S[redacted]ET

USDRE 77-5420A
Copy No.

DDRE 01810

DEFENSE SCIENCE BOARD

SUMMER STUDY
ON

Approaches to the Countering of Warsaw Pact Command, Control, and Communications Systems (Counter-C^3) (U)

Volume II

DECEMBER 1977

OFFICE OF UNDERSECRETARY OF DEFENSE RESEARCH AND ENGINEERING
WASHINGTON, D.C. 20301

Exempt from the GDS of E.O. [redacted]
D[redacted] 1990 Classified by: OUSDRE

S[redacted]

SECRET

USDRE 77-5420A

DEFENSE SCIENCE BOARD

SUMMER STUDY
ON
Approaches to the Countering of
Warsaw Pact Command, Control,
and Communications Systems
(Counter-C^3) (U)

Volume II

DECEMBER 1977

SPECIAL HANDLING REQUIRED
NOT RELEASABLE TO FOREIGN NATIONALS

NATIONAL SECURITY INFORMATION
Unauthorized disclosure subject to criminal sanctions.

SECRET

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

TABLE OF CONTENTS (Concluded)

SECTION A

COUNTERS TO S.U. ARMOR/MECHANIZED INFANTRY C^3 SYSTEM

STATEMENT OF PROBLEM

([redacted]

([redacted]

[redacted]

([redacted] Although each member force of NATO has evolved doctrine and organizations to effect counters to enemy C^3, [redacted] Especially oriented toward the situation of U.S. forces (but nonetheless largely applicable to other NATO nations), this study examines Soviet combat forces at division level and below, and is structured to: (C)

1. (U) Identify and review specific C^3 dependencies and vulnerabilities of WP tank and motorized rifle forces
2. (U) Determine the appropriate countermeasures within stated tactical contexts

3. (U) Prescribe means (or methods for determining means) to quantitatively predict tactical benefits accruable from successful applications of preferred countermeasures

4. (U) Examine existing and programmed U.S. Counter-C^3 organizations, operational procedures, and materiel for conformance to the determinations above

5. (U) Identify any program actions needed to improve congruity between planned Counter-C^3 capabilities and identified high-benefit opportunities

SCENARIOS

[redacted] It will be convenient to consider U.S. Counter-C^3 capabilities [redacted] as the separate and combined use of four fundamental Counter-C^3 actions – destruction, jamming, deception, and exploitation. The elements of [redacted] Two specific scenario situations provide the basis for the subsequent discussion of alternative Counter-C^3 techniques:
(1) [redacted]
(2) [redacted]

(C) The approximate deployment of [redacted]

[redacted] Two characteristics of [redacted]

[redacted]

[redacted] As a consequence of [redacted]

[redacted]

[redacted]

FIGURE 1. TANK/MOTORIZED RIFLE DIVISION, APPROXIMATE DEPLOYMENT OF RADIO NETS (U)

[redacted]

[redacted] Σ

[redacted] Counter-C^3 techniques for degrading the effectiveness of opposing forces [redacted]

[redacted]

[redacted]

PROPERTIES OF COMMAND AND CONTROL COMMUNICATIONS

VHF/FM Nets

(C)

(S)

(S) [redacted]

(S)

(S)

MF/HF Nets

(S)*

(S) [redacted]

*(U) EW Mini-Review (U), USASA, 19 August 1976, SECRET/NO FORN.

Multichannel Relay

(S) [redacted]

(S)

(S)

[redacted]

Other Means

[redacted]

(C)

(C)

(C)

COUNTER-C^3 TECHNIQUES

Concepts

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

(S)

[redacted]

Candidate System Descriptions

(S)

1. [redacted]
   a.
   b.
   c.

2.
   a.
   b.

3.

4.

Brief descriptions of candidate Counter-C^3 system characteristics and capabilities corresponding to each of the Counter-C^3 concepts listed above are provided in Table 1. The materiel concepts are described in terms of targeting techniques, deployment means, and payload characteristics.

(S)

5.

a.

b.

[redacted]

6.

7.

8.

9.

Brief descriptions of candidate Counter-C^3 systems characteristics and capabilities corresponding to the above listed concepts for degrading the combat effectiveness of enemy maneuver units are provided in Table 2.

[redacted]

(U) Approximate acquisition costs for major elements of the Counter-C^3 systems are provided in Table 3 in cases where the necessary capability is not currently available or in advanced development.

(S)

TABLE 1

CANDIDATE COUNTER-C^3 TECHNIQUES FOR DISRUPTING AND EXPLOITING SOVIET DIVISION PLANNING (U)

[redacted]

TABLE 2

CANDIDATE COUNTER-C^3 TECHNIQUES FOR DEGRADING COMBAT EFFECTIVENESS OF MANEUVER UNITS (U)

[redacted]

[redacted]

TABLE 3

ESTIMATED COSTS OF UNIQUE COMPONENTS OF CANDIDATE COUNTER-C^3 TECHNIQUES (U)

[redacted]

[redacted]

[redacted]

CURRENT/PLANNED CAPABILITIES

(S) [redacted]

[redacted]

(S)

(S)

[redacted]

[redacted]

FIGURE 2. ARMY SIGINT/EW COMBAT SUPPORT STRUCTURE (U)

[redacted]

(S)

[redacted]

(a)

(b)

[redacted]

(c)

TABLE 4

PRESENT AND PROGRAMMED ARMY SIGINT/EW SYSTEMS (U)

[redacted]

[redacted]

[redacted]

TABLE 4 Part A (Continued) (U)

[redacted] [redacted]

[redacted]

TABLE 4 (CONCLUDED) (U)

Part B: Jamming Systems (U)

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

FIGURE 3. SYSTEM THREAT CORRELATION (U)

[redacted]

[redacted]

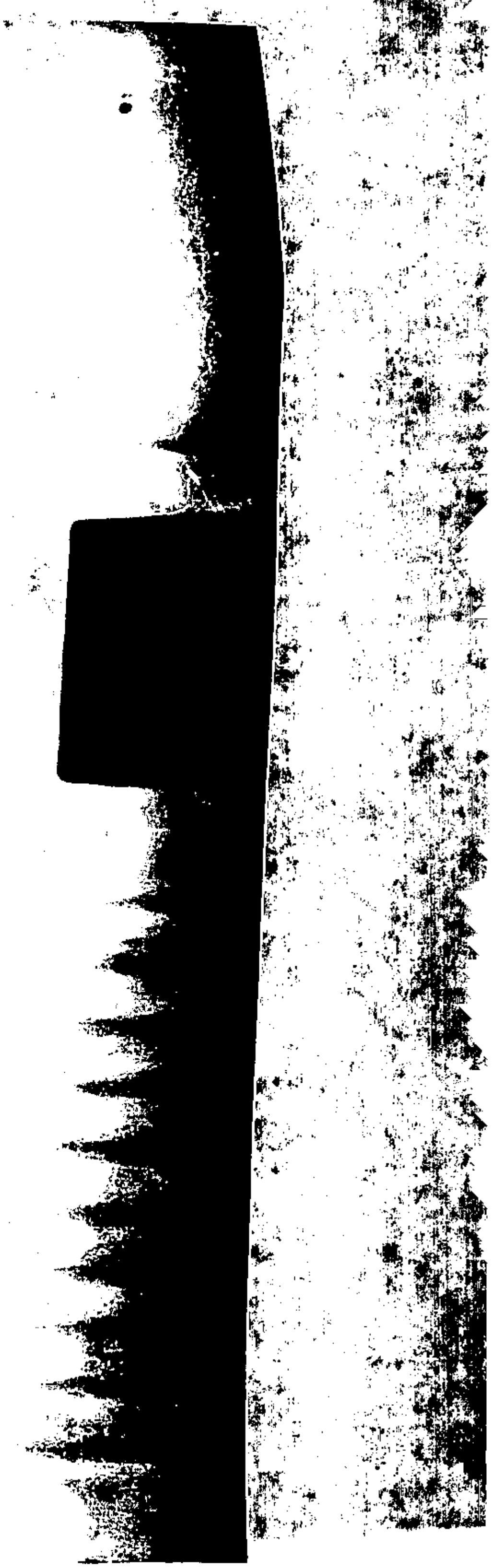
(d)

[redacted] [(2)

(a)

(b)

[redacted]



(c) [redacted]

(d)

[redacted]

(e)

CONCLUSIONS AND RECOMMENDATIONS

[redacted] Specific Goals of Counter-C^3 Against Tank/Motorized Rifle Division [redacted]

[redacted] Disruption of Forward Battalions [redacted]

[redacted]

[redacted]

[redacted]

[redacted] Delay of Second Echelon Regiment [redacted]

[redacted]

[redacted]

[redacted]

Location and Destruction of Division CP Communications, Planning Staffs, and Equipments

[redacted]

Achieving Favorable or Acceptable Force Ratios Opposite Main Attack Sectors

[redacted]

Limiting Effectiveness of Enemy Radio-Electronic Combat

[redacted]

[redacted]

Existing U.S. Programs

Emphasis

(S) [redacted]

Scope of Recommended Changes

(S)

[redacted]

Specific Recommendations

(S) Program Changes Directed at Battalion Combat Units

(S)

1.

2. [redacted]

Program Changes Directed at Regimental and Division Communications

We recommend the development and deployment of:

1. [redacted]

2.

3.

4. [redacted]

Policy Opportunities to Improve C^3

(S) [redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

SECTION B

[redacted]COUNTERS TO S.U. ARTILLERY C^3 SYSTEM[redacted]

STATEMENT OF PROBLEM

(U) Soviet doctrine envisions massive use of artillery in support of offensive operations to disorient front line personnel, inflict personnel casualties, destroy defense installations, disorganize command and control, neutralize weapons, and disrupt logistic support.

[redacted]

[redacted]

[redacted]

(S) [redacted]

(U) Obviously, a concept which would result in serious degradation of Soviet artillery effectiveness would not only improve the U.S. defensive posture but would also be a major factor to a Soviet commander in assessing the probability of a successful attack. The disruption of Soviet artillery C^3 through exploitation, jamming, deception, or destruction may offer the opportunity to cause a significant degradation in artillery effectiveness.

