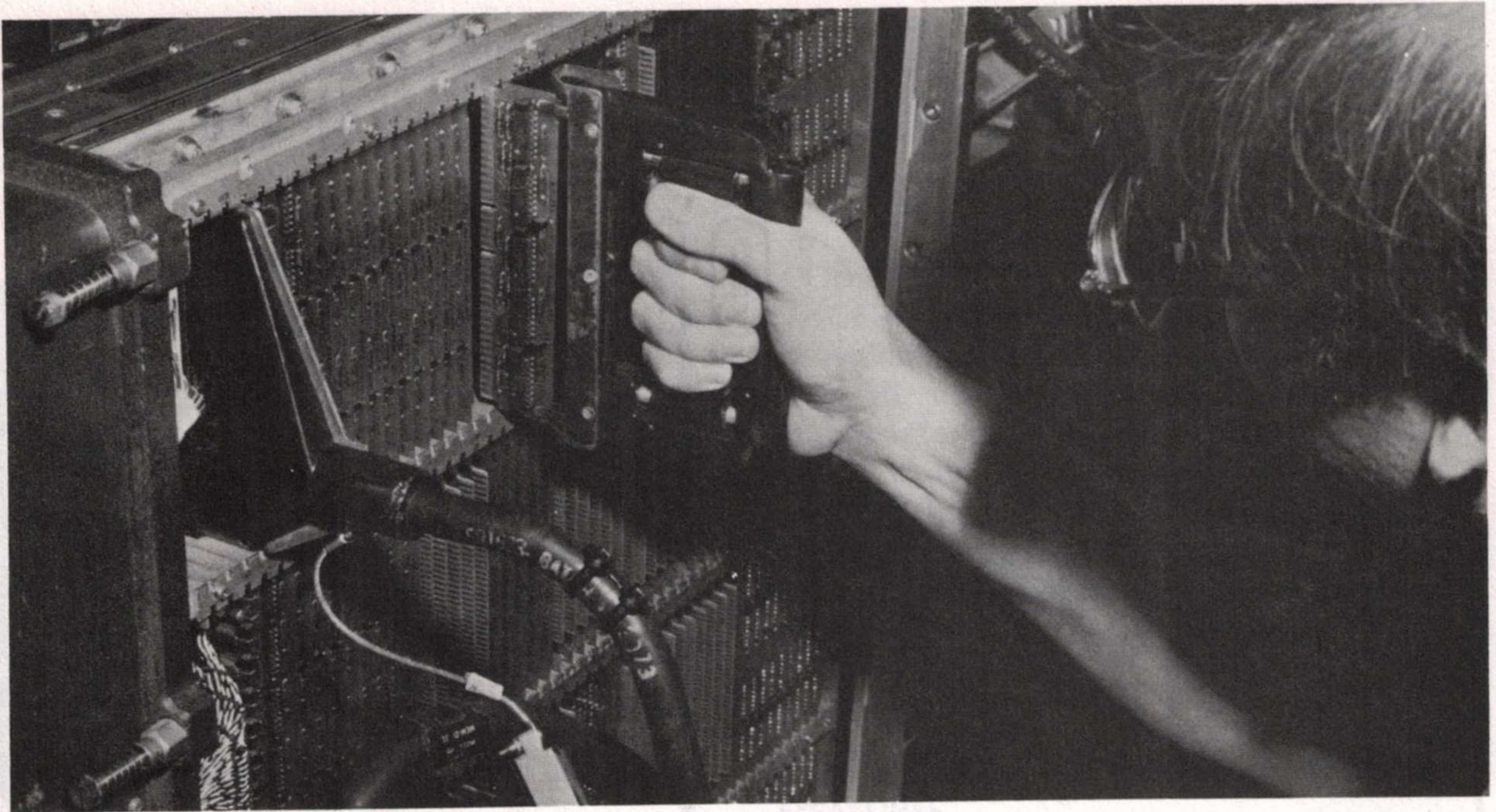
The TACFIRE system can be operated even while one of its components is down for maintenance. The system is easily maintained at organizational level due to its own self-test performed under the control of the operator, and because modular design enables components to be directly exchanged at organizational level. The characteristics of diagnostic programs and modularity contribute to support of continuity of operations.

### DIAGNOSTIC PROGRAMS

Diagnostic programs stored within the computer's memories enable the computer to diagnose itself. These programs check



TEST SET USED BY OPERATOR TO EVALUATE CIRCUIT CARDS.



**OPERATOR REMOVING A CIRCUIT CARD WITH A CARD PULLER**

components of the computer to detect and locate hardware faults. This technique defines which component has failed and what item within that component requires further evaluation by the operator. This information is printed out by the computer for the operator to use during repair procedures. Over 90 percent of the failures can be corrected at the organizational level by the operator.

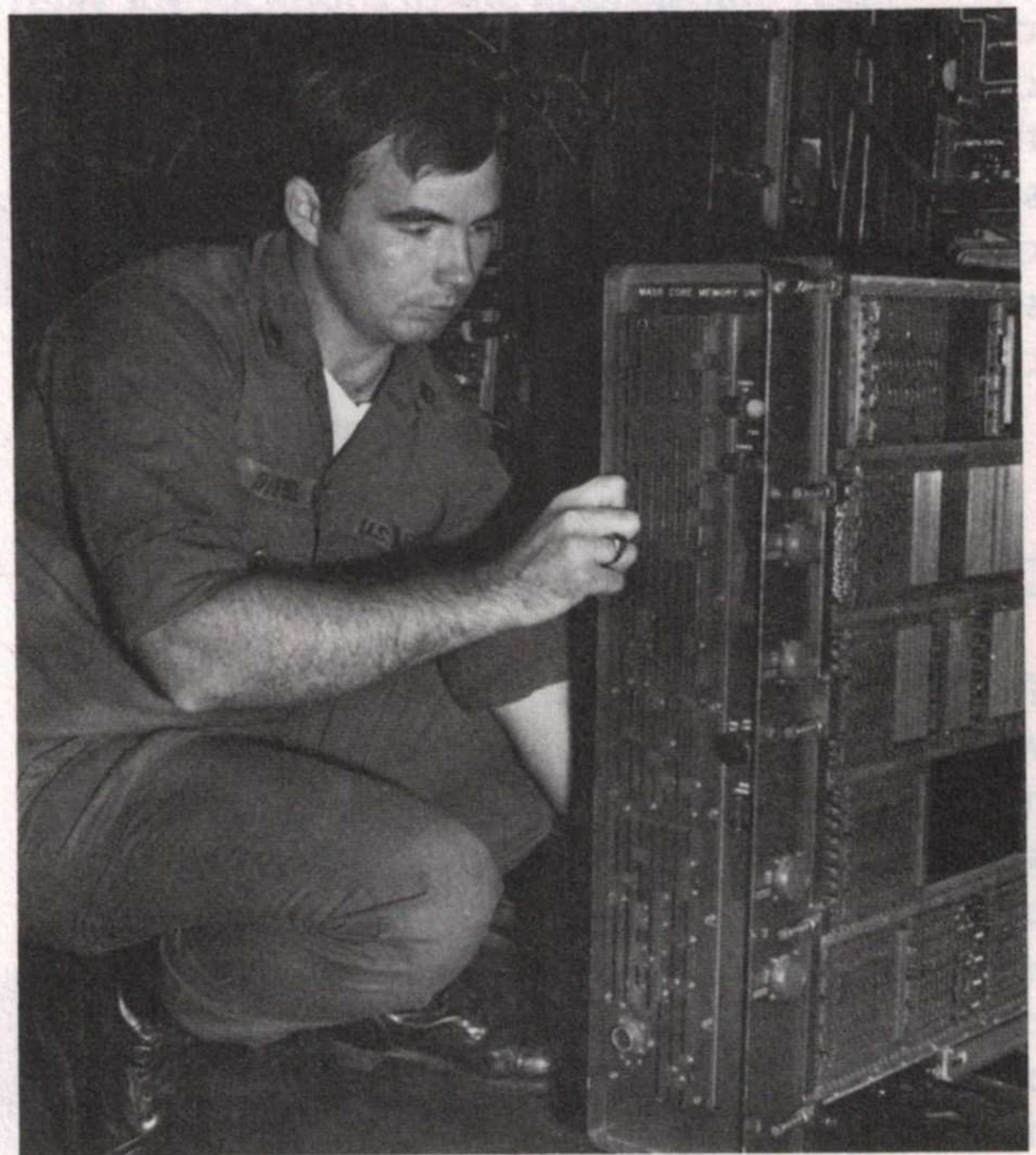
#### MODULARITY

If the operator cannot repair a failed component by using spare parts from the operations sustaining kit, he can exchange that component. The use of individually removable components provides modularity for the TACFIRE computer. Modularity, in turn, enables the operator to correct most computer failures within 30 minutes by exchanging the failed component with an operational one provided by the contact maintenance team.

#### CONTACT MAINTENANCE TEAM (CMT)

The contact maintenance team from the direct support maintenance unit will be notified when organizational maintenance

personnel encounter a system or component malfunction that is beyond their capability to correct. The CMT is composed of one or two highly skilled technicians capable of locating faulty wiring, cabling, or connectors and malfunctioning circuit cards, modules or end



**OPERATOR REMOVING A MODULAR COMPONENT FOR EXCHANGE**

items. The CMT will be assigned to the HQ and light maintenance company, maintenance battalion, division support command. For nondivisional units the CMT will be assigned to the DS Light Maintenance Battalion. The DS maintenance facility should be collocated with the division artillery FDC. The CMT will return faulty equipment to the GS level for repair using normal supply and maintenance procedures. Direct exchange procedures will be accomplished at GS level as prescribed in DA Circular 700-21 and SB 11-617. Parts allocated at the DS level will be items of the authorized stockage list (ASL) upon deployment.

### □ ALTERNATE MODE CONFIGURATION

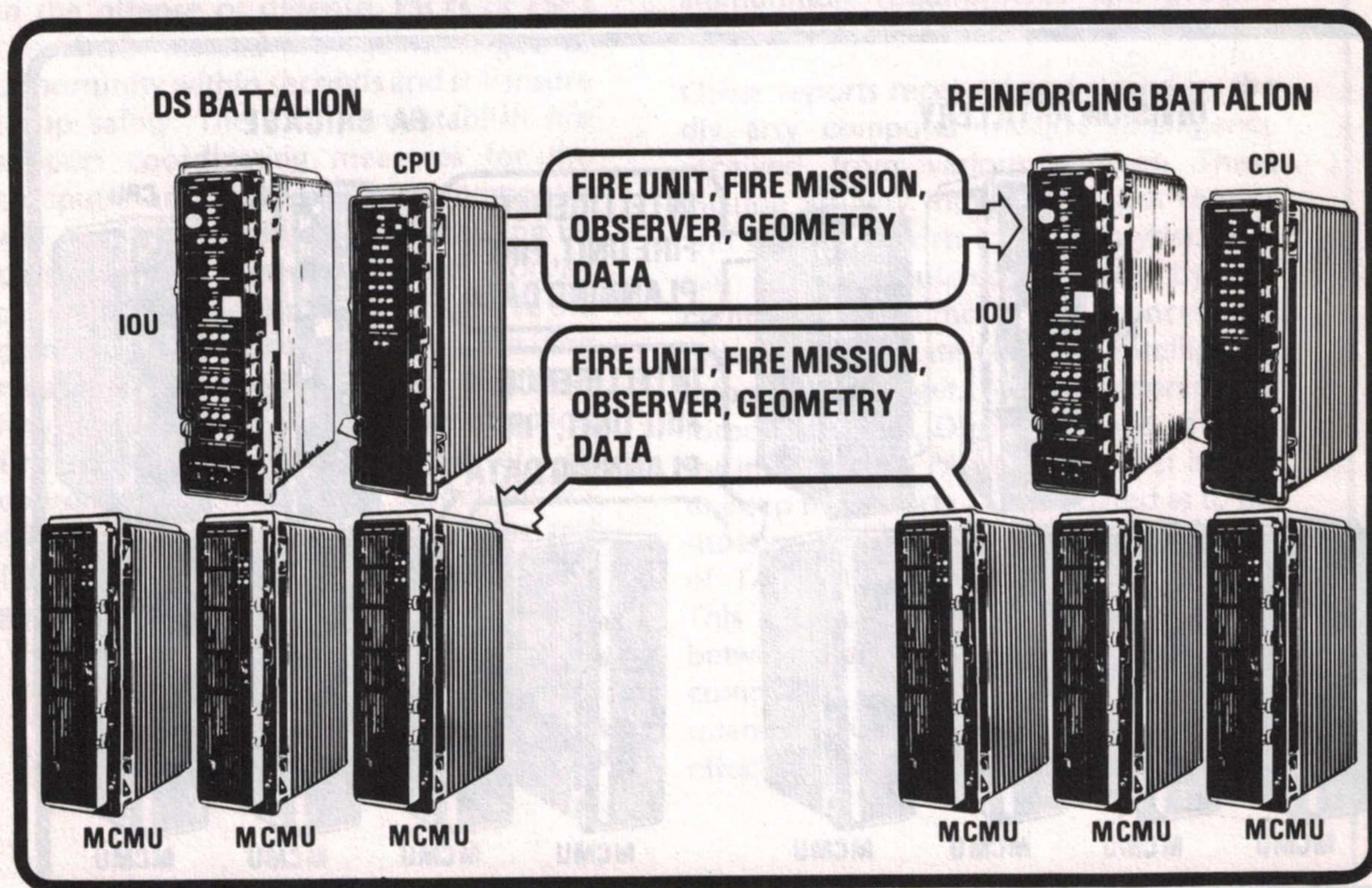
The TACFIRE computer can be operated in an alternate mode configuration while organizational maintenance personnel diagnose and repair components. Operation in an alternate mode configuration is made