SCENARIOS AND FORCE DISPOSITIONS

(U) The two battle scenarios selected for examination of the Soviet artillery are: (1) the meeting engagement which occurs after the Soviets have crossed the border into West Germany and have encountered NATO covering forces, and (2) a massive Soviet breakthrough attempt of NATO general defensive positions. These are discussed in turn with emphasis placed on artillery command, control, and communications aspects.

PRIORITIES OF SOVIET ARTILLERY SYSTEMS

General

[redacted]

Organization

(U) Every Soviet division has its own division artillery. In the motorized rifle division (comparable to a Western mechanized division), until recently, these were [Ref. 4, pp. 158-159]:

- Two battalions of 122-mm howitzers of 18 weapons each (probably model D-30 in first-line divisions)
- One battalion of 152-mm gun howitzers of 18 weapons each (probably model D-20 in first line divisions)
- One battalion of 18 multiple rocket launchers; 40 tubes each of 122-mm (model BM-21)

- One FROG battalion of four launchers (probably FROG-7)
- Each of the three MR Regiments has its own organic 122-mm battery, also. (The antitank, air defense, and mortar units are not covered here.)

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

Doctrine

(U) There is a substantial body of written doctrine concerning Soviet artillery employment. There are, however, some contradictions and new trends in Soviet doctrine which render it less specific than would otherwise be the case.

(U) The first of these contradictions is that Soviet doctrine is written specifically to govern the conduct of nuclear warfare. It therefore prescribes that nuclear weapons will be used to create gaps in the enemy's lines which the maneuver divisions will exploit. In such a case, the conventional artillery will be used to attack the enemy front lines which cannot be struck by nuclear weapons due to safety considerations. The artillery will also fill in areas where nuclear weapons are not used. Soviet tactical air support is not used against close-in targets (as in U.S. practice) but against deeper targets such as artillery, command posts, reserves, road networks, etc. If nuclear weapons or tacair are not available, conventional artillery fires are increased accordingly. While Soviet doctrine does concede that there may be circumstances under which a war would be conventional, even if only for a time, or under which nuclear weapons might not be available in a particular sector, it is sometimes difficult to determine whether a particular doctrine is designed for nuclear or nonnuclear operations [Ref. 2, pp. 109-118].

(U) Another factor which tends to blur doctrinal distinctions is the present trend toward fast moving mobile operations. In the years following World War II, it was clear that Soviet doctrine favored the deliberate breakthrough attacks with massive artillery support in which the maneuver was secondary to firepower.

(U) There has been a definite shift, however, in the last 10 to 15 years to a more mobile tactical concept stressing meeting engagements and attacks from the march. These tactics, almost by definition, stress maneuver and reduce the role of firepower. As a result, it is sometimes difficult to determine whether the applicable Soviet doctrine in a particular situation is the deliberate use of massive firepower or the more flexible use of firepower in a fast breaking mobile situation.

General Concepts of Employment of Artillery*

(U) Artillery fire planning is initiated at the highest level involved in an operation and is then performed successively down to the lowest echelon. Soviet fire planning is centralized, detailed, and flexible following certain principles which include:

- Centralized planning by artillery commanders from front through regiment to conserve ammunition holdings
- Stockpiling of ammunition whenever possible

*(U) Ref. 5 and Appendix F.

- Flexibility in switching fires to neutralize worthwhile targets of opportunity when sanctioned by the overall commander
- Grouping of artillery battalions and regiments for specific immediate support commitments and reserve tasks

(U) The fires of all artillery units within the division are incorporated into the army or front fire support plan, and the artillery unit commander at each echelon coordinates the fires under his control. He determines new requirements and missions, and together with the Chief of Rocket Troops and Artillery (CRTA) or Chief of Artillery, depending on the level, makes suggestions to the combined-arms commander concerning adjustments in tactical organization as the situation develops. The fire planning process includes target acquisition, organization for combat, assignment of tactical missions, determination of ammunition requirements, and formulation of a detailed fire plan.

(U) Soviet doctrine emphasizes the employment of nuclear fires in conjunction with conventional fire support in all types of military operations, particularly in the area of main effort. Nuclear weapons in some instances supplant conventional fires, but in general they merely extend the limits and scope of artillery employment. Nuclear weapons provide the capability for support of ground forces through the depth of and beyond the tactical zone of operations. Targets designated by Soviet commanders for destruction by nuclear weapons must meet two requirements: first, destruction of the targets must be essential to the success of the overall offensive or defensive plan; and second, the employment of the weapons must not present problems of control or jeopardize operational security.

(U) Fire planning is conducted at all echelons and is closely coordinated with the plans of supported units to ensure that during all phases of combat there is continuous and effective fire support. Accurate, continuous fire planning is a mandatory function of all artillery staffs within the units of the Soviet division. The basis for division artillery fire planning is established during the reconnaissance of the area of anticipated action by the division commander, his CRTA, and other staff members. During that reconnaissance, the organization for combat and means of coordination are determined. The artillery representative receives instructions from the combined-arms commander which form the basis for determining which objectives should be shelled by the artillery and the priority for each objective, the sequence in which targets should be attacked, time of attack, and the order in which targets should be neutralized. An overriding factor in fire planning is the availability of nuclear support.

(U) The division CRTA submits requests and recommendations for the employment of nuclear fires. The fires of nuclear weapons organic to the division and/or nuclear strikes allocated to the division from army level are closely integrated with air strikes and conventional fires and the overall scheme of maneuver. Signals are agreed upon for requesting and shifting fire to successive zones and objectives. The CRTA indicates exactly where it is necessary to establish artillery OPs, endeavoring to place them together with the OPs of the division commander.

Conventional Employment Concepts

(U) Soviet planners are guided by the following principles in employing artillery:

- Reinforcement of lower echelons with artillery units from higher echelons in both offensive and defensive operations
- Organization of these reinforcements together with organic artillery elements into temporary functional artillery groups
- Integration of nuclear and conventional fires with air support into a single coordinated fire support plan
- Utilization of a fire preparation to precede all major offensive actions regardless of whether nuclear weapons are used
- Employment of all artillery in a direct fire role at regimental and lower levels
- Use of tanks to supplement the fire preparation when a shortage of artillery exists

Allocation of Artillery

(U) The following are general principles for the allocation of conventional artillery:

- Front and Army normally allocate their conventional artillery to first echelon divisions, although Army may on occasion retain some long-range artillery for use in the main sector of attack
- A division will in turn allocate some of its organic and attached artillery to leading regiments, particularly on the main axis of attack
- A regiment may place some of the artillery received from division in direct support of leading battalions
- Motorized rifle regiments hold their organic artillery
- Second echelon divisions, regiments, and battalions are not normally reinforced with additional artillery until they are committed
- Second echelon divisional artillery will normally augment the fires of the first echelon divisions, especially in the sectors of the main effort

Artillery Organization for Combat

[redacted] [

[redacted]

(S)

•

•

•

• [redacted]

General Concepts of Fire Support

(U) Target priorities for both offensive and defensive fires include:

- Nuclear-capable artillery and rockets and their control systems
- Command posts, observation posts, communication (radio) centers, and radar stations
- Conventional artillery and air defense units
- Reserves and service support units
- Enemy defensive strong points, ATGM positions especially

(U) Artillery fire missions can be categorized in terms of desired target response.

- Harassment. Aims at about 10 percent damage to keep enemy heads down, reducing the effectiveness of aimed fire
- Neutralization. About 20 to 30 percent damage to deprive the enemy of his will to fight temporarily
- Annihilation. Completely disables the enemy's ability to fight, inflicting 50 to 60 percent damage
- Others. Demolition, interdiction, and screening fires can also be fired

(U) Methods of fire are provided in Table 5. These will be discussed in operational context under offensive and defensive employment.

(U) In addition to the above, it should be noted that direct fire and night firing techniques are employed by Soviet forces.

- Direct fire. The development of artillery in a direct fire role is standard in the Soviet Army. All of their artillery are capable of firing direct fire missions and carry armor-defeating ammunition, particularly 85-mm and 100-mm guns
- Night firing. Artillery fires conducted at night may be observed or unobserved. Artillery observers conduct fire on targets which may be artificially illuminated by the use of illuminating shells, searchlights, or flares dropped by aircraft. Adjustments are also made on illuminated targets from aircraft and helicopters. Unobserved fires are conducted from data prepared during daylight or adjustments on targets are made by sound, flash, or radar. Direct fire weapons utilize infrared equipment for night firing [Ref. 5]

Communications

[redacted]

TABLE 5

SOVIET METHODS OF FIRE* (U)

	Type of Fire	Characteristics	When Used
1.	Fire Assaults (ON)	Maximum rate of fire.	During preparations initially, at end and possibly at other times. Conducted between fire assaults, or concentrations of fire. Extent of target damage may be assessed during this period to determine necessity of further fire assaults.
2.	Observational Fire	Low rate of fire will be deliberate or at will.	Conducted between fire assaults, or concentrations of fire. Extent of target damage may be assessed during this period to determine necessity of further fire assaults.
3.	Massed Fires (MO)	Extreme density at fire, multiple battalions of artillery or all available weapons of combined arms unit. Goal is decisive suppression in a short time period.	Planned preparations.
4.	Concentrated Fire (SO)	Several batteries of battalion against a single target or group of targets. May be planned or unplanned. Calculated by target area.	Any type of battle. In support of attacks when targets well determined and ammunition limited. During attacks on call to support offensives. If preplanned, SO may be cancelled. Ammunition expenditure depends on nature and value of target and may be either suppression or annihilation.
5.	Successive Concentrations of Fire (PSO)	Targets grouped together in successive lines and fired upon successively as the attackers advance. Always planned. Must be carried out if not cancelled prior to beginning of live support. Calculated by rounds per target area per minute.	During attacks or counterattacks, in support of advancing troops and vehicles. Ammunition expended at a set rate.
6.	Stationary Barrage ([illegible])	High density fire. Short period of time. Fired on call when enemy advances into line. Planned by frontage covered per gun.	In defense, on call.
7.	Rolling Barrage (PZO)	High density of fire on preplanned lines shifting on order from supported commander. Planned by frontage covered per gun.	During offensives in support of advancing troops during initial attack phase. Requires large number of guns and ammunition expenditure.
8.	Double (Triple) Rolling Barrage	High density of fire on two (or three) preplanned lines shifted on order. Planned by frontage covered by gun.	During offensives like single rolling barrages when sufficient guns and ammunition available.
9.	Neutralization or Annihilation of Individual Targets	Expenditure determined by individual conditions as shown above. Basis for other types of fire.	Offense or defense.
10.	Demolition Fire	Normally fired by large calibre weapons with special shells for destruction of concrete, etc.	Against structures.
11.	Observer Adjusted Fire	Number of rounds not predetermined. Target damage is assessed during fire which ceases when criteria achieved.	When ground or air observer is available.
12.	Dummy Transfers of Fire	False transfer to other targets.	Used to draw troops under cover out into open
13.	Pauses	To deceive as to purpose or time of initial assault in an attack	Can be used during preparation.
14.	Control and Registration Fire	To determine settings for fire for effect.	

UNCLASSIFIED

* Ref. 5.

[redacted]

FIGURE 4. SOVIET FIELD ARTILLERY BATTALION RADIO NETS (U)

[redacted]

Meeting Engagement

General

(U) Soviet doctrine and training have given considerable emphasis to the meeting engagement in recent years. This emphasis is probably due to the suitability of the meeting engagement as a vehicle for training in mobile decentralized operations and also due to the application of the meeting engagement style to a wide range of combat situations. Our information on the meeting engagement at battalion level is quite comprehensive. Unfortunately, our information at regimental and divisional levels is rather limited and does not include the details of artillery C^3.

Planning

(U) At battalion level the meeting engagement has been reduced to what is almost a set piece battle drill due to the need for rapid reaction.

(U) For example, it is standard that a Soviet division advancing to make contact in anticipation of a meeting engagement would attach a 122-mm artillery battalion to the leading regiment or regiments. If additional artillery was available from Army, division might attach another battalion for a total of two. The regiment in turn would attach the organic artillery battalion to the advance guard battalion commander who would attach one battery to his advance party. This organization for march and combat would be done in an assembly area under radio silence by means of oral orders, messenger, and wire. Inasmuch as this is almost a routine breakout, it can be done rapidly with a minimum of amplifying instructions. As soon as an artillery battalion receives the order to support a tank or MR battalion acting as an advanced guard, it would do the following:

- Resupply as necessary to include approximately one basic load of ammunition (~ 80 rounds per tube)
- Disseminate geographical or other brevity codes
- Prepare one or more tentative fire plans based on predicted locations of contact [Ref. 6, pp. 52-56]

(U) The possibilities of interfering with this process by jamming or otherwise appear to be minimal insofar as the Soviet division would be at some distance away and would essentially be under radio silence.

(U) In the NATO/Pact Central Front situation, a Soviet division which would be preparing to cross the border to effect a meeting engagement (no notice attack) or to drive into the NATO covering force (warned attack) would take elaborate security precautions to conceal its presence and dispositions. It is probable that its assembly area would be equipped with an elaborate wire net. In this case to interfere with the planning process would be almost impossible. Not only is the Soviet division in sanctuary and protected from hostile action until the war actually starts, but the elaborate wire network would obviate the need for using radios.

Movement*

(U) At the prescribed time, the advance guard would leave the assembly area and would organize itself as shown below as it crossed the initial point. The actual march would be controlled by designating control points and times on a specific route. The use of radios would be minimal, just reporting reaching of control points, until contact with the enemy was made. The order of march would be as follows:

MR Battalion Main Body	Direction of March Advance Party
MR Battalion (–), Tank Company (–), Artillery Battalion, other attachments (AT, AD, etc.), (MR Battalion CO and Artillery Battalion CO stay together)	MR Company, Tank Platoon, Mortar Company, Artillery Battery (from Regiment), (MR CO Commander and Battery Commander stay together)

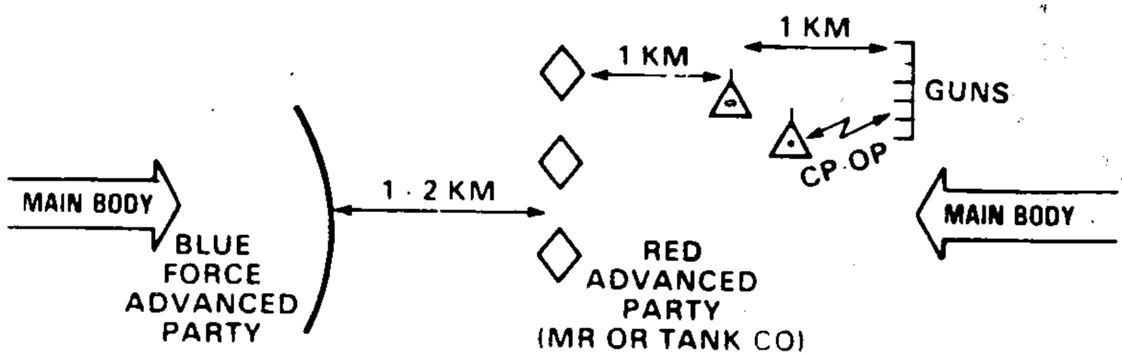
(U) The Tank Battalion would have a battalion from division artillery, of which a battery would support the advance party, the remainder the main body. During the march, units would maintain radio silence to the maximum extent feasible. Once contact with the enemy was established, radio would be used in the normal way.

Targeting and Fire Control**

(U) The Advancing Party. As soon as the advance party makes contact with the enemy, it deploys and attacks or defends (depending on the situation). Its artillery battery occupies a position at once and supports the action. The two commanders are essentially collocated and coordinate face-to-face. According to doctrine, a wire line would be laid between the two. The general situation is shown in Figure 5. The battery receives its fire commands from the commander at his CP/OP by radio (R-107 or R-123). While it is possible that the preplanned fires would be consistent with the actual situation, it seems more likely that the fires would be handled as targets of opportunity. The CP/OP would have two FM radios – one in the battery command and fire direction net and one in the battalion command net. It would also have a wire line to the maneuver company CP/OP if necessary, as mentioned above, and to a lateral OP

*(U) Ref. 6, pp. 52-56.

**(U) Ref. 7, pp. 90-94.



- CP-OPs collocated, probably on first ridgeline
- Battery receives fire commands from CP-OP (FDC)
- Fires probably on-call, targets of opportunity
- Primarily radio dependent for fire requests and fire direction

UNCLASSIFIED

FIGURE 5. SOVIET ARTILLERY C^3 MEETING ENGAGEMENT (U)

if one is set up. The gun battery would also have two FM radios, netted as above. It would also have wire to the individual guns as soon as it could be laid. An SP battery would have the option of using radios to communicate with the individual gun crews (see Figure 4). There is some dispute as to where the battery FDC is actually located. It could be at or near the battery CP/OP or separated from it up to 1-2 km.

(U) Counter-C^3 Opportunities. There are definite possibilities for interfering with the artillery C^3 during this phase of the action. The CP/OP would probably be on the first ridgeline and could probably be located by means of a map study and visual reconnaissance. Likewise, the artillery battery is so close to the front that it could probably be located by a Blue forward observer plotting its flash and sound. Also, obviously fire control messages from the CP/OP to the firing battery would be completely radio dependent.

(U) The Main Body*. Based on information from various sources (division, combat reconnaissance patrol, air, etc.) and a map study, the battalion commander formulates a tentative scheme of maneuver. As soon as the area of contact can be estimated or is known, he maneuvers his battalion to the flank and delivers a deep flank attack at once. The general concept is shown in Figure 6.

(U) The firing batteries would receive their firing position locations by a combination of radio, motor messenger and face-to-face orders. It will be noted that they are far forward by U.S. standards and go into position and start firing from the march almost immediately (in 15 to 20 minutes). The artillery battalion commander is at or near the maneuver battalion CP/OP. His battery commanders stay with their supported maneuver company commanders. The battalion commander would assign each battery one or two fire missions keyed to terrain features. Presumably thereafter, each battery would fire "on call" missions with battalion intervening, if necessary, to fit the fire support more closely into the maneuver battalion scheme of maneuver.

(U) As in the advance party situation, there are definite possibilities for interfering with the fire control messages between the respective battery CP/OPs and their guns, and also with the battalion FM command net. The Soviet artillery battalion is in a very exposed position and is completely dependent on radio.

(U) Commitment of Regiment**. There is very little specific information on the employment of the regiment (tank or MR) in the meeting engagement and little, if any, on the details of artillery support. One can postulate, however, that the operation would develop much as it does for the battalion (see Figure 7).

---

*(U) Ref. 8 and Ref. 9, pp. 29-32.

**(U) Ref. 9, pp. 20-32.

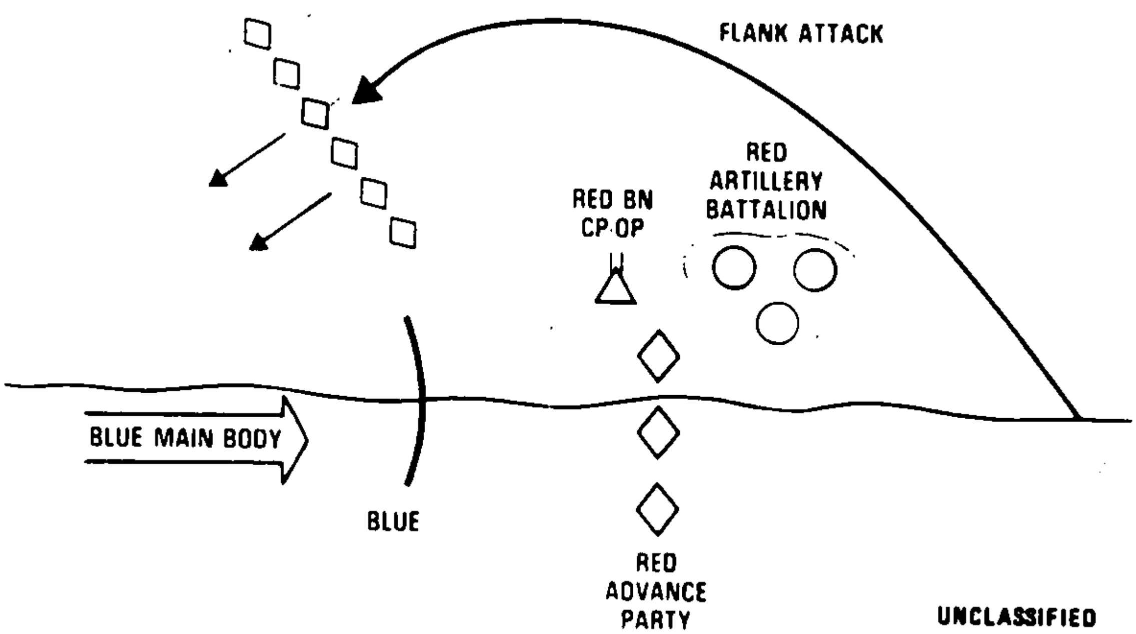


FIGURE 6. COMMITMENT OF THE ADVANCE GUARD MAIN BODY (U)