possible by the fact that when one component fails, its function can be assumed by a like component. The alternate mode configuration contributes to system reliability by permitting the computer system to be operated even when some of its components are inoperable.

### □ MUTUAL SUPPORT

Mutual support is the term used to describe the alternate method employed to continue the mission in the event of normal computer (unit) displacement or a total TACFIRE computer failure. Mutual support is conducted between battalions or between div arty's to support continuity of operations.

Mutual support contributes to both reliability and maintainability. By permitting continuous TACFIRE availability during displacement or computer maintenance, the mutual support concept insures that TACFIRE will be there whenever it is needed.



BATTALION MUTUAL SUPPORT

## BATTALION MUTUAL SUPPORT

At battalion, mutual support consists of having two computers exchange data and each being prepared to assume the duties of the other at any time. For example, a DS battalion and its associated reinforcing (reinf) battalion may provide mutual support for each other. If the DS battalion's computer is being displaced, the reinforcing battalion's computer performs its own TACFIRE duties, as well as those of the DS battalion.

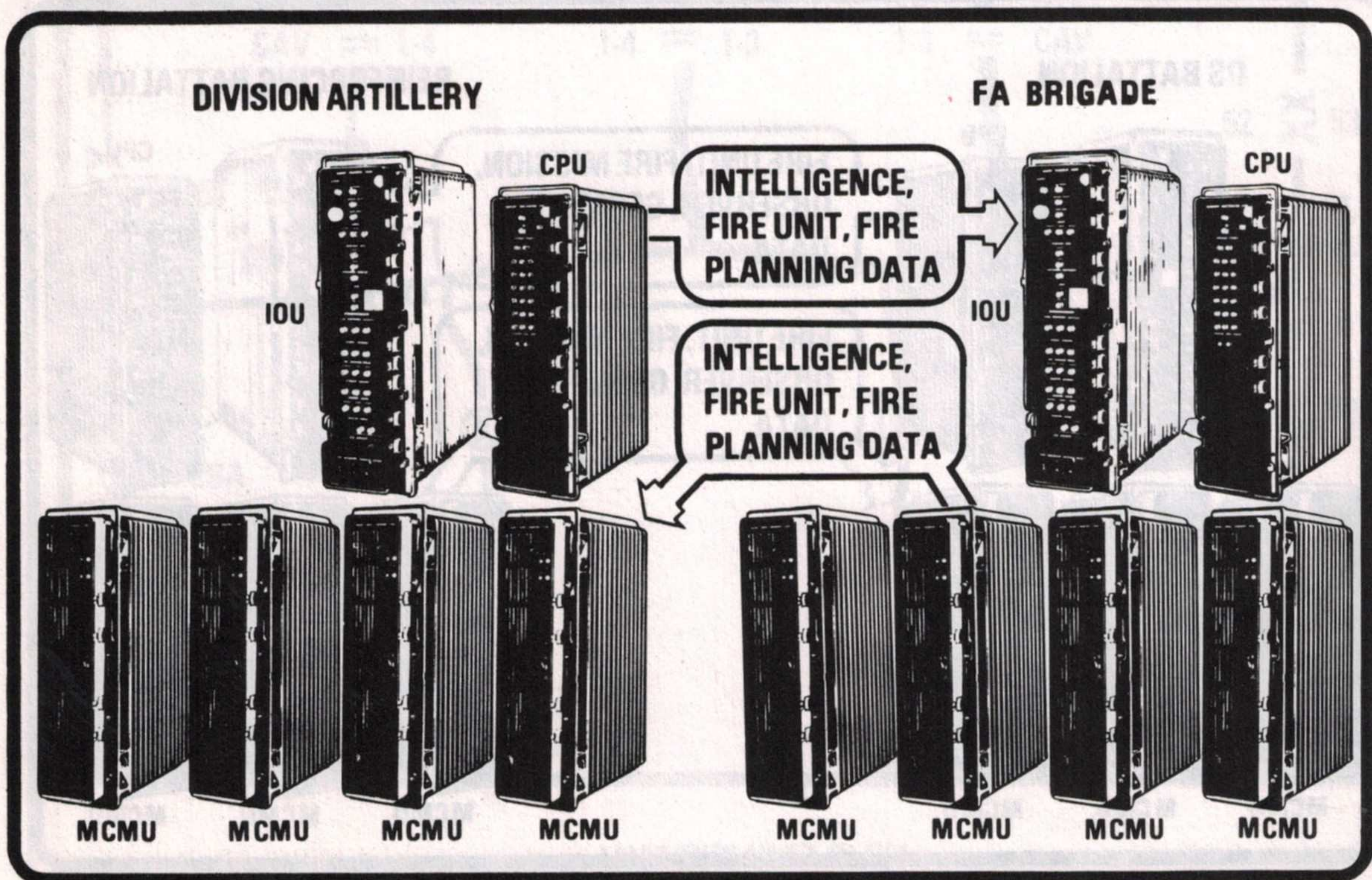
Mutual support is conducted by exchanging data pertaining to fire unit, fire mission, observer, FS coordination measures, fire planning, and communications. Once exchanged, mutual support data is updated as changes occur. This updating is accomplished automatically. For instance, when a DS battalion FDO updates a fire unit location, his computer automatically transmits a copy of the change to the reinforcing battalion's computer. The reverse is also true.

If one of the computers is displacing or has a catastrophic failure such as a complete

breakdown of one of the mass core memories, mutual support is immediately implemented. Once mutual support is implemented, the remote terminals (FO's, FSO's, btry, etc.) of the displacing or failed computer communicate with and obtain data processing services from the mutual support battalion just as though it were their parent computer. When the displacing computer is again operational, mutual support is discontinued.

## DIV ARTY, FA BDE, AND CORPS ARTY MUTUAL SUPPORT

Div arty's, bde's, and corps arty's all have the same computer configuration and can provide mutual support in the same manner as battalions do. Exchange of data and implementation is accomplished the same way. Normally, div arty and its associated FA bde will provide mutual support to each other. A corps arty and one of its subordinate div arty's will support each other.



DIVISION ARTILLERY MUTUAL SUPPORT

# THE BATTERY COMPUTER SYSTEM

## Chapter 5

The battery computer system (BCS) will replace the FADAC now in use by field artillery cannon batteries and the battery display unit (BDU) to be issued with TACFIRE. The BCS will dramatically increase the flexibility and responsiveness of the field artillery and its effectiveness within the fire support system.

The BCS consists of a microprocessing computer and up to 12 gun display units (GDU). A GDU contains a section chief's assembly (SCA), a small handheld unit similar to a pocket calculator, that stores complete mission data and allows the section chief to display that data, and two gun assemblies (GA) that display the quadrant and deflection. The GA's will be mounted for easy viewing by the gunner and assistant gunner. By using WD-1 wire, each GDU can be positioned up to 1,000 meters from the BCS.

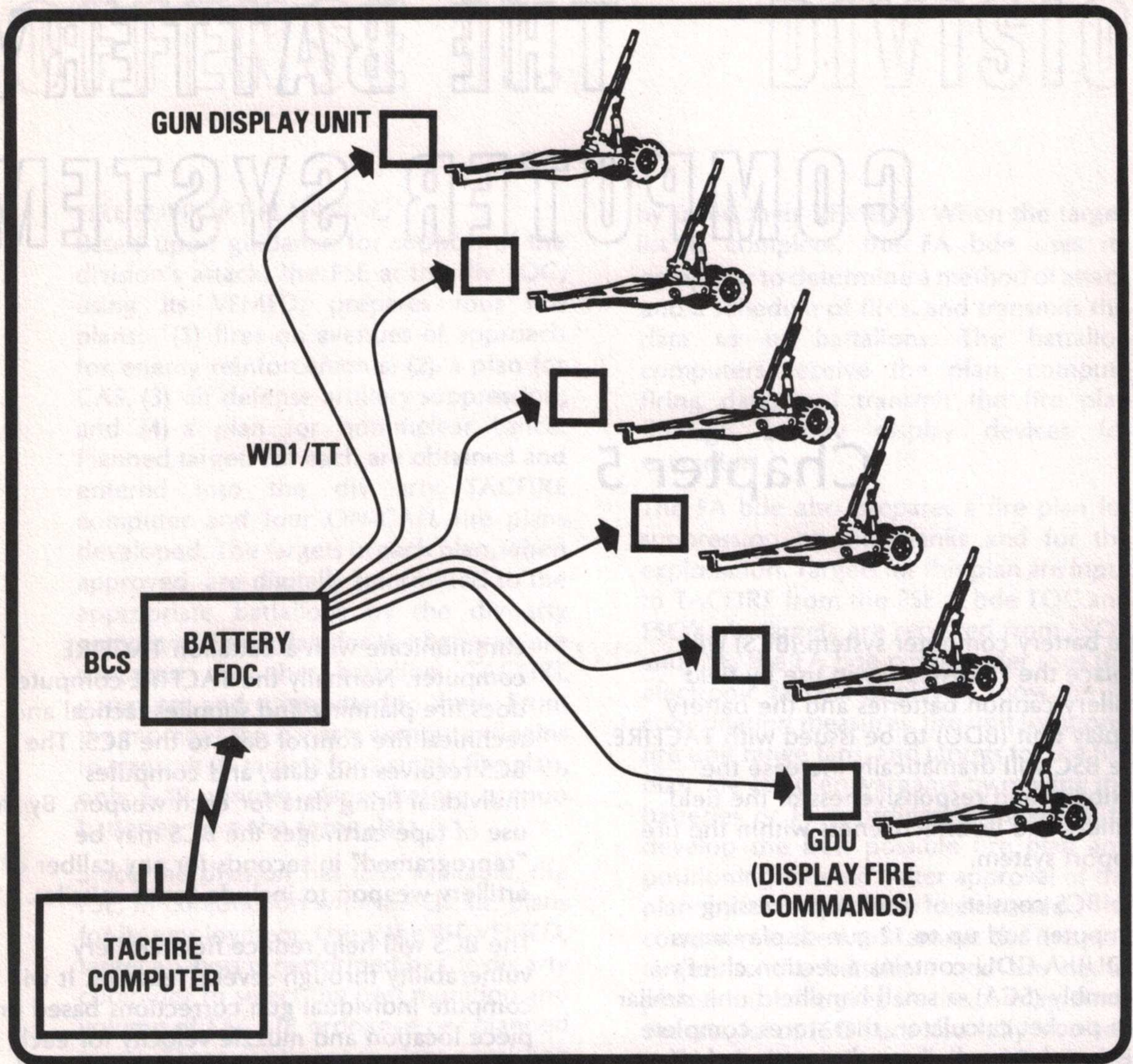
### □ FUNCTIONS

The BCS complements and enhances TACFIRE capabilities. It will provide increased flexibility by its capability to stand alone and compute fire mission data when the battery is operating independently or when it cannot

communicate with a battalion TACFIRE computer. Normally the TACFIRE computer does fire planning and supplies tactical and technical fire control data to the BCS. The BCS receives this data, and computes individual firing data for each weapon. By the use of tape cartridges the BCS may be "reprogramed" in seconds for any caliber of artillery weapon to include Lance missiles.