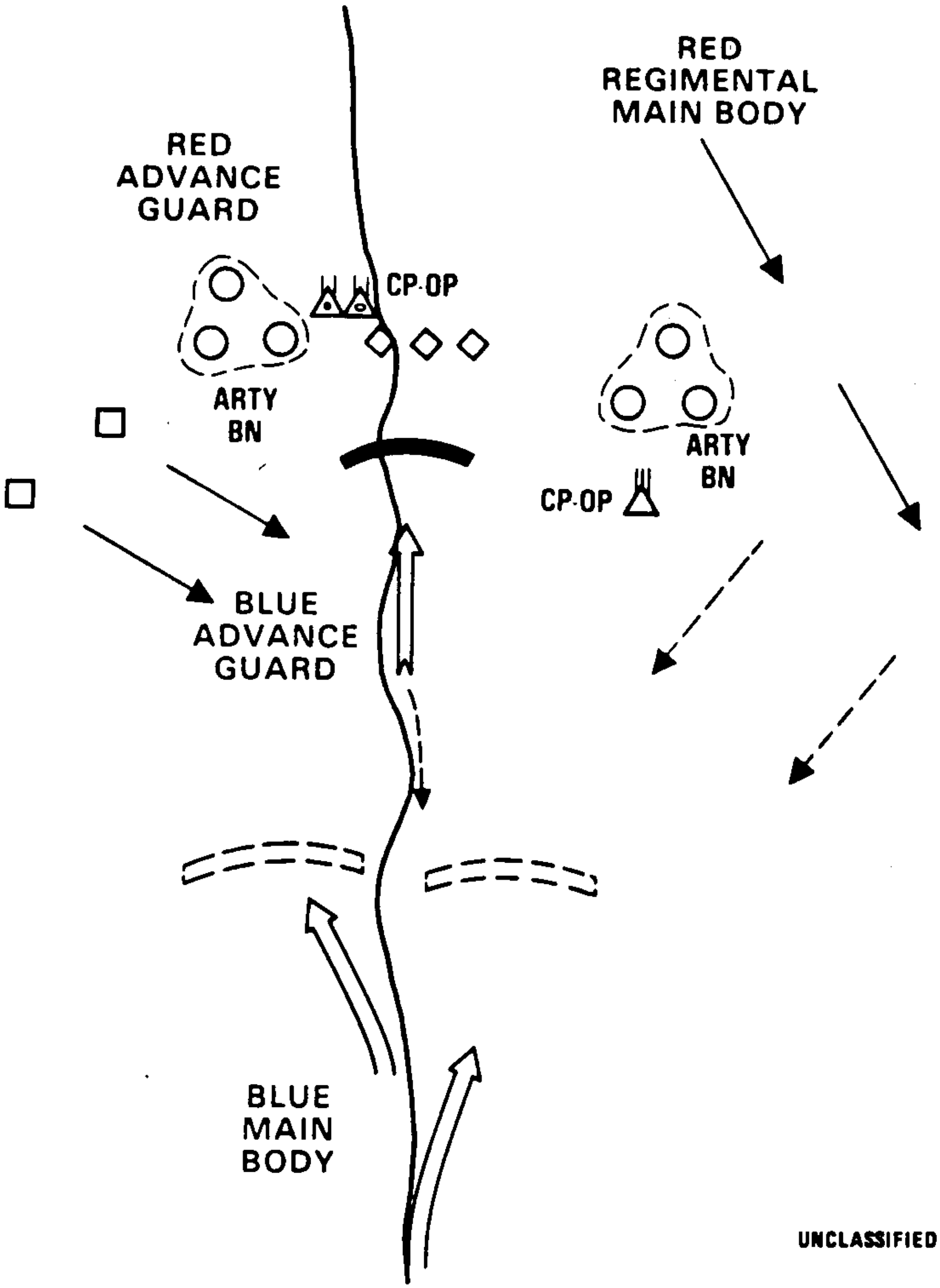


FIGURE 7. COMMITMENT OF REGIMENT (U)

(U) Figure 7 assumes that the regiment has two battalions of artillery in support and that a RAG is formed. Presumably the RAG commander (who is also a battalion commander) would communicate with his other battalions by both AM and FM radio. As the division began to take closer control of the maneuver, division artillery would likewise take closer control of its units. Jamming of this net is attractive in theory but too little is known of battalion and group level traffic to make a judgment.

(U) The possibilities for interfering with artillery C^3 begin to diminish at regimental level for several reasons. The regimental CP is farther back, it has more redundancy in its nets and radios, and, as it normally does not control actual fire missions, its radio traffic is not particularly time sensitive.

(U) At division artillery level the possibilities are even less. Division artillery is in the multichannel carrier radio net and may even be on a wire or cable net so its communication redundancy is substantial.

(U) The possibilities for interfering with the various surveillance and target acquisition sensors (i.e., countermortar and counter-artillery radars, DF, sound, flash, etc.) were examined. However, the information on communication routing is almost nonexistent so no useful conclusions could be drawn.

Breakthrough

General*

(U) Soviet doctrine no longer prescribes the classic World War II type breakthrough attack in which many divisions were massed in close proximity to the enemy days or hours prior to an attack. Obviously such massing under nuclear conditions, or in a nuclear imminent theater such as Central Europe, would expose a force to catastrophic losses. The current doctrine for a breakthrough attack is to deliver an attack from the march. The more deliberate form, which would be used to attack a strong and heavily defended position, has the following characteristics:

- A covering force holds the attack line and aggressively reconnoiters the enemy position
- All or most of the artillery is put into position under the cover of darkness the night before the attack
- First echelon (or assault) divisions move forward at the last possible moment with, ideally, their lead elements crossing the line of departure at the appointed hour

*(U) Ref. 2, pp. 109-120, 125-126, 141, and 146, and Ref. 10, pp. 134-139.

- Second echelon divisions are concealed well back in assembly areas and called forward when needed
- Operational concept is to break the enemy defenses rapidly, in hours, and drive deep into his position. Thus, the Soviet force is massed in space and time only for a matter of hours, if all goes well

(U) The term breakthrough attack is also often used to describe an actual attack from the march. In this case, if the Soviets estimate that the defense is hastily organized or over-extended, they may elect to advance on a broad front with advance guards and go immediately into the attack when contact is gained. This form of attack is prescribed to deal with enemy reserves that have set up a hasty defense. It might also be seen in the initial attacks on NATO's main defensive position after the covering force has been driven in or at any time during exploitation.

(U) The more deliberate form might be seen in the initial attack across the NATO borders or if the Soviet attacks from the march bogged down.

Artillery Organization

(U) As mentioned earlier, Soviet artillery in support of a breakthrough attack would be organized in regimental artillery groups (RAG), divisional artillery groups (DAG), and possibly army artillery groups (AAG). Figure 8 shows a typical organization in an area of main effort.

Command and Control

(U) A simplified command and control chart, Figure 9, shows the standard radio link up through the army echelon of command. As can be seen, division artillery has considerable redundancy and alternative routing to go to either division or army artillery by radio. Regiments have both VHF/FM and HF/AM and have enough radios to set up duplicate channels, if necessary. As shown in Figure 4 from battalion down, the radio nets are basically VHF/FM only and are thus more susceptible to jamming or other interference.

(U) The wire situation is more changeable. One can reasonably assume that division artillery has either wire or cable land lines available to the rear under most circumstances. If a deliberate breakthrough is planned, most if not all the artillery would be wired in, with single (primary) or double (alternate) circuits. On the other hand, as an attack progresses, each echelon of control would progressively outrun the wire net and have to revert to "radio only" control.

(U) Figure 10 gives a rough idea of when or where various echelons would outrun the wire net. As a rough rule of thumb, the critical CP/OP-firing battery links over which the bulk of fire direction takes place have to rely on radio solely after an advance by the forward units of 5-10 km. This situation is exacerbated by the fact that fire

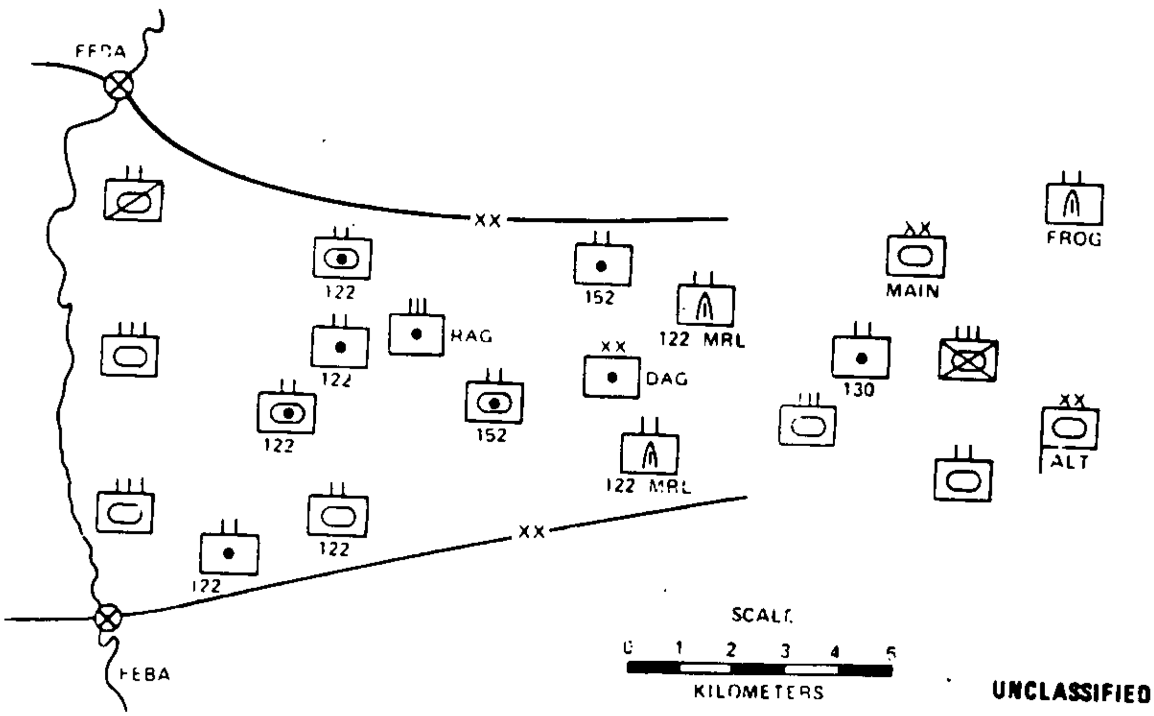


FIGURE 8. ARTILLERY ORGANIZATION BREAKTHROUGH ATTACK MAIN EFFORT AXIS (U)