The BCS will help reduce field artillery vulnerability through several features. It will compute individual gun corrections based on piece location and muzzle velocity for each weapon in the battery. This will allow maximum weapon dispersion to take advantage of terrain positioning. The BCS will drastically reduce radio transmissions since it features secure two-way digital communication, with fire support officers, forward observers, and TACFIRE at field artillery battalions. In addition, the battery computer system can automatically relay messages between forward observers and the battalion TACFIRE. Artillery target intelligence, such as shell reports, is an example of the type of information that can be relayed to a TACFIRE computer system.

More effective field artillery fire will be an additional contribution of the battery



**BATTERY COMPUTER SYSTEM**

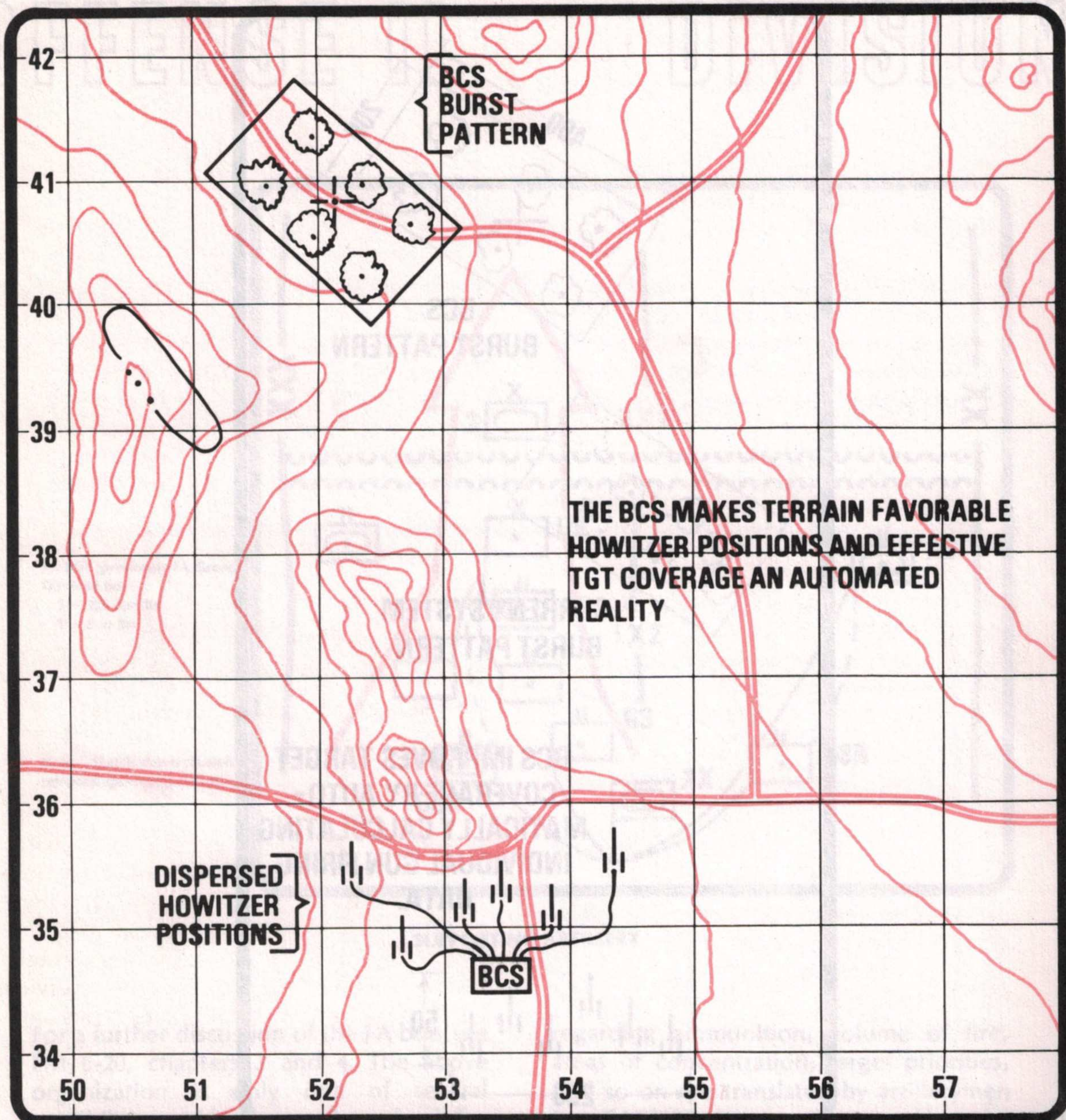
computer system. Improved target coverage is achieved by the use of individual gun firing data that is dictated by the target's size and attitude. However, should the FDO desire, he can direct the firing of a parallel, open, closed, or converged sheaf. The BCS, when used with the ground/vehicular laser locator designator (GVLLD), will enhance the ability of the battery to engage moving targets by predicting the future location of such targets.

By using advanced technology, the BCS will give us far greater computer and power

source *reliability* at the battery level. Instead of depending on one power source (a 1.5-kw generator) the BCS will also be capable of operating from vehicle batteries when a 100-ampere kit is installed.

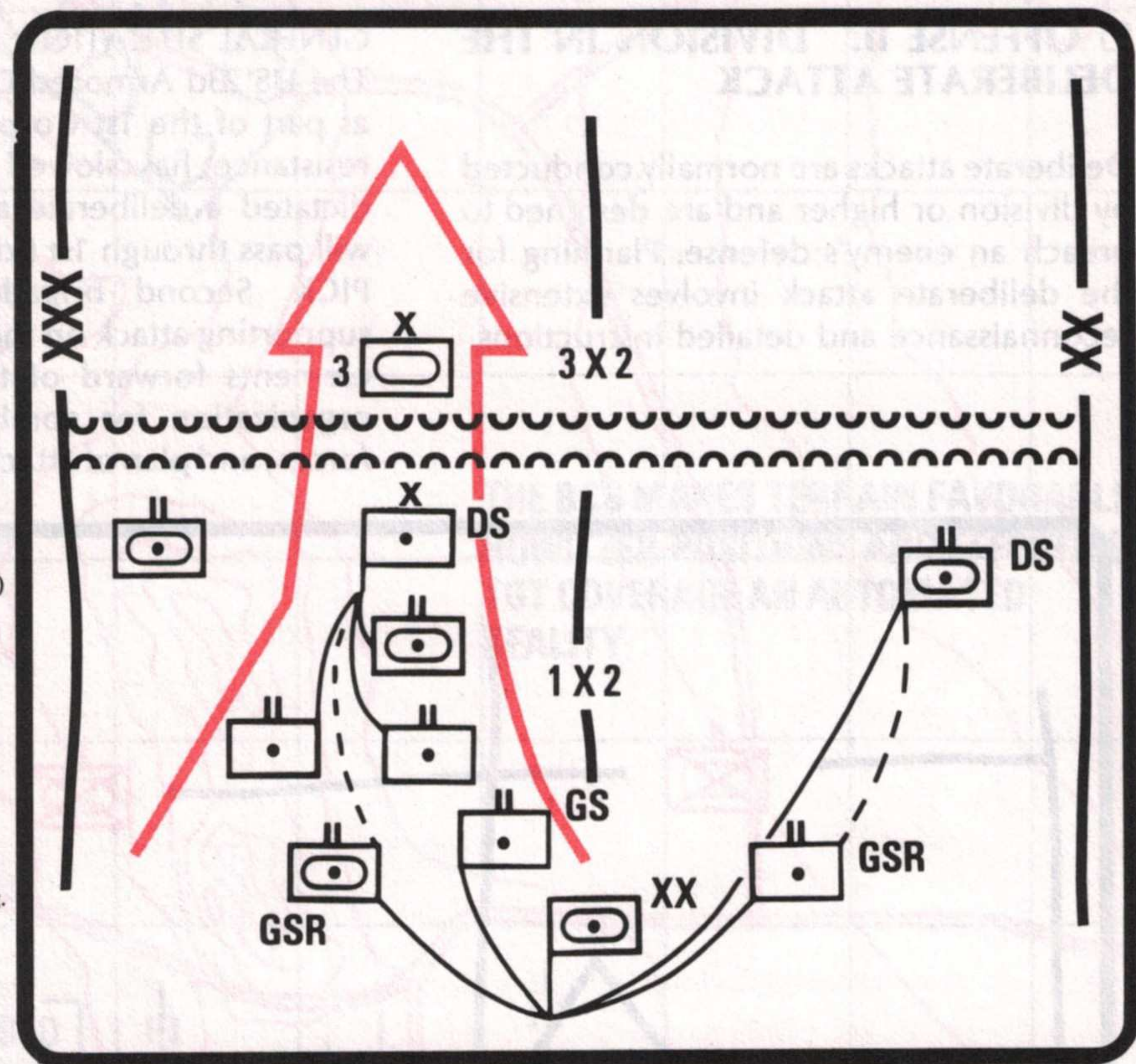
**AVAILABILITY**

The battery computer system will be available to the field artillery by early 1980.





# OFFENSE II. DIVISION



FA BDE (previously FA Group)  
 DS to 3d Bde:  
 2 — 155-mm Bn  
 1 — 8-in Bn

Note. Sketch shows mission relationships—not positioning.

## SUPPORTING ARTILLERY

For a further discussion of the FA bde, see FM 6-20, chapters 3 and 4. The above organization is only one of several possibilities and has been selected only for purposes of illustration. The same is true for other organizations and schemes throughout this training circular.

### COMMANDER'S CRITERIA

In planning for the attack, the division commander provides general guidance for use of fire support. These statements

regarding ammunition, volume of fire, areas of concentration, target priorities, and so on are translated by artillerymen into TACFIRE criteria and entered into the computer's data base at division artillery.

When the div arty CO returns from the division briefing, he states, "The division commander wants to concentrate as much firepower in the 3d Bde's area of penetration as possible. To implement this, the FA bde with three FA battalions will be DS to 3d Bde. Increase their controlled supply rate (CSR) to 200 rounds per tube

# APPENDIX A

## SUMMARY OF TACFIRE ORGANIZA- TIONAL STRUCTURE AND DUTIES

The introduction of TACFIRE into FA units changes many traditional organizational structures and duties. This is required to capitalize on the capabilities of the TACFIRE system and to provide for organizational maintenance. An extensive test of these organizational concepts will be conducted concurrent with the TACFIRE system's operational test (OT III) during early spring of 1978. The system will come into the field, however, in the summer of 1977. This test of the system's effectiveness under operational conditions will provide the basis for the full deployment decision. The structure given below is therefore tentative as of the date of this TC.

### □ BATTALION TACFIRE SYSTEM

The battalion TACFIRE system is comprised of four components: (1) the operation section (2) fire support officers (3) forward observers and (4) firing battery.

### OPERATIONS SECTION

The operations section consists of an operation element, an intelligence element, and a fire direction element.

### OPERATIONS ELEMENT

Personnel within the operations element are:

S3 (04)

Operations sergeant (E8)

Assistant operations sergeant (E7)

One TACFIRE equipment specialist (E4)

One clerk-typist (E4)

One senior field switchboard operator (E6)

The operations element operates in standard Army vehicles and is provided with a variable format message entry device (VFMED). The VFMED is used to obtain data processing services from the TACFIRE computer located with the fire direction element. These services include fire planning, such as target lists and schedule of fires; requests for fire mission coordination; target intelligence reports; and ammunition and fire unit status reports.

### INTELLIGENCE ELEMENT

The intelligence element consists of the S2 and a TACFIRE intelligence specialist (E4). The intelligence element shares the use of the operation element's VFMED and is responsible for the processing of target intelligence data in support of counterfire, current operations, and fire planning. This responsibility will include receiving target intelligence information from FIST and FSO,

receiving target intelligence from the div arty TACFIRE system, and providing survey schemes and control point information to the TACFIRE computer.

#### FIRE DIRECTION ELEMENT

The fire direction element consists of two fire direction officers (CPT), two fire direction sergeants (E6), and two TACFIRE equipment specialists (E5). A fire direction NCO operates the TACFIRE computer control console under the supervision of a fire direction officer. His duties include:

Processing calls for fire.

Performing fire planning.

Executing counterfire programs.

Receiving target intelligence reports from FIST's and FSO's and forwarding them to the div arty TACFIRE computer.

Operating the digital plotter map to prepare overlays for the S3 or FSO's.

#### FIRE SUPPORT OFFICER (FSO)

FSO's are located with each maneuver battalion and brigade and are the key to timely integration of fire support and maneuver. The FSO is the adviser on fire support matters to the commander and receives the commander's guidance for programming the TACFIRE computer with commander's criteria. The FSO uses the variable format message entry device (VFMED) to obtain data processing services from the TACFIRE battalion computer, thus enabling him to perform these functions. The FSO provides target coordination, FS coordination measures, fire planning data, and ATI reports. The automatic message of interest relay function of TACFIRE automatically forwards to an FSO each incoming request for fire that impacts in his area of responsibility. The FSO is thus provided with an extraordinary ability to stay abreast of the battle. The FSO, based on maneuver commander's guidance, enters permissive and restrictive measures into the TACFIRE computer to protect friendly units

through graphical control measures, termed "geometry." The geometry function is one of the most important contributions of the FSO as the computer automatically warns the FDO of violations and hence establishes a requirement for further coordination.

In fire planning, the FSO submits targets and scheduling instructions. The FSO may prepare a complete fire plan by using the TACFIRE computer through his VFMED.

The FSO handles ATI data by submitting reports and requests for search of the division artillery ATI file. An FSO may request an ATI file search by automatic relay through his battalion to the division artillery computer. He may have these targets returned to his battalion computer and stored as a fire plan target list or forwarded to him.

#### FIST CHIEF

The FIST chief uses the digital message device to communicate with the TACFIRE computer. He acquires targets and requests fires by submitting fire missions to the battalion fire direction element with his device. The battalion TACFIRE computer processes all types of requests for fire . . . grid, polar, and shift from a known point . . . to determine fire commands. The FIST chief may also input fire planning targets, frontlines traces for his area of responsibility, and friendly unit locations using the DMD.

The DMD can transmit the following types of messages.

Calls for fire against targets of opportunity  
Subsequent corrections during fire missions  
Requests for mixed munitions in fire for effect

- \* Intelligence reports
- On-call targets
- Initiation of on-call fires
- \* Target fire planning
- Frontline traces
- Friendly unit locations

\*See note on page 5.

## FIRING BATTERY

The firing battery has a battery display unit (BDU) to receive fire commands from the fire direction element. The battalion fire direction element receives the call for fire, determines fire commands, and digitally transmits them to the firing battery. The fire commands are displayed and printed by the BDU.

During fire planning, the battalion fire direction element determines fire commands to support the schedule of fires. This data is transmitted to the battery where it is held until time for execution. The battery executes the fire plan in accordance with the prescribed schedule.

## □ DIVISION ARTILLERY TACTICAL OPERATIONS CENTER (DATOC)

The DATOC is composed of three elements, the operations element, the target production element and the fire control element.

### OPERATIONS ELEMENT

The operations element at div arty will be manned by:

S3 (LTC)

Two operations officers (MAJ)

One intelligence sergeant (E8)

One chemical staff NCO (E6)

Four chronograph operators (E5 and E4)

Two operations specialists (E4)

Two clerk-typists (E4)

The operations duty officer is responsible to the S3 for the overall operation of the division artillery tactical operations center during his shift. He has overall responsibility for the preparation of field artillery fire plans to support division operations. Personnel of the operations element operate the DATOC VFMED to obtain the ammunition count, situation reports, and expenditures by subordinate units. They may also obtain fire unit status and capabilities, enter met data, and support survey by entering and extracting survey data and/or field work. They conduct fire planning by planning targets, establishing

attack methods, scheduling fires, and preparing and disseminating the fire plan schedule of fires using their VFMED and the TACFIRE computer.

## TARGET PRODUCTION ELEMENT

This section is supervised by the operation duty officer and is composed of MI personnel, two targeting NCO (E7 and E6), and four targeting EM (E4). The target production element shares the use of the operations element VFMED to perform duties such as developing artillery target intelligence criteria. They also develop counterfire target lists and counterfire plans. In addition, this element develops target indicators, combines targets, evaluates reports, and sorts and collates targets stored in the computer.

## FIRE CONTROL ELEMENT

The fire control element is composed principally of the following personnel.

Two counterfire officers (CPT)

Two fire control NCO's (E7)

Two TACFIRE equipment specialists (E4)

Four fire control specialists (E4)

Two radio operators (E4)

The fire control element provides the personnel to operate the division artillery TACFIRE computer. They prepare the TACFIRE computer for operation, operate the computer, and perform organizational maintenance on TACFIRE equipment. In addition, fire control personnel provide relief for the TACFIRE computer operators as well as assisting in maintenance of the TACFIRE computer power unit.

The counterfire duty officer is the TACFIRE fire direction officer (FDO) and directly supervises operation of the TACFIRE computer center. A fire control NCO operates the artillery center console (ACC) to enter and retrieve data from the TACFIRE computer. When not otherwise occupied, fire control personnel use the operations

element's VFMED to prepare counterfire plan programs, pass targets to subordinate battalions, and send requests for additional fires to the FSE. When requested, the TACFIRE FDO uses the digital plotter to prepare overlays and the electronic tactical display to show fire control information graphically.

## □ DIVISION FIRE SUPPORT ELEMENT

The fire support element (FSE) is organic to the division artillery headquarters battery and is deployed with the division tactical operations center (DTOC). The fire support element consists of the following personnel.

- One fire support coordination assistant (LTC)
  - One fire support coordination assistant (MAJ)
  - One FA intelligence officer (MAJ)
  - One target analyst (CPT)
  - One operations sergeant (E8)
  - One intelligence sergeant (E8)
  - Three fire direction crewmen (E7, E6, E3)
  - Three radio TT operators (E5, E4)
- Fire direction crewmen operate and maintain the FSE's TACFIRE terminal device (VFMED)

under the supervision of the target analyst. The FSE, as an element of the DTOC, has access to the following agencies: Electronic Warfare Intelligence Operations Center (EWIOC), Tactical Air Support Element (TASE), the Airspace Management Element (AME), and the Naval Gunfire Liaison Officer (NGLO). Since the FSE has access to fire support resources that are not under direct control of the div arty, the div arty TACFIRE computer prepares requests for additional fires and sends them to the FSE. Any element of the DTOC may develop targets and pass them to the FSE for attack. Conversely, the FSE may pass targets to these agencies.

Using TACFIRE equipment and functions, the FSE can:

- Receive requests for additional fires from div arty.
  - Perform target analysis.
  - Generate fire missions.
  - Conduct nuclear fire planning.
  - Prepare vulnerability analyses.
  - Perform fallout predictions.
- Target analysis performed by TACFIRE provides the basis for decisions concerning the most effective means of engagement.

# APPENDIX B

## TACFIRE EQUIPMENT

The TACFIRE system is composed of central computers and computer access remote terminals. Digital communication links the computers and terminals over current radio and wire nets. The terminal operators can obtain data processing from the TACFIRE computers. The FA battalion, division artillery HQ (div arty), FA brigade HQ, and the FA section at corps are provided with central computers. FIST's, FSO's, FSE's, and S3's use remote terminal equipment (VFMED) to obtain data processing services from the central computers.

### DIV ARTY TYPE TACFIRE COMPUTER

The div arty type computer is found at div arty and FA bde levels. Each of these echelons has exactly the same computer although its name implies that it is used by div arty only. The div arty computer has software and hardware specifically designed to deal with the problems of providing tactical control of associated FA battalions. The div arty type TACFIRE computer performs the following general functions.

Tactical fire direction to recommend battalions to fire, type munitions, and volume of fire.

Correlation and processing of artillery target intelligence.

Nonnuclear fire planning in support of the maneuver force.

Survey computations and trig list storage.

Fire support element target analysis, nuclear fire planning, fallout prediction, and vulnerability analysis.

Digital communication over standard Army communication equipment (AN/VRC-46, AN/GRC-106, multichannel, field wire, etc.) provides for the input of data into the computer and the return of results.

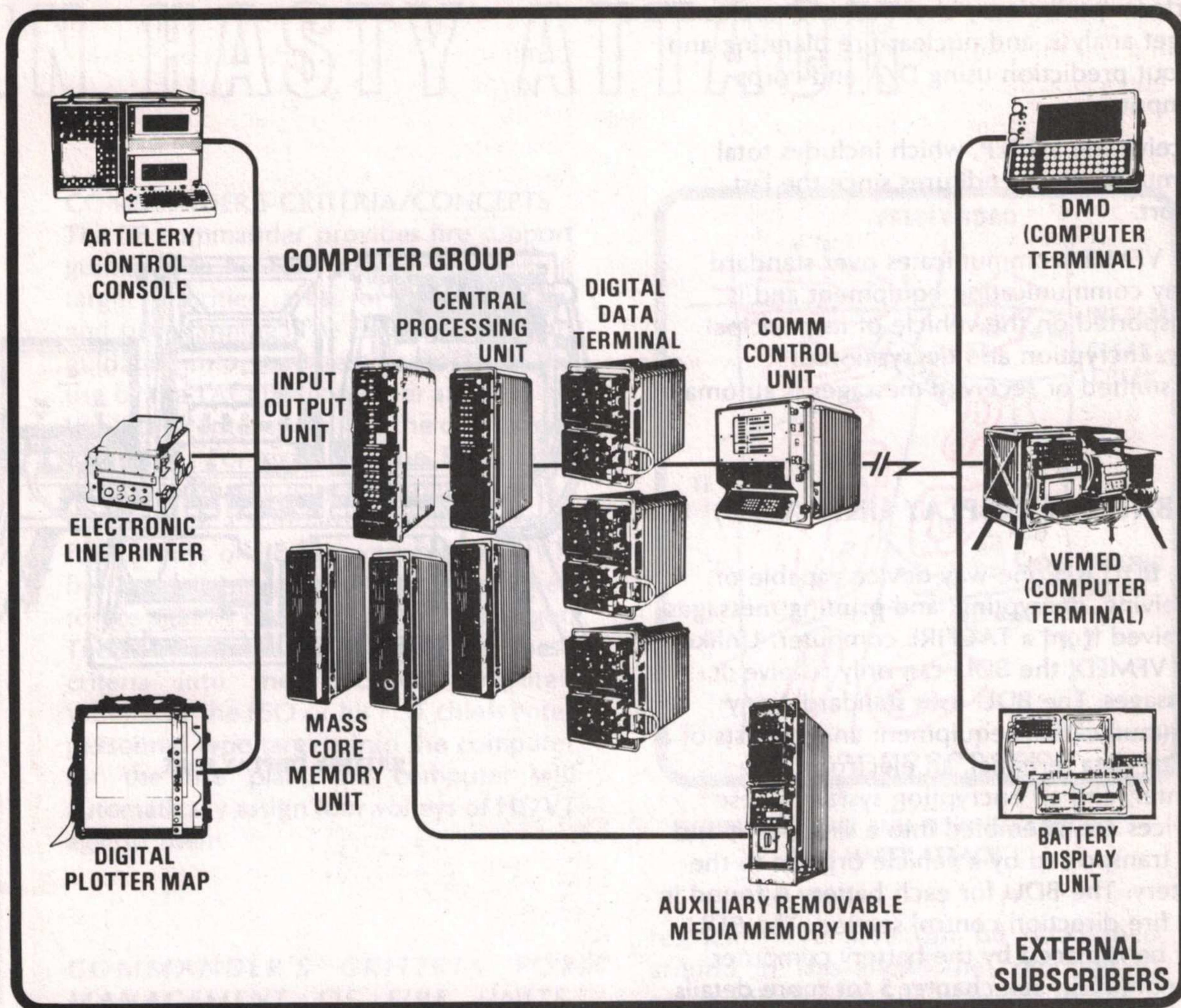
Encryption and decryption of messages is automatic. The components of the div arty type computer and their purposes, are found following the discussion of the battalion computer. The components of the battalion and div arty computers are physically the same and serve the same general purposes. The primary difference between div arty and battalion TACFIRE lies in software (applications programs). The div arty computer center is housed in two S-280 equipment shelters, each of which is mounted on a 5-ton truck.