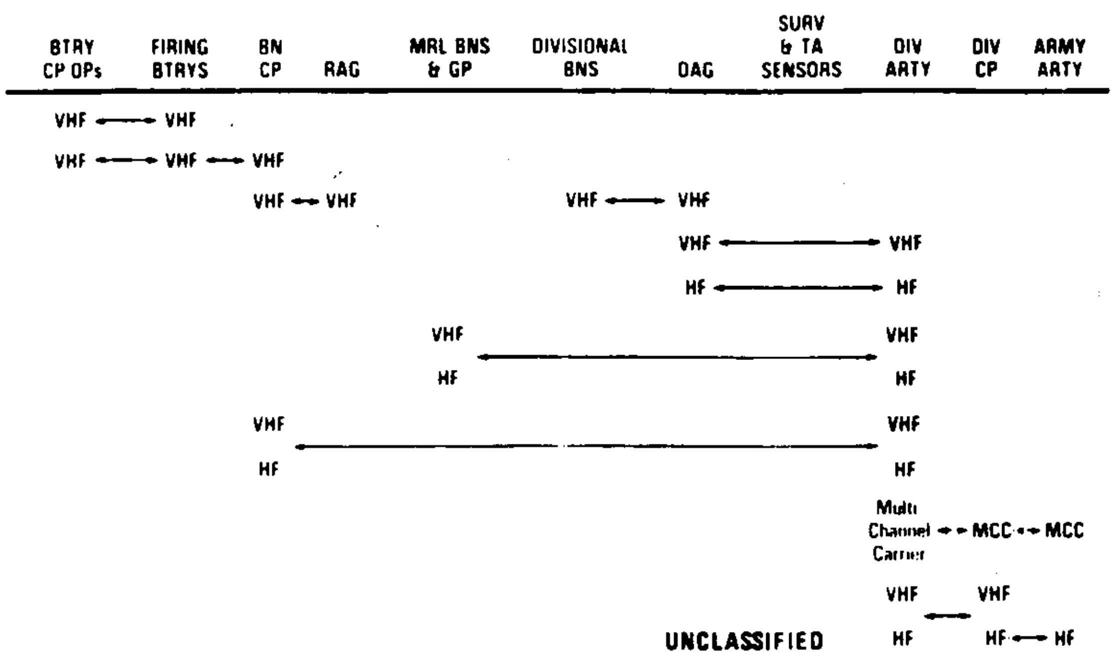


FIGURE 9. ARTILLERY COMMAND AND CONTROL RADIO LINKS (U)

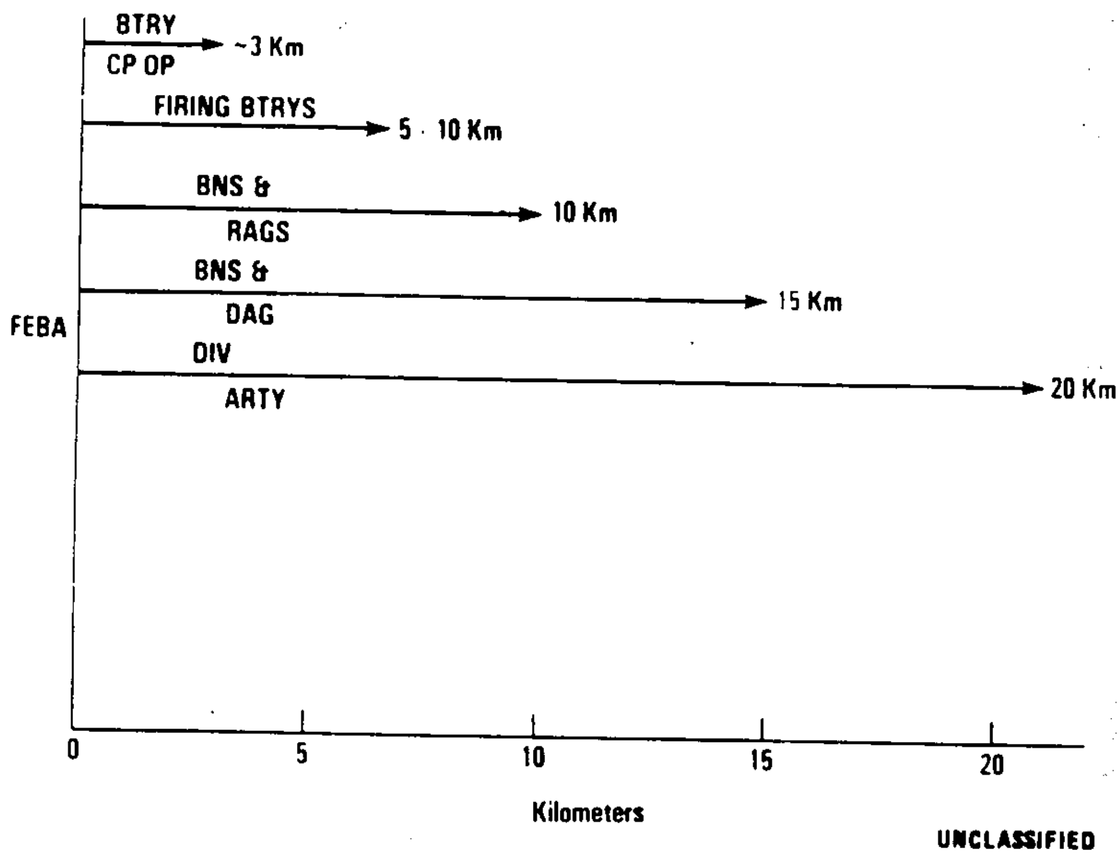


FIGURE 10. LOCATION OF FORWARD UNITS WHEN ARTILLERY WIRE NET OUTRUN (U)

planning (i.e., designation of preplanned concentrations) is less useful the deeper one moves into the enemy position. Thus, one could estimate that useful preplanning cuts off just about at the same point where the direct support artillery is forced to rely solely on radio for fire direction and control.

(U) If one places the wire net/radio net/control situation strictly into the NATO context, it shapes up as follows:

Preattack to attack begins at border:	Wire net complete Radio not essential Fire preplanning thorough Red artillery massed Execution of preplanned fires
Forward units advanced: 5 km	Battery CP/OP off wire Battery CP/OP radio essential Firing batteries on wire to rear FDC link on radio Battalion on wire, radio to batteries Fire preplanning beginning to lose focus Red artillery still massed Observer adjusted fires increasing
Forward units advanced: 10 km	Battery CP/OP radio essential Firing batteries radio essential Battalions shifting to radio Fire preplanning of little value 122-mm Battalions 2/3 to 1/3 of guns in action
Forward units advanced: 20 km	Radio essential all echelons and units but FROG and possibly division artillery Fire planning little value All units firepower down to 2/3 to 1/3

(U) As can be seen from this rough analysis, as the Red forces approach the NATO main battle position, their own firepower drops markedly; their artillery C^3 comes under full load and in its key elements is solely on a relatively limited number of VHF/FM radios, i.e., two per battery location.

(U) It should be noted, however, that Soviet intelligence probably has good information on NATO plans for occupation of the main battle position which would allow useful fire preplanning in that particular area.

COUNTER-C^3 OPPORTUNITIES

General

(U) Counter-C^3 actions considered are: (1) jamming communications and data links, (2) deceiving the enemy's C^3 system through the use of decoys or insertion of misinformation (e.g., into a computer or a radar-controlled system), (3) exploiting the C^3 system through the use of SIGINT, COMINT or DFing (e.g., against CPs), and (4) employing weapons to physically destroy key C^3 nodes such as command and observation posts and fire direction centers (FDCs).

1. (U) Jamming artillery communication links would have several inherent tactical advantages such as:

- speed of application
- buys time until target can be destroyed
- especially valuable against hardened or dispersed targets that are difficult to destroy such as self-propelled weapons
- does not require precise target location or highly accurate weapon delivery
- can handle many targets over a broad area

2. (U) Deception measures can:

- deny valid targeting information to the enemy
- misdirect his fire
- confuse his application of force

3. (U) Exploitation actions can:

- identify and locate targets
- monitor the effectiveness of our own jamming
- establish jamming parameters (power, frequency, etc.)

Vulnerabilities and Counter Actions

[redacted]

(C)

[redacted]

[redacted]

•

• [redacted]

•

•

e

[redacted]

[redacted] A survey was made of the opportunities for countering the C^3 [redacted]

(S) [redacted]

[redacted]

RECOMMENDATIONS

(U) It is recommended that:

1. (U) The U.S. Army establish a test doctrinal base for future development effort which explores the use of ECM as a major counterfire system.