### BATTALION TACFIRE COMPUTER

The battalion computer possesses software and hardware specifically tailored to provide tactical control of associated firing batteries and interaction with reinforcing artillery. The battalion computer focuses on the support of a maneuver brigade or reinforcement of another field artillery battalion. It performs the following general functions.

Processing of artillery target intelligence.

Tactical fire direction to recommend batteries, munitions, and volume of fire.



TACFIRE BATTALION COMPUTER CENTER

**□ VARIABLE FORMAT MESSAGE ENTRY DEVICE (VFMED)**

The VFMED is a two-way computer terminal found throughout the TACFIRE system at locations such as FSO, FSE's, and FA S3's. It consists of the following components in a single unit.

- Display scope (cathode ray tube).
- Alphanumeric keyboard.
- Digital data terminal.
- Electronic line printer.
- Encryption system.

Since the VFMED is only a terminal, it performs no processing in itself. By communicating with the central computer, the VFMED allows the operator to:

- Receive copies of incoming calls for fire.
- Perform fire support coordination.
- Obtain the status of all assigned fire units to include grid, azimuth of lay, ammunition count, and current mask and registration data.
- Obtain a copy of the current FS coordination measures.
- Perform nonnuclear fire planning to compile a target list, prepare the schedule of fires, and to disseminate the plan to the fire units.

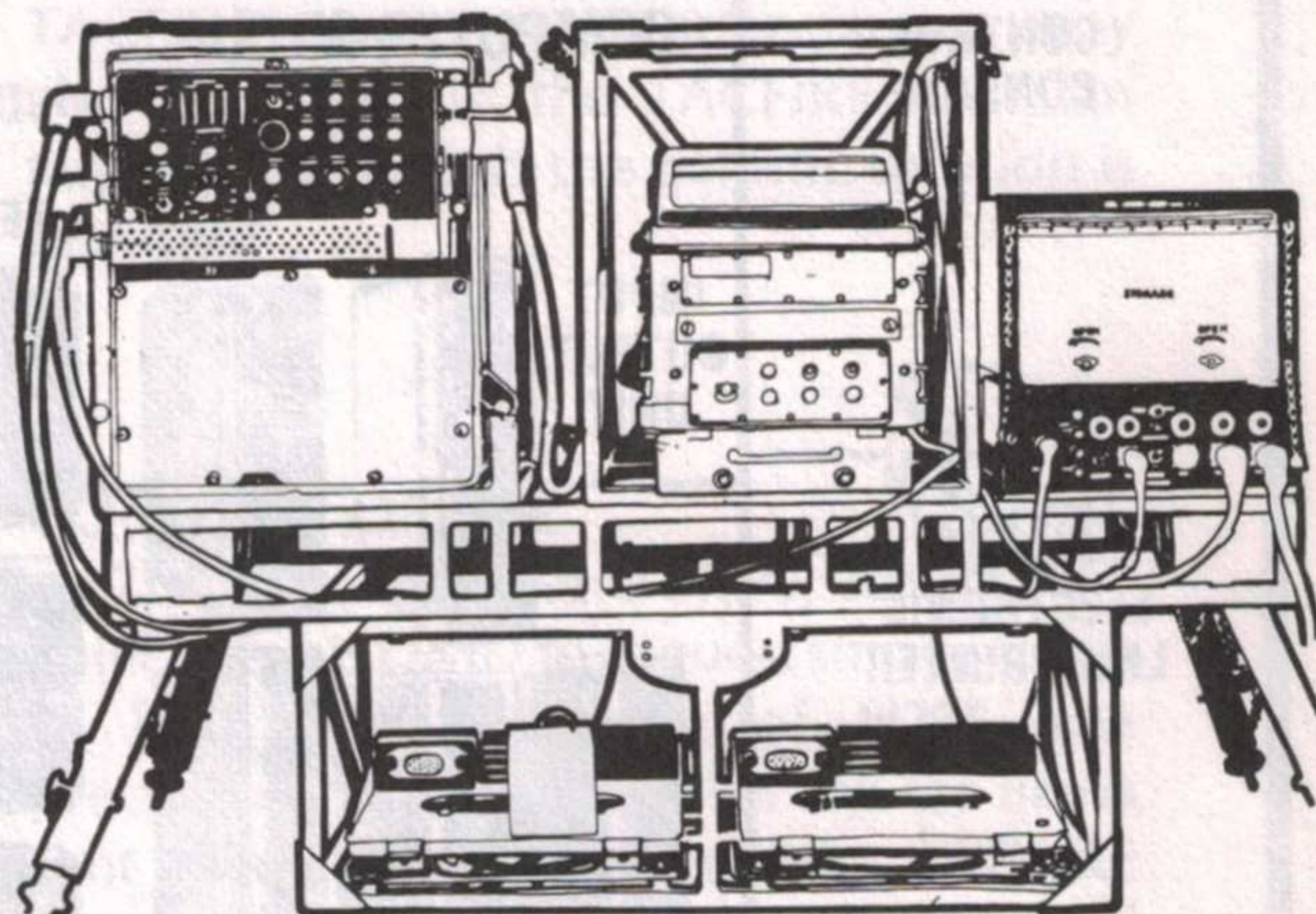
Perform preliminary chemical and nuclear target analysis and nuclear fire planning and fallout prediction using D/A and corps computers.

Receive the SITREP, which includes total ammunition expenditures since the last report.

The VFMED communicates over standard Army communication equipment and is transported on the vehicle of its principal user. Encryption and decryption of transmitted or received messages is automatic.

#### □ BATTERY DISPLAY UNIT (BDU)

The BDU is a one-way device capable of receiving, decrypting, and printing messages received from a TACFIRE computer. Unlike the VFMED, the BDU can only receive messages. The BDU uses standard Army communications equipment and consists of a digital data terminal, an electronic line printer, and an encryption system. These devices are assembled into a single unit and are transported by a vehicle organic to the battery. The BDU for each battery is found in the fire direction control section. The BDU will be replaced by the battery computer system (BCS). See chapter 5 for more details.



**BATTERY DISPLAY UNIT**

**DIGITAL PLOTTER MAP**



## □ DIGITAL MESSAGE DEVICE (DMD)

The DMD is also a two-way device used mainly by the FIST chief. It is a small, handheld battery-powered device that enables him to:

Request and conduct fire using grid, polar, or shift from a known point target location techniques.

- \* Transmit planned targets to the TACFIRE computer.

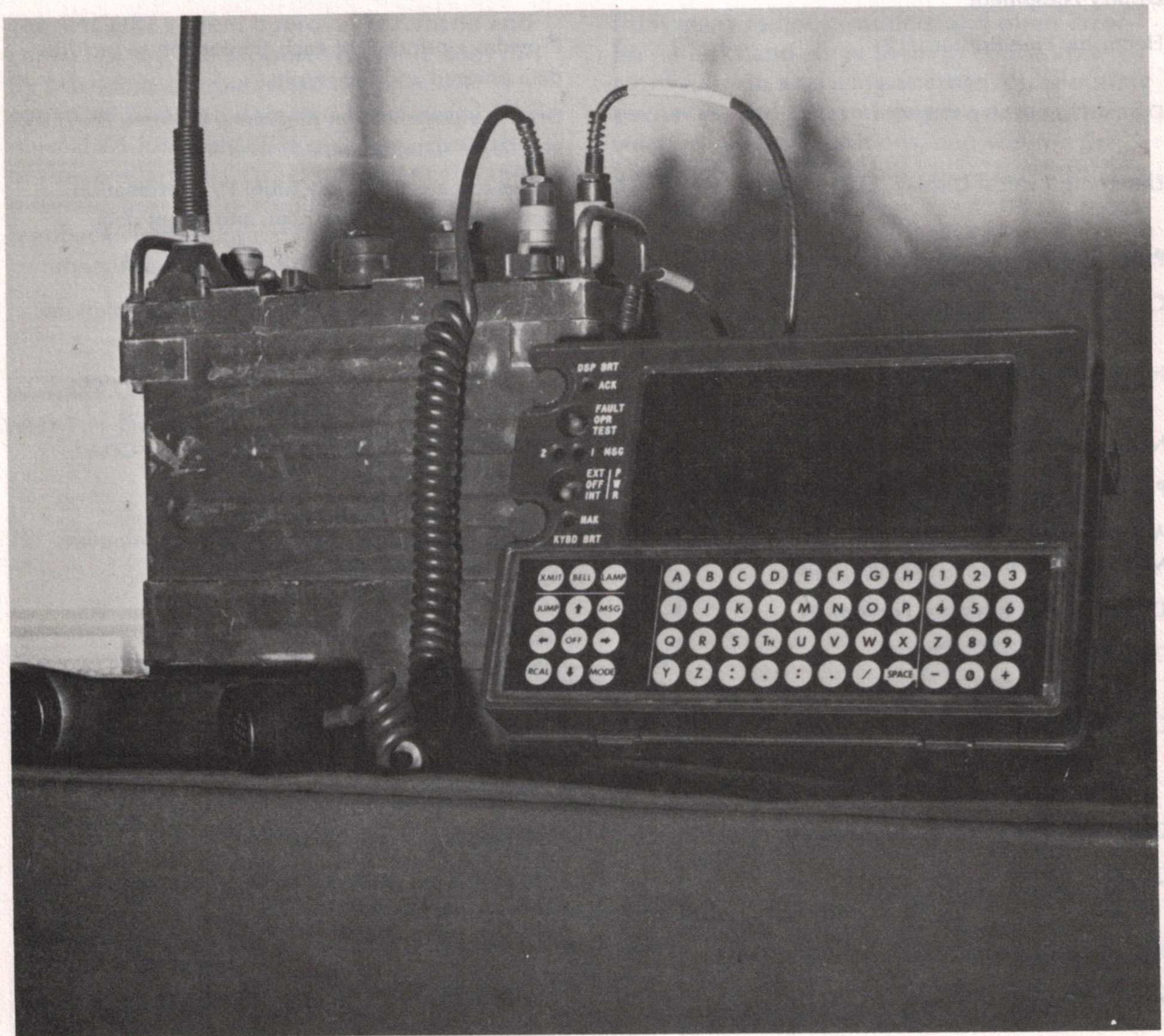
\*See note on page 5

- \* Enter his own location into the battalion computer.

Receive the message to observer.

Compose, transmit, and receive plain text messages or intelligence reports.

- \* The DMD communicates over standard Army comm equipment (AN/PRC-77, AN/VRC-46, field wire, etc.). The FO is not equipped with a COMSEC device; however, each message is authenticated through the use of existing code sheets. Classified information can be encoded by the FO and sent digitally.



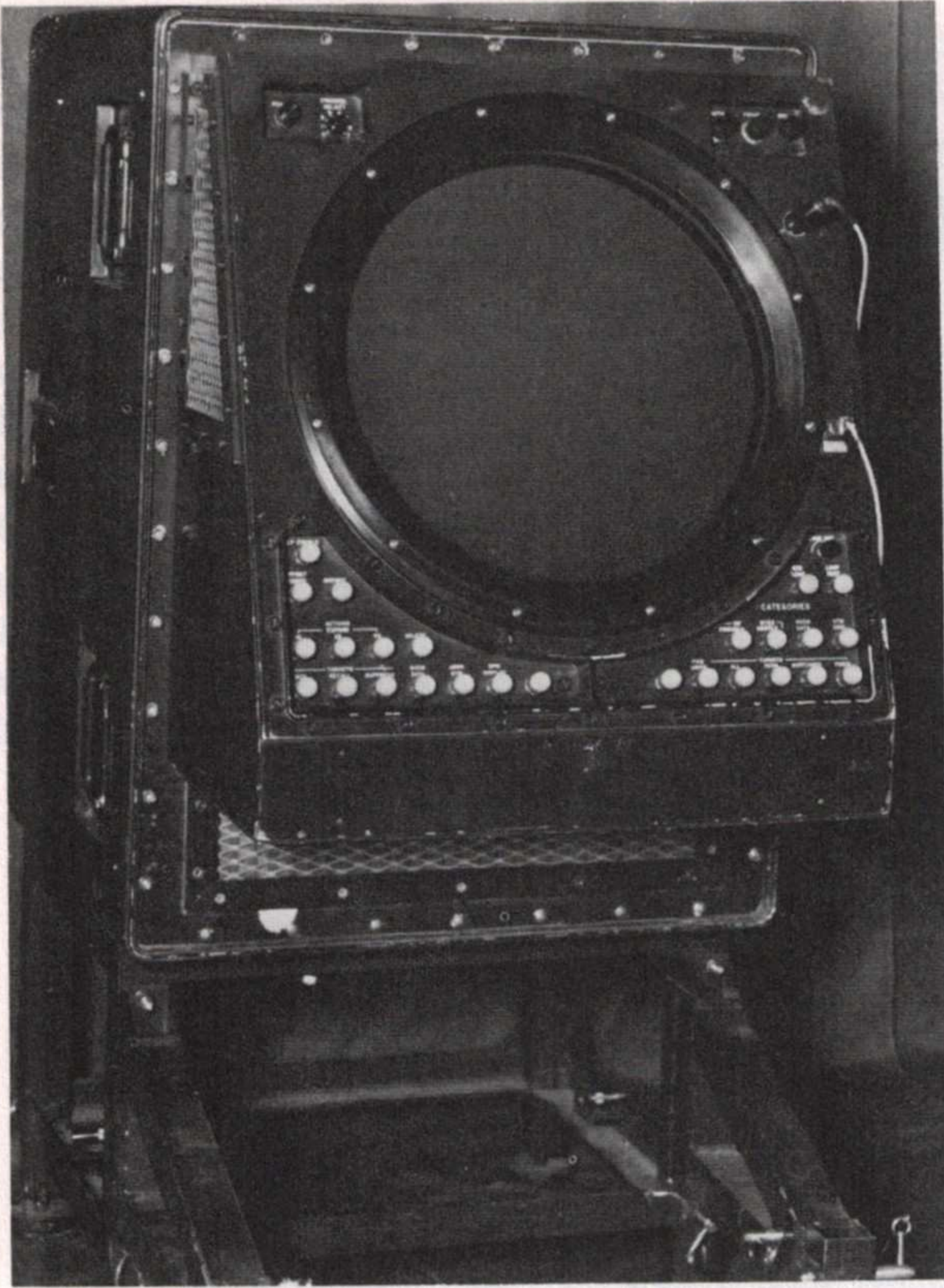
DIGITAL MESSAGE DEVICE.

## □ BASIS OF ISSUE

The basis of issue for these items of equipment is shown below.

### TACFIRE COMPUTER CENTER HARDWARE

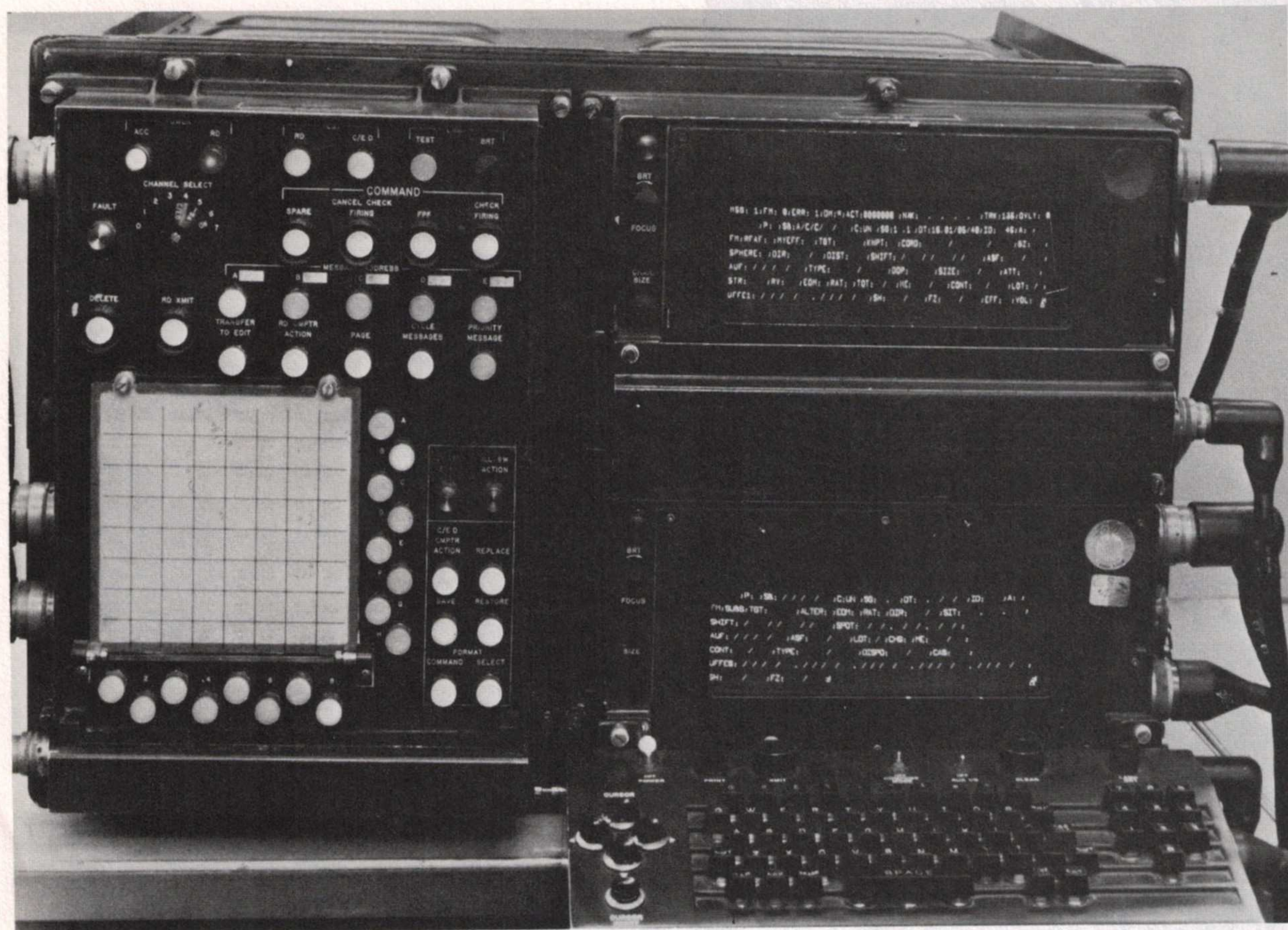
<b>Operator Interface Equipment</b>	<b>D/A</b>	<b>BN</b>	<b>PURPOSE</b>
Artillery Control Console (ACC)	1	1	Interfaces the operator with the computer. Is used by the operator to control all processing, data entry, and data retrieval by the computer.
<b>Display Equipment</b>			
Electronic Line Printer (ELP)	2	1	Provides a printout of each transaction to include data entered and the results.
Digital Plotter Map (DPM)	1	1	Draws FS coordination measures, fire unit, fire plan, and target data on maps or overlays.
Electronic Tactical Display (ETD)	1	0	Shows (on a cathode ray tube) FS coordination measures, fire unit, fire plan, and target data.
<b>Processing Equipment</b>			
Central Processing Unit (CPU)	1	1	Performs all data processing to generate solutions to FA problems.
Input/Output Unit (IOU)	1	1	Controls data transfers between the computer's CPU, memories, and all other components.
Mass Core Memory Units (MCMU)	4	3	Stores data and programs for use by the CPU.
<b>Program Loading Devices</b>			
Auxiliary Removable Media Memory (ARMM) — magnetic tape	2	1	Enables loading of programs into the computer's memories and storage of dynamic data.
<b>Comm Device Interface Equipment</b>			
Digital Data Terminal (DDT)	7	6	Connects the computer to Army comm devices, e.g., AN/VRC-46. Enables digital communications.
Communication Control Unit (CCU)	1	1	Provides automated control of all comm nets terminating in the TACFIRE center as a switch-board would.
<b>Communications Security Equipment</b>			
COMSEC System	1	1	Enables the encryption and decryption of digital messages transmitted or received.
<b>Equipment Housing</b>			
S-280 Equipment Shelter	2	1	Houses the TACFIRE computer center, hardware, and provides a controlled environment for the equipment and operators.