2. [redacted]

3. [redacted]

[redacted]

-
-
-
-
-
-

4. [redacted]

5. [redacted]

[redacted]

SECTION C

MEANS FOR DETERMINING MILITARY WORTH OF COUNTER-C^3 APPROACHES

GENERAL PROBLEM AREAS

(U) The impact that counter-command, control, and communication (Counter-C^3) actions (i.e., exploitation, deception, jamming, or destruction) can have on military operations appears to be little understood or appreciated. A lack of interest by field commanders has been evidenced by the low priority afforded Counter-C^3 play in training, field exercises, and troop tests (although some improvement has been noted). In the few cases where jamming has been played, it invariably is terminated quickly so as not to interfere with "the more important training aspects" of the field exercise. As a result, participants in the exercise come to view jamming as an unrealistic harassment that is unfairly imposed rather than a real-world threat that could seriously disrupt military operations. Also, location and destruction of CPs and communication nodes and deception techniques are rarely practiced.

(U) Without an appreciation for the impact that Counter-C^3 actions can have on their own operations, commanders frequently fail to recognize the advantage that can be gained by employing Counter-C^3 actions against an adversary. In field exercises, U.S. forces seldom employ Counter-C^3 actions against enemy players and then exploit the enemy's disrupted C^3 system by launching a decisive attack. Thus, the severity of the impact of Counter-C^3 actions on mission effectiveness (friendly or enemy) is hardly ever experienced during field training or tests.

(U) The lack of appreciation for Counter-C^3 actions is reflected in other areas such as in limited equipment procurements which has resulted in an inventory of poor quality and low quantity. This is because historically it has been much easier for commanders to recognize and understand in combat situations the advantage gained from the physical destruction of enemy forces as opposed to disruption of C^3. It is also easier for systems analysts to predict and quantify the improvement that a new weapon will have on force effectiveness than it is to determine what improvement a new radio intercept and direction finder or jammer will have. Consequently, in a competition for developmental and acquisitional funds, the destruction-oriented weapon system is generally the winner.

(U) Because the effects of Counter-C^3 measures are diffused and subtle, it has been difficult to quantify their military worth. In the analytic community, quantitative measures of the effectiveness of nonlethal Counter-C^3 actions have not been developed and validated by field exercises as they have been for weapons. Consequently, Counter-C^3

play in combat simulations and war-gaming models is neglected, and the effectiveness of Counter-C^3 actions is seldom mathematically assessed and compared with the effectiveness of weapons. Even if an appropriate measure of military worth were available, modeling Counter-C^3 actions would still be difficult since very little data have been collected on their impact during either actual combat or field exercises.

(U) From the above, it appears that there are two general areas in which actions can be taken that will lead to a better appreciation of the military worth of Counter-C^3 capabilities. The first is to conduct field exercises and troop tests with the principal objectives of training in an EW environment and measuring Counter-C^3 procedures and actions on combat effectiveness. The second is to conduct analyses and simulations designed to reduce the scope and cost of field tests and to provide an analytical framework in which the effectiveness of various Counter-C^3 actions can be judged. The following paragraphs provide a discussion of the proposed actions.

TROOP FIELD TRAINING EXERCISES

(U) Field training exercises are generally designed to test and measure the current status of unit training and to exercise command, control, and communications procedures in an environment that approaches that of combat. These exercises, conducted on a periodical basis, offer an excellent vehicle for the introduction of Counter-C^3 measures, particularly jamming and deception play. They can be a major step toward developing a better understanding and appreciation of what jamming can do to the coordination and execution of combat operations at the troop unit level. With a better appreciation of the tactical value of Counter-C^3, user support for such measures can be gained, needs can be better defined, employment concepts tried, and tactics and doctrine developed and rehearsed. Therefore, it is recommended that Counter-C^3 measures, especially electronic countermeasures, be made a regular part of the Army Training Evaluation Program (ARTEP) and that the program be extended to include a division-level (representative segment) command post exercise whose principal objective is evaluating Counter-C^3 procedures on combat effectiveness.

OPERATIONAL TESTING

(U) A comprehensive understanding of the effects of denying or degrading the ability of a military commander to control his forces is a basic requirement in planning a counter-command, control, and communications program. Since it is not practical with current equipment to consider the complete disruption of command and control operations, the understanding of the effects of Counter-C^3 must extend to detailed knowledge of specific critical C^3 channels.

(U) Although considerable effort has been expended by the intelligence community in analyzing Soviet exercises and documents on C^3, there is a clear need to perform joint operational tests designed to determine the relative importance of specific C^3 links. In addition, later tests are required to determine the value of the various Counter-C^3 recommendations of this report.

(U) An initial step in the series of tests envisioned would be a command post exercise (CPX) in which officers with appropriate training and experience participate in various war games. During this CPX, the normal or preferred channels used to transmit orders to subordinate units or to receive data on which to make a decision will be withdrawn from the exercise. The effects of the removal of these channels of control will be assessed as to the time required to implement alternative procedures and the overall effect on operations from corps to company levels. The CPX must be staffed with both Army and Air Force officers because of the joint nature of C^3 operations. The objective of the CPX phase of testing is to provide inputs into the test design for a field exercise.

(U) The second phase of testing would be designed to validate the findings of the CPX in a field environment while using appropriate communications nets. Because field exercises are very costly, maximum use of simulations will be made. In this way, the actual field deployments and lengths of exercises can be sized to test the most critical C^3 channels. Upon completion of the field exercises in this phase, one will have established a baseline of the expected effects of the denial of specific C^3 channels to commanders of various maneuver units and weapons systems. At this stage, the variables of detections, location, jamming, or weapons accuracies have not been played. The intent has been to identify critical command and control channels and node, and the expected results of denying these to the force commander.

(U) The final test phase will be a joint operational test in which exploitation, deception, jamming, and destruction techniques will be attempted and the results analyzed. These results can then be compared against the established baseline to determine the acceptability of the Counter-C^3 to achieve the desired enemy response.

(U) Certain Counter-C^3 techniques may be based upon a peacetime identified vulnerability of the enemy's practices, which, if he is alerted, he can correct prior to hostilities. These "fragile" techniques must be handled with caution to prevent compromise, and in such cases field testing may not be appropriate.

(U) A concept for JOT&E of Counter-C^3 operations is given in Appendix F.

COUNTER C^3 SIMULATIONS AND MEASURES OF WORTH

(U) A major difficulty in assessing the military worth of nonweapon systems is that there is no widely accepted simple standard that is a valid measure of their worth. Probability of kill (P_k), the measure frequently used to express the effectiveness of weapons, has obvious limitations with respect to nonweapons and even limitations with respect to weapons themselves. Nonweapons do not kill, and hence it is not feasible to measure their effectiveness or worth in terms of a P_k. Weapons, although they do have a kill capability, can have a relatively higher or lower military worth than indicated by a P_k when factors such as survivability, suppression, target value, and the tactical situation are taken into consideration.

(U) The dependence of military worth on variables other than P_k suggests a need for assessing military worth in the context of a scenario so that the additional variables can be represented. This is currently being done for weapons systems. A weapon system's worth is frequently measured by the number of enemy weapons or equipments they are credited with destroying in a particular scenario; that is, measured in terms of either the absolute number of enemy materiel losses or the ratio of enemy to friendly losses during a particular engagement. The analytical techniques and parametric values that have been developed to calculate the numbers and ratios, for the most part, have been validated by tests in a "real-world" environment and are generally widely accepted. The same, however, cannot be said about techniques and parameters for evaluating the worth of nonweapon systems. Thus, in the absence of a unique and proven measure for assessing the worth of nonweapons, one approach that can be readily adopted for their assessment is to use the same measures that are used for weapons. Even though Counter-C^3 systems themselves do not destroy materiel, they can increase the effectiveness of friendly weapons in a scenario, and the increased destruction that results can be attributed to the Counter-C^3 system. In such cases the worth of the Counter-C^3 system can be expressed in the same terms as for the weapon (i.e., as the number of enemy weapons or equipments destroyed).

(U) As an example of the above, jamming the radio communications of a Soviet tank company in an ambush zone can be simulated with a very high resolution combat model, and the military worth of the jamming can be expressed as a change in the loss exchange ratio for the forces in the scenario. In the model, artillery fires are used to force the enemy tanks to "button up" and thus prevent use of hand and arm signals. Functionally, jamming the unit radio net will (1) force the tanks to individually acquire targets and (2) disrupt the tactical formation; i.e., the opposing force will arrive at the open fire ranges simultaneously and will not operate in a coordinated manner. In the absence of jamming, model calculations indicate that the defending U.S. unit will achieve a loss exchange ratio (attackers killed per defenders killed) of less than 4 to 1 against the attacking tanks. If the attacking tanks must acquire their own targets (no cueing from other tanks), the exchange ratio improves to about 4.5 to 1. If the attacking force is in addition disrupted so that the tank platoons arrive with delays of approximately a minute between each platoon, the loss exchange ratio improves to 7.0 to 1 in favor of the defender. Jamming of the opposing company command net can thus clearly lead to significant improvements in friendly force effectiveness. These analytical results must, however, be validated with troop tests. The U.S. Army REALTRAIN tank engagement scoring system could be used to test the value of a forward deployed set-on communications jammer in a realistic combat situation, and the test results could be used to refine the existing combat simulation.

(U) Another example of how to estimate analytically the military worth of jamming also uses loss exchange ratios but for a larger force-on-force simulation. The effectiveness variable could be time delay (induced by jamming), and military worth could be measured as the increase achieved in friendly to enemy force ratios as a result of disrupting the planned phased arrival of Soviet second echelon regiments at the FEBA. Again, however, data derived through troop exercises are needed for validation. In this case, the level of the test has to focus on division, vis-a-vis company, but should have at least one battalion-size maneuver force to permit a more realistic evaluation.

(U) The BDM Corporation, in a study comparing the relative capabilities of U.S. and Soviet ground forces to conduct electronic warfare (EW)*, developed a methodology to assess the military worth of EW systems in a simplified scenario and selected rate of kill (R_k) as a measure of the military worth of the EW system. Represented in the scenario are four of the major components of the target engagement sequence: a target array, target acquisition resources, command and control elements, and weapons. Various EW options can be played in the scenario and the effectiveness of each can be measured by its ability to degrade the opposing force's R_k. For example, the effectiveness of U.S. direction finding (DF) systems can be assessed by first determining the accuracy to which the systems can locate Soviet emitters and then calculating, in a given scenario, the probability of certain emitters being destroyed by fire. The loss of the emitters results in a degradation of Soviet target acquisition capability which in turn results in a reduced Soviet R_k of U.S. targets. Similarly, the effectiveness of U.S. jammers against Soviet tactical communications nets can be evaluated in terms of a reduced Soviet R_k by first determining the situations in which jamming is possible and then measuring the impact of communications delays caused by jamming.