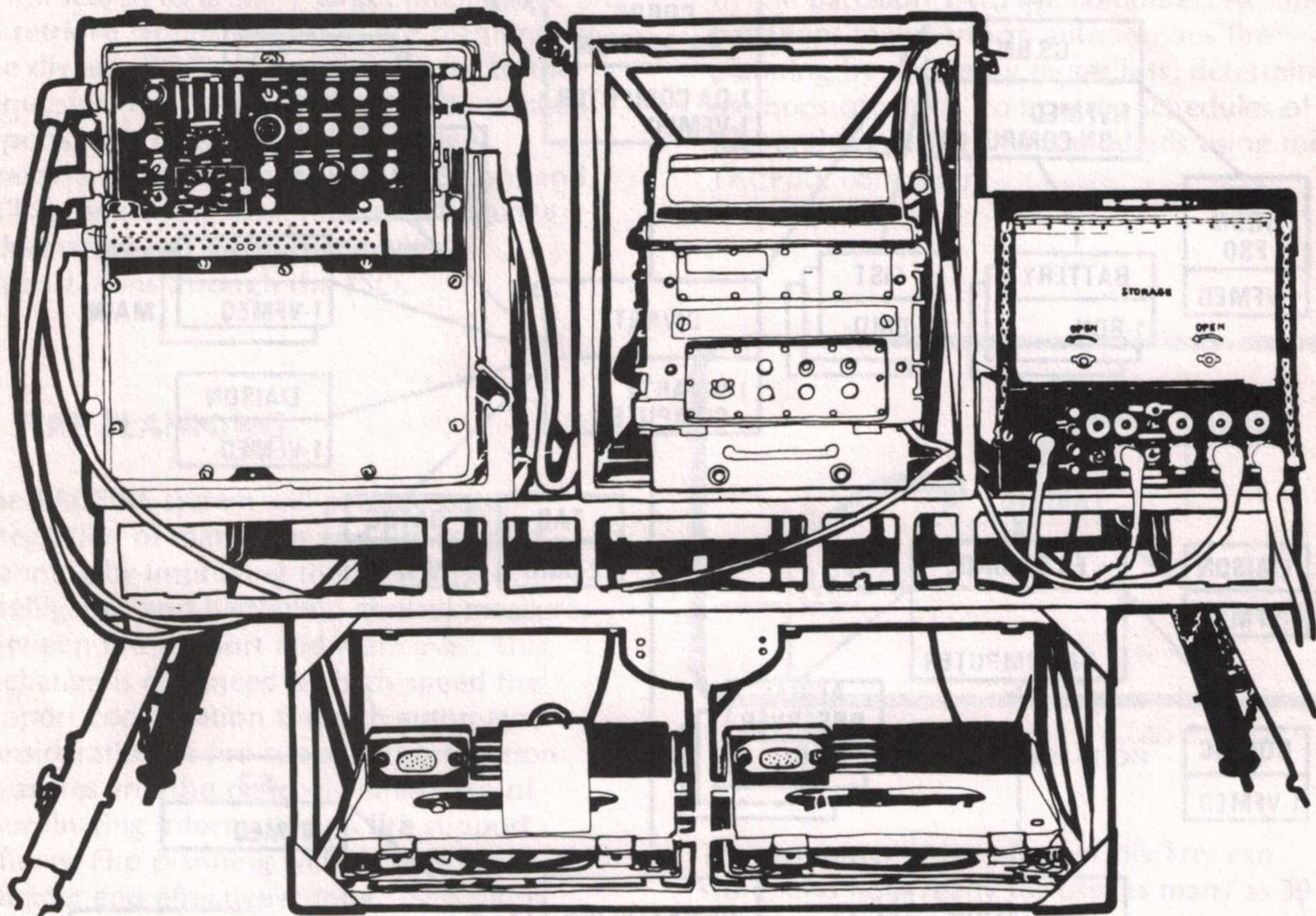
**ELECTRONIC TACTICAL DISPLAY**

**COMMUNICATIONS CONTROL UNIT**



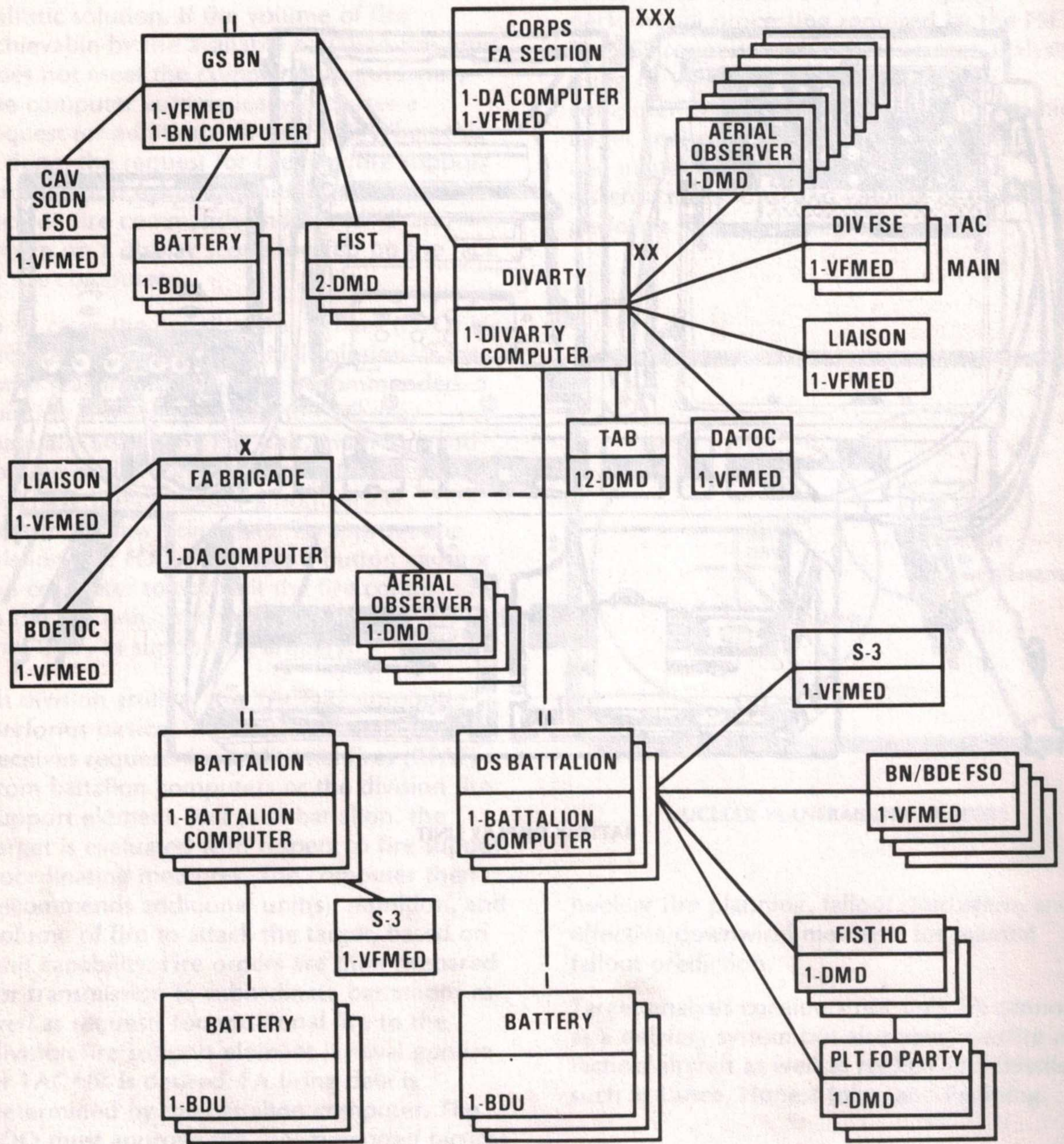


**ARTILLERY CONTROL CONSOLE**



BATTERY DISPLAY UNIT

# INF (MECH) DIVISION



BASIS OF ISSUE FOR TACFIRE EQUIPMENT

# APPENDIX C

## DEVELOPMENTAL ITEMS THAT INTER-FACE WITH OR COMPLEMENT TACFIRE

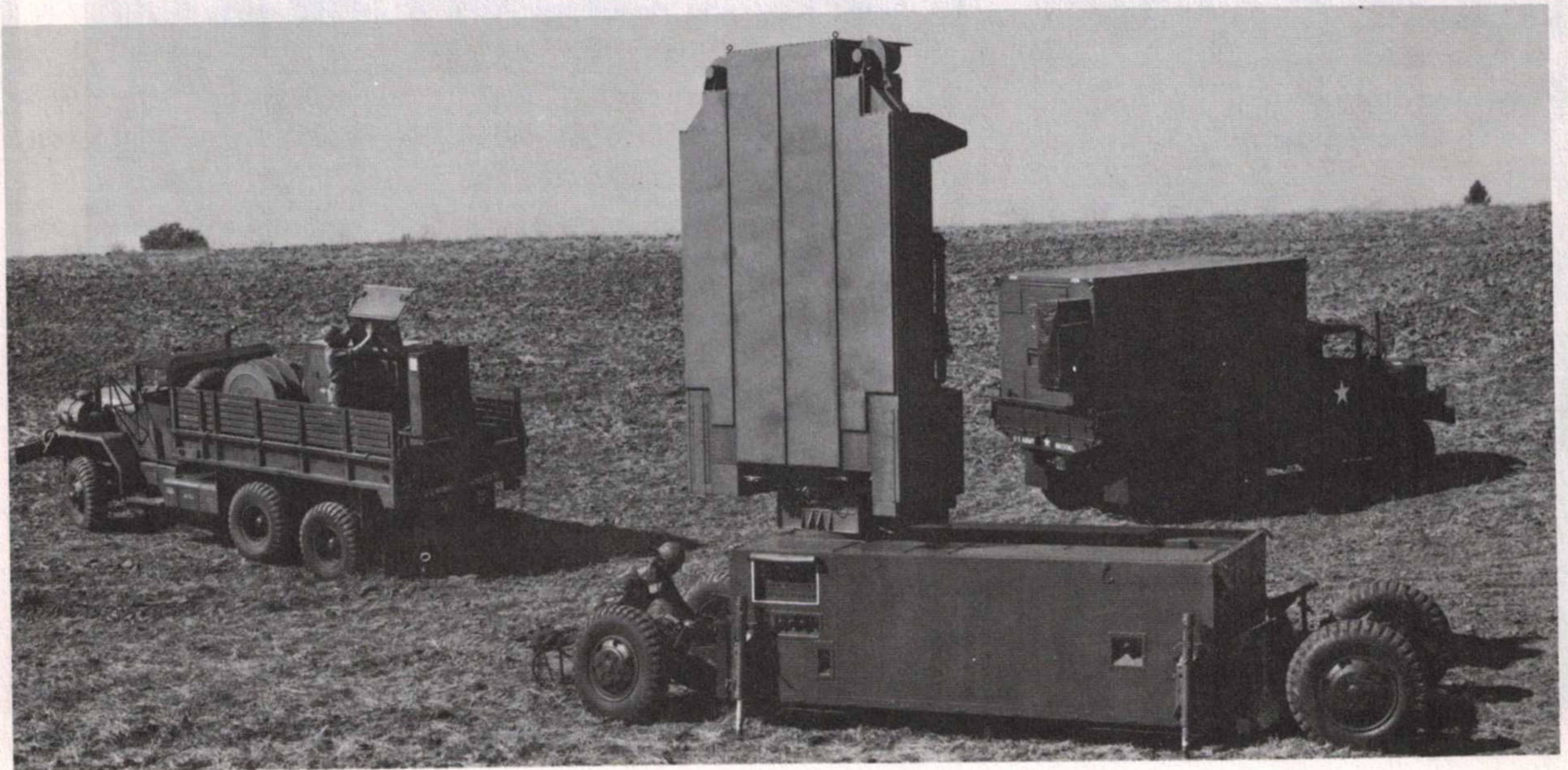
To increase its contribution to the combined arms team, the field artillery must improve its target acquisition, command and control, and weapons capabilities. Numerous developmental items now undergoing test will allow the field artillery to greatly improve its efficiency.

The field artillery, using TACFIRE and other equipment now under development, will evolve into a fire support system capable of detecting targets, allocating firepower, and opening fire within seconds. Automatic data processing equipment will enable rapid, accurate target acquisition and secure digital transmission of that data to the command and control team. To achieve these goals, a high degree of automated interoperability between target acquisition agencies and fire support sources is being actively pursued.

### □ DEVELOPMENTAL HARDWARE

#### COUNTERBATTERY RADAR

The counterbattery radar, AN/TPQ-37, will increase the ability of the field artillery to locate hostile artillery weapons. It represents a revolutionary improvement over conventional



AN/TPQ-37 COUNTERBATTERY RADAR IN FIELD SETTING.

radars in that it will communicate automatically and digitally to provide hostile weapon locations to a division artillery or battalion TACFIRE computer. There are five primary features of the AN/TPQ-37 radar: (1) TACFIRE interoperability, (2) a 1,600 $\mu$ r sector of scan, (3) a 35+ kilometer range, (4) multiple detection capability, and (5) determination of weapons locations. The basis of issue for the AN/TPQ-37 is two per division artillery. The AN/TPQ-37 is planned to be employed by the organic target acquisition battery and will normally communicate directly with the div arty TACFIRE.

#### COUNTERMORTAR RADAR

The AN/TPQ-36 radar's purpose is to detect hostile mortar rounds in flight and to determine the location of the weapon that

fired them. This radar will communicate directly with TACFIRE. TACFIRE receives the digital message from the radar, determines counterfire fire commands, and transmits them to a fire unit. The AN/TPQ-36 has the following capabilities: (1) TACFIRE interoperability, (2) 15+ kilometer range, (3) 4,800 $\mu$ r coverage, (4) 1,600 $\mu$ r sector of scan, (5) multiple target detection, and (6) determination of the location of hostile weapons.

Each division artillery will have three AN/TPQ-36 radars. These radars will be organic to the target acquisition battery but will normally be attached to a DS battalion and communicate directly with the DS battalion TACFIRE computer. The AN/TPQ-36 is in the engineering development stage.



AN/TPQ-36 COUNTERMORTAR RADAR IN FIELD SETTING



## GROUND LASER LOCATOR DESIGNATOR

Within the field artillery system, errors typically result from an inaccurate target location as determined by the FO. This necessitates subsequent adjustments and may preclude surprise fires. The ground/vehicular laser locator designator (GVLLD) will improve the FO's ability to locate targets and digitally communicate that location to a battery or battalion TACFIRE computer in a call for fire. In addition, the laser is used to conduct registrations with minimum ammunition

expenditure, and assists the FO in engaging targets of opportunity with surprise, first round fire for effect massed fires. A second and equally important function of the (GVLLD) will permit the FO to engage tanks with cannon launched guided projectiles (CLGP). The laser is used to designate a tank or any other point target to provide the homing signal for these smart projectiles. This feature of the GVLLD will revolutionize the engagement of tanks by the field artillery.

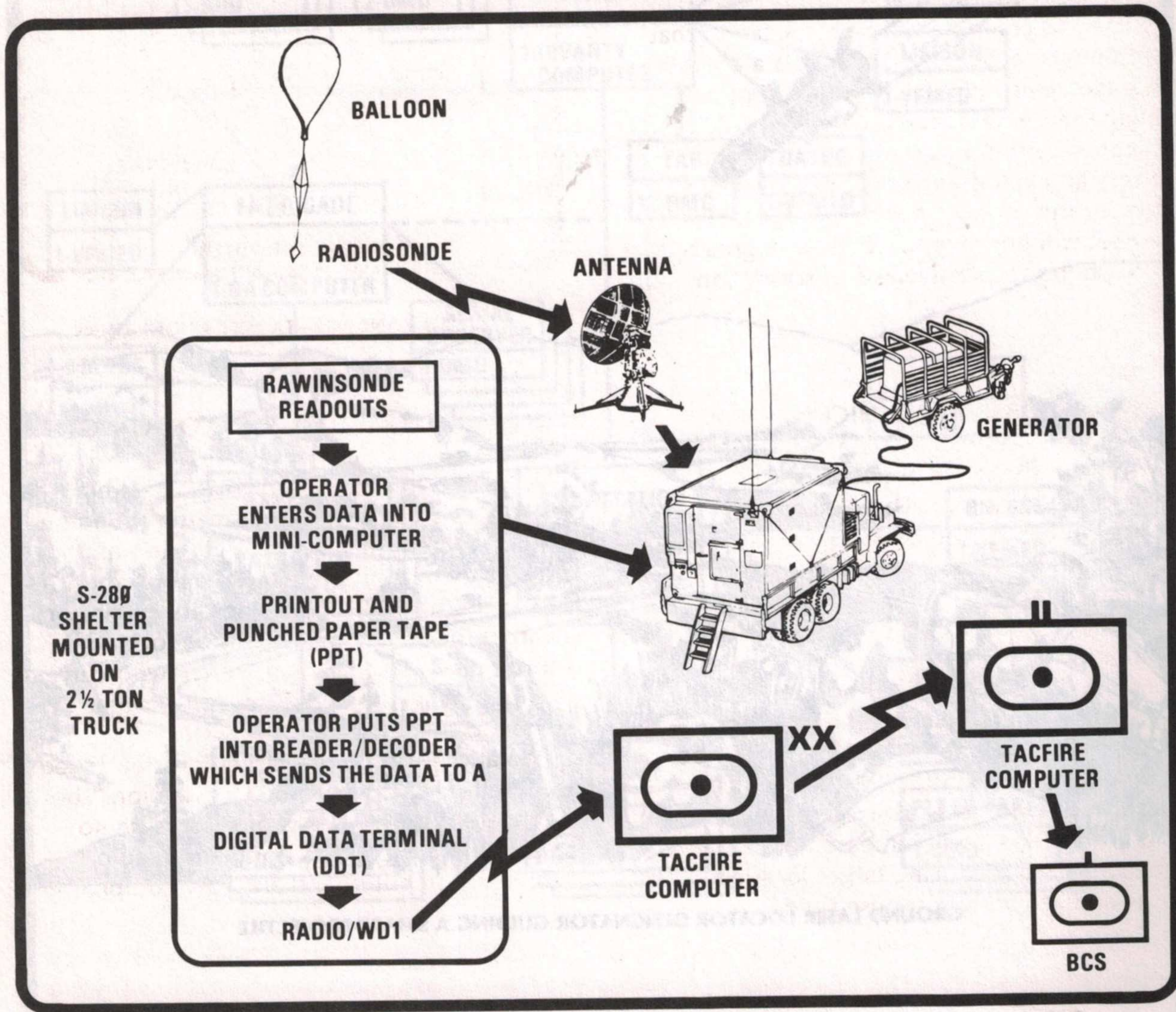


**GROUND LASER LOCATOR DESIGNATOR GUIDING A SMART PROJECTILE**

### AUTOMATED MET STATION

During firing, the action of weather upon a projectile may cause the burst to occur at a point other than the aimpoint. The automated met system (AMS) is used to sense the atmosphere by tracking weather balloons aloft and preparing meteorological (met) messages. These messages will be digitally transmitted to the div arty TACFIRE computer, which will disseminate them to subordinate battalions and batteries for use in their computers. The AMS may also communicate directly with a battalion TACFIRE computer. By timely

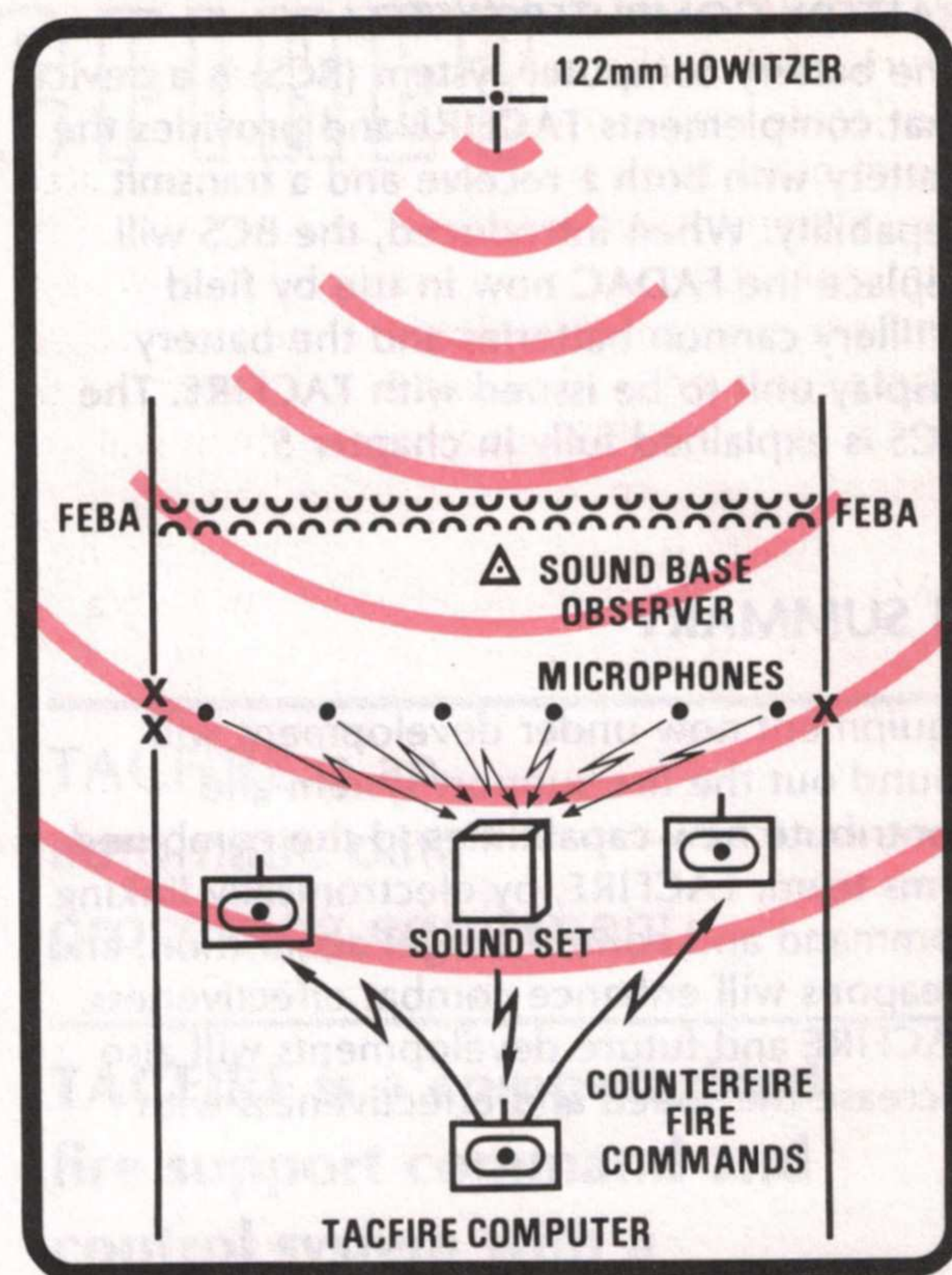
measurement and use of weather conditions, accuracy is improved. The AMS adds a minicomputer to the current balloon, radiosonde, and ground receiving (RAWINSONDE) system to automate calculations previously done manually. This permits faster met message preparation and dissemination, and dramatically improves the accuracy and reliability of met data by reducing human errors. The AMS will contribute to more effective surprise fire by making accurate near real-time met data a reality.



AUTOMATED MET STATION (Improved Rawinsonde System)

## SOUND RANGING

The primary purpose of sound ranging is to locate hostile weapons by determining the origin of the sound waves generated in firing. To accomplish this, microphones are emplaced at points of known location along a line generally parallel to the FEBA and connected by radio data link (AN/GRA-114) to the sound ranging recorder. An observer approximately 2,000-3,000 meters forward of the microphone base "activates" the sound ranging set when he hears or sees enemy weapons firing. The sound ranging set records the relative time of arrival of the sound waves at the microphone positions. These times of arrival are read from the recording tapes and are used to compute the target location that is fed into the TACFIRE system via a digital message device (DMD). The new sound ranging set, with its radio data link, will be operated by the div arty target acquisition battery and will dramatically reduce setup time for the sound microphone base. This new set will improve reliability and greatly increase the responsiveness of sound ranging.



SOUND RANGING—TARGET ACQUISITION

## FORWARD OBSERVER VEHICLE

The forward observer vehicle (FOV) kit is currently in the letter of agreement (LOA) stage of development. The conceptual evaluation conducted by MASSTER in Oct-Nov 75 confirms that the FOV is a valid concept to increase the effectiveness of our FO's. The FOV kit will consist of a vehicle positioning system, an azimuth reference device, a GVLLD, and night optics. All these items will be tied together and interface with TACFIRE through the DMD. This kit will be applied to M113A1 APC's for FIST chiefs supporting armor, mechanized, or cavalry units. The FOV kit will increase field artillery effectiveness by reducing target location errors and reducing response time.

## FIELD ARTILLERY ACOUSTIC LOCATING SYSTEM

The field artillery acoustic locating system (FAALS) is a completely automated sound ranging system that employs a matrix of sensors (with transmitters) forward of the FEBA. Enemy artillery and mortars within (or nearby) the sensor matrix can be located more quickly and accurately than with current equipment since FAALS uses sensors that surround the target and the system automatically computes target location based on a self-generated weather correction. The complete system consists of sensors, radio relays, and a ground station with a radio receiver, computer, and ancillary equipment.

## BATTERY COMPUTER SYSTEM

The battery computer system (BCS) is a device that complements TACFIRE and provides the battery with both a receive and a transmit capability. When introduced, the BCS will replace the FADAC now in use by field artillery cannon batteries and the battery display unit to be issued with TACFIRE. The BCS is explained fully in chapter 5.

### □ SUMMARY

Equipment now under development will round out the fire support system and contribute new capabilities to the combined arms team. TACFIRE, by electronically linking command and control, target acquisition, and weapons will enhance combat effectiveness. TACFIRE and future developments will also increase the speed and effectiveness with

which the FA can mass surprise fires, reduce FA vulnerability by reducing registrations and facilitating use of favorable terrain gun positions, and revolutionize the engagement of moving and stationary point targets by the field artillery.

Firepower is a chief ingredient of combat power. Field artillery is a long range, flexible component of combat power. The field artilleryman, functioning as both the FS coordinator for the force and a major provider of firepower, bears a large share of the responsibility for effective fire support of the combined arms team. New target acquisition and command and control equipment as well as developmental weapons will increase the ability of the field artillery to provide effective fire support within the combined arms team. TACFIRE, the lead system of this dramatic improvement in combat capability, is upon us NOW.

**TC 6-1**

**15 JULY 1977**

By Order of the Secretary of the Army:

**BERNARD W. ROGERS**  
*General, United States Army*  
*Chief of Staff*

Official:

**PAUL T. SMITH**  
*Major General, United States Army*  
*The Adjutant General*

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