(U) Although R_k can be a suitable measure of the worth of Counter-C^3 operations, it is still one step removed from a direct comparison of the worth of a nonweapon with a weapon and thus only indirectly answers the question: What is the worth of a Counter-C^3 system compared to the worth of a weapon system? A more direct answer is of importance to decision makers who are faced with the problem of determining

* (U) The BDM Corporation, NTA: Impact of EW on Target Kill Rates at U.S. Brigade/Soviet Regimental Level (U), 30 July 1976, SECRET/NO FOREIGN DISSEM.

whether or not an EW system might be more cost effective than a weapon system in a given situation. For these decision makers, it would be helpful to know the worth of the EW system directly in terms of an equivalent number of weapons and to understand under what conditions the equivalency is valid.

(U) Since a reduced enemy R_k results in an increased survivability of friendly weapons, the increase can also be used as a measure of the military worth of Counter-C^3. That is, the worth of Counter-C^3 activity in a particular scenario can be expressed as equivalent to a certain number of friendly weapons (i.e., those that survive the battle as a result of Counter-C^3). This measure gives a somewhat more direct and meaningful assessment of the worth of EW than does R_k. For example, if 30 minutes of jamming a Soviet fire combat net results in four U.S. antitank weapons surviving the battle (i.e., not lost to casualties, damage or suppression), the worth of 30 minutes of jamming in the scenario is equivalent to four U.S. antitank weapons. In this situation, it would be more cost effective to provide the commander with an effective, low-cost jamming capability than provide four additional relatively high-cost antitank weapons. This is not to say that jamming is worth four antitank weapons in all situations, but rather in the particular situation evaluated, the worth of jamming is equivalent to the effectiveness of four antitank weapons. Expressing the worth of jamming in terms of a number of antitank weapons is a more direct means of comparing the two systems than is R_k.

(U) The following illustrates how the worth of jamming can be measured in terms of the increase in the survivability of weapons in a scenario similar to the one set forth by BDM. A Soviet field artillery battalion net, shown in Figure 11, is the target; and the military worth of jamming the net is measured by the increase in the number of U.S. infantry antitank weapons that survive the Soviet artillery bombardment.

(U) Figure 12 shows a Soviet firing scenario for a single artillery battalion. It is a steady state scenario since the number of fire requests per hour is constant. Also, if the elements of the scenario are unperturbed by an opposing force, the number of rounds fired per hour is constant. The figure is essentially the same as the preceding except superimposed are parametric values that make its net dynamic. Values are given for the number of fire requests initiated per hour, the elapsed time from initiation of a request until firing is completed, and the number of rounds fired per request. The figure shows that in the unperturbed steady state condition each battery fires an average of 800 rounds per hour (a total of 24 battery missions per hour x 100 rounds per battery mission ÷ 3 batteries). The values used are assumed in order to illustrate the methodology. Real-world values would have to be determined by tests or intelligence reports.

(U) Not shown is a U.S. target array which, for illustrative purposes, is assumed to be a mechanized infantry battalion. The array provides a means for assessing the impact of 800 rounds of Soviet fire on a U.S. force, and thereby a means for determining the number of infantry antitank weapons in the battalion that remain effective throughout the bombardment.

[redacted]

[redacted]

[redacted]

FIGURE 11. SOVIET FIELD ARTILLERY BATTALION RADIO NETS (U)

[redacted]

FIGURE 12. EXAMPLE OF SOVIET FIELD ARTILLERY BATTALION FIRING SCENARIO (U)

(U) The feasibility of jamming the various links of the Soviet artillery net was examined in Section 8 of the report which concluded that jamming the two links to the firing batteries (one link coming from the battery CP-OP/FDC and the other from the battalion CP-OP/FDC) should be the most effective means for disrupting a battery's fires against targets of opportunity.* Jamming these links to one or more batteries can alter the steady state condition in the described scenario, thus reducing either the number of rounds fired per mission or the number of missions fired. Which battery fires are reduced and by what amount depends upon what battery links are jammed and the duration of the jamming. Based on a given jamming scheme, the resulting reduction in Soviet fires can be calculated and the impact of the reduced fires on the target array used to assess the increase in the number of surviving antitank weapons. The increase in the number of survivors then provides a measure of the worth of jamming in the scenario.

(U) An advantage to this type of scenario is its flexibility. It can be expanded to include a U.S. artillery battery, both as part of the target array and part of the firing scenario. When included, a U.S. and Soviet counterbattery duel can be simulated and the increased survivability of the artillery as well as the infantry used to assess the worth of jamming. Also, by selecting different combinations of fire request rates for the Soviets and different numbers and deployments of targeted weapons for the U.S., the military worth of jamming can be assessed over a wide variety of scenarios. This flexibility permits the sensitivity of the military worth of jamming to the tactical scenario to be readily determined.

(U) A maneuver unit's command net may replace the illustrated artillery net, and the military worth of jamming a command net to delay the arrival of second echelon forces can be assessed. The steady state conditions would again apply but in this case would be represented by U.S. and Soviet forces in contact along the FEBA being reinforced at preselected constant rates for the duration of the battle. Jamming Soviet command links could delay the arrival of their second echelon forces. Since U.S. reinforcements would continue to arrive, the force would become more favorable for the U.S. with time. The measure of the military worth of jamming would thus be the number of additional U.S. tanks and APCs that survive the battle as a result of a more favorable force ratio caused by jamming.

---

*(U) Degradation of scheduled fires by jamming was assessed as not effective since the fires are preplanned and not controlled by radio transmissions.

RECOMMENDATIONS

(U) It is recommended that:

1. A two-phased joint operational test and evaluation (Army and Air Force) be conducted whose principal objectives are to:

   a. Test and measure the effectiveness of simulated Soviet EW actions on the combat effectiveness of a U.S. division (segment) supported by tactical air (Phase I).

   b. Test and measure the effectiveness of U.S. Counter-C^3 actions (jamming, exploiting, deceiving and CP destruction) on a vertical segment of a simulated Soviet division (Phase II).

2. The Army's Training and Evaluation Program (ARTEP) be expanded to:

   a. Assess unit performance in an EW environment.

   b. Include a division level CPX with a full battalion maneuver force so that the impact of EW applications on force combat effectiveness can be realistically evaluated and new tactics and doctrine can evolve.

3. An analytical framework for estimating the military worth of Counter-C^3 capabilities be developed. The following are needed:

   a. High resolution simulations/models to define and quantify the functional improvement in friendly unit performance and/or the degradation in enemy capabilities (artillery, air defense, maneuver unit).

   b. Aggregation of high resolution model results to a division level simulation/model.

   c. Integration of test and field exercise results into simulations and models for refinement and to validate analytical results and develop guidelines for more effective integration of Counter-C^3 actions into operational plans.

GLOSSARY TO SECTION A

ACRONYMS, ABBREVIATIONS, AND PROJECT NAMES

Abn	Airborne
ACA	Multichannel Airborne Collection Assembly (LEFOX GREY)
ASA	Army Security Agency
CAC	Control and Analysis Center
CAS	Close Air Support
CEFIRE TIGER	Airborne multichannel jammer (AN/ALQ-150)
CEFLY LANCER	Airborne communications emitter location and intercept system (AN/USQ-71)
CELTS	Coherent Emitter Location Testbed System
CEWI	Combat Electronic Warfare and Intelligence
Coll	Collection
CSG	Cryptologic Support Group
DF	Direction Finding
DOA	Direction Of Arrival (direction finding)
DS	Direct Support
ECM	Electronic Countermeasures
ELS	Emitter Location System
ERP	Effective Radiated Power (over isotropic)
EW	Electronic Warfare
EWIOC	Electronic Warfare Intelligence Operations Center
FDM	Frequency Division Multiplexing
Gnd	Ground
GS	General Support

GUARDRAIL	Airborne communications intercept and location system
INSCOM	Intelligence and Security Command (US Army)
IOSS	Intelligence Organization Stationing Study
LCA	Multichannel Light Collection Assembly (LEFOX GREY)
LEFOX GREY	Multichannel collectors
LOB	Line Of Bearing (radio direction finding)
Manpack	Backpacked intercept and direction finding set (AN/TRQ-30)
MCA	Multichannel Medium Collection Assembly (LEFOX GREY)
MM	Manual Morse
Non-Comm	Non-Communications
OUTS	Operational Unit Transportable System (HF skywave collector)
PPM	Pulse Position Multiplexing (form of Time Division Multiplexing)
QUICK FIX	Heliborne communications jamming, intercept, and direction finding system (AN/ALQ-151)
RDF	Radio Direction Finding
REC	Radio Electronic Combat (Soviet Electronic Warfare)
RPV	Remotely Piloted Vehicle
SCCS-F	Single Channel Collection Set, Forward (replaces TRAILBLAZER)
SCCS-R	Single Channel Collection System, Rear
SOI	Signal Operating Instructions (frequency/callsign)
SSAS	Special Signal Analysis System (radio fingerprinter)
SSB	Single Sideband
SSL	Single Station position Locator (replaces AN/TRD-26)
TACELIS	Tactical Communications Emitter Location and Identification System (AN/TSQ-112)
TACJAM	Tactical Communications Jammer (AN/MLQ-34)

TDOA	Time Difference Of Arrival (emitter location)
TOC	Tactical Operations Center (main combat command post)
TRAFFIC JAM	Ground-based communications jammer (AN/TLQ-17A)
TRAILBLAZER	VHF ground intercept and direction finder Quick Reaction Capability (AN/TSQ-114)
WP	Warsaw Pact

REFERENCES TO SECTION B

1. R.M. Cline et al., Net Technical Assessment: Effect of Soviet Artillery Fire Support on U.S. Infantry Antitank and Artillery Counterfire Capabilities (U), System Planning Corporation, Report 291, April 1977 (SECRET/NO FORN).

2. Sidorenko, The Offensive, Moscow, 1970 GPO (UNCLASSIFIED).

3. U.S. Army FSTC, Gun and Howitzer Systems (Current and Projected) Eurasian Communist Countries (U), January 1977 (CONFIDENTIAL).

4. R. Bond, The Soviet War Machine, Chartwell Books, Inc., New York, 1976 (UNCLASSIFIED).

5. U.S. Army Intelligence Threat Analysis Detachment OACSI, Unpublished Paper, 1977.

6. "A Battalion in an Advance Guard," Military Herald, No. 3, 1972 (UNCLASSIFIED).

7. Selyawin and Kuidmaa, "Supporting the Advance Party," Military Herald, No. 8, 1974 (UNCLASSIFIED).

8. Krysamou, "Artillery in a Tactical Attack Formation," Military Herald, No. 13, 1975 (UNCLASSIFIED).

9. Kirsanou, "In Meeting Engagement," Military Herald, No. 8, 1974 (UNCLASSIFIED).

10. The Armies of the Warsaw Pact Nations, Friedrich Wiener, Carl Ulberreuter, Publishers, Vienna, 1976 (UNCLASSIFIED).

APPENDIX A

COMBAT EFFECTIVENESS OF COUNTER-C^3 CAPABILITIES

[redacted] The four categories of Counter-C^3 actions examined below are: (1) exploitation, (2) deception, (3) jamming, and (4) destruction of the enemy command, control, and communications systems. The first two types of Counter-C^3 action can increase friendly force effectiveness through concentration of friendly efforts at the proper time and place (exploitation) and by dilution of opposing enemy capabilities (deception). Jamming or destruction of the enemy C^3 system has the primary goal of disrupting enemy capability to coordinate the fire and maneuver of the combined arms team. Two related, derivative, Counter-C^3 actions are: (1) protection of the friendly C^3 system from enemy jamming and/or destruction and (2) masking of friendly C^3 systems from exploitation by the enemy.

[redacted] The combat effectiveness of Counter-C^3 actions is directly related to the value of the C^3 function to the opposing military force. Effective C^3 capabilities are essential to a military force during dynamic phases of an engagement when critical time-sensitive information must be transmitted to achieve a coordinated total force effort. Consequently, productive Counter-C^3 actions also tend to be time sensitive.

[redacted] The specific opportunities for effective Counter-C^3 actions are scenario and mission dependent/ [redacted] The tempored and spatial descriptions of the battlefield are sufficiently different for each mission/scenario situation to require a separate analysis of the potential impact of Counter-C^3 actions. For each case, however, it is necessary that sufficient combat power is available to penalize an enemy force degraded or disrupted by Counter-C^3 actions.

[redacted] The objectives of Counter-C^3 actions also tend to differ for each phase of the engagement. During the period of preparation for a major engagement, exploitation of indications of likely enemy courses of action and disruption of the enemy planning process may be most productive. During the movement to contact phase, delay of selected enemy maneuver elements may be necessary to disrupt a time-phased buildup of combat power. Finally, during the direct fire engagement, dilution of enemy fires and isolation of forward combat units may be most productive.

[redacted] The measures of effectiveness of Counter-C^3 capabilities are thus dependent on the scenario, the mission of the supported force, and the phase of the battle. Effective exploitation of the enemy C^3 system can result in favorable initial conditions for an engagement. The military worth of an effective exploitation capability can be measured directly in terms of enhanced survivability of major weapons due to the favorable initial conditions for the engagement. The delay in the arrival of enemy second echelon forces due to disruption of the enemy C^3 system (jamming or destruction) can be measured in terms of the time that is necessary for forward deployment of reserves or lateral displacement of forward units. An additional delay of 15 minutes may, for instance, be inadequate while a delay of 1 hour may be more than sufficient to establish favorable initial conditions for the direct fire engagement. During direct fire battle, the effect of diluting enemy fires by use of decoys and disrupting coordinated employment of maneuver elements by the enemy force can be measured directly. This degradation in enemy combat effectiveness can be measured in terms of the enhanced survivability of friendly forces for an equal level of damage inflicted. Isolation of forward enemy maneuver elements by disrupting communications with adjacent units and with higher echelons can also have a fundamental impact on the outcome of the battle in that the fraction of casualties necessary to inhibit performance of the assigned mission (the unit breakpoint) can be significantly lowered. Combat experience indicates that units that are isolated may break at a casualty level of less than 5 percent as compared to 30 percent or greater for units that have adequate communications.

[redacted]

[redacted]

[redacted] Another example of a potentially effective Counter-C^3 action is to use decoys to dilute the fires of a numerically superior attacking force. A defending force that has an exchange ratio of 2 to 1 against a numerically superior enemy from static firing positions can achieve a significant improvement in effectiveness (from an exchange ratio of 2 to 4) by relocating to alternate firing positions when pinpointed by the enemy (a nearby hit is detected). If, in addition, the defender deploys an equal number of decoys that are half as detectable as the tanks, the exchange ratio increases to 6 to 1.

[redacted] An even more significant potential enhancement in combat effectiveness can be achieved if the planned phased arrival of combat power at the FEBA can be disrupted.

[redacted]

[redacted]

[redacted]

APPENDIX B

JAMMER POWER CALCULATIONS

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

TABLE B-2

MEETING ENGAGEMENT (U)

[redacted]

[redacted]

(C)

(C)

(C)

(C)

[redacted]

(C)

([redacted]

[redacted]

[redacted]

TABLE B-3

BROADBAND JAMMER PERFORMANCE REQUIREMENTS (U)

[redacted]

[redacted]

[redacted]

APPENDIX C

JAMMING EFFECTIVENESS CALCULATIONS

(U) 1. The jamming effectiveness charts were derived from the following basic equation for propagation loss:

(1) $L = 108\text{-}20 \log h_t h_r + 20 \log f + 40 \log d$

where L = propagation loss in dB

h_t = transmitting antenna height in feet

h_r = receiving antenna height in feet

f = frequency in MHz

d = distance in kilometers

This equation is an empirically derived, generally accepted model for VHF propagation loss (above 40 MHz) over plane earth. Other models and test data have been used to validate the accuracy of the above equation with general agreement found for most typical terrain conditions. The theory of propagation over plane earth is presented in a simplified form that is made possible by restricting the frequency range to above 30-40 MHz, where variations in the electrical constants of the earth have only a secondary effect.

(U) 2. The jamming problem is described by the following equation:

(2) $J/S = P_j - L_j - (P_t - L_t)$

where J/S = jam to signal power ratio (dB)

P_j = jammer ERP (dBm)

L_j = loss between jammer and victim receiver (dB)

P_t = threat transmitter ERP (dBm)

L_t = loss between the threat transmitter and victim receiver (dB)

A J/S value of 6 dB has been well established as the nominal value of jam to signal power ratio needed to completely eliminate communication in FM radios (assuming bandwidth and frequency are properly matched).

(U) 3. With the appropriate parameters entered in equation (2), the maximum effective standoff distance for the jammer can be found for the given conditions. The effects of foliage, frequency, and other propagation anomalies are even less pronounced when the jamming problem is solved. That is, the absolute value of propagation loss in the jammer link and the transmitter link will be influenced by those factors, but the difference in power seen by the victim receiver (J/S ratio) is constant (assuming all links operate over the same type terrain). It is the J/S ratio at the victim receiver which determines jamming effectiveness.

(U) 4. When the propagation loss for each link (found by equation (1)) is included in equation (2), then equation (3) follows:

$$(3) \quad J/S = 10 \log P_j/P_t + 40 \log D_t/D_j + 20 \log H_j/H_t$$

where J/S = jam to signal power ratio (dB)

P_j = jammer ERP (watts)

P_t = threat transmitter ERP (watts)

D_t = threat transmitter link distance (km)

D_j = jammer standoff distance (km)

H_j = jammer antenna height (ft)

H_t = threat transmitter antenna height (ft)

This equation can be solved for any of the parameters above when the other conditions are known.

APPENDIX D

EXPENDABLE JAMMER EFFECTIVENESS

[redacted]

APPENDIX E

DIGITAL CONTROL OF COMMUNICATIONS EQUIPMENT

(An Opportunity for Gaining Electronic Warfare Advantage)

(U) This appendix is intended to suggest some simple development policy objectives which, if adopted, could give us a vastly improved communications and Counter-C^3 posture through digital control of communications equipment. We shall first distinguish digital control of communications from communication of digital data. Next, we shall show some of the benefits which could follow from widespread use of digitally controlled communication equipment. Finally, we shall outline some simple development policy objectives which could lead us toward these benefits.

DIGITAL CONTROL VERSUS COMMUNICATION OF DIGITAL DATA

(U) Digital control of communications equipment should be distinguished from communication of digital data. By digital control of communications, we mean the use of digital control signals, presumably generated by some computing device, to establish the frequency, bandwidth, modulation type, duration, and power level of transmissions and to control the frequency, bandwidth, detection circuits, and sensitivity of receivers. The communication being controlled can be of any standard type, including AM or FM voice, FSK teletype, or any of a variety of digital data links. The use of digital control automates the functions served by the knobs, switches, and dials found on today's communication equipment.

(U) Digital control has been used for some time in intercept receivers. The R1849 receiver in the AN/ULR-17, for example, is entirely controlled by digital signals. The only manual controls on this receiver are an on/off switch and a pair of numerical address dials which can be set to distinguish one receiver from another. Manual control of such a digitally controlled receiver is made possible by a manual control box which generates the appropriate digital control signals in response to the positions of knobs and switches set by an operator. The R1849 receiver and its control box can either be adjacent or far separated as is often done in direction-finding applications. Remote control of the receiver, of course, requires a suitable digital data link to carry the control signals. The ESL receiver (R2017) used in QUICK FIX and TRAILBLAZER is another example of an existing digitally controlled intercept device.

(U) Digitally controlled communications equipment is entirely compatible with and interoperable with existing manually controlled equipment. The intercept receivers mentioned above are used to receive a wide variety of manually controlled transmissions. Similarly, the digitally controlled jammers which are part of the TACJAM equipment can readily be heard in manually controlled receivers. Because digitally controlled communications equipment is compatible with our existing inventory of manually controlled equipment, a graceful transition to widespread use of digitally controlled equipment is possible.

WHY USE DIGITAL CONTROL

(U) By using digital control, we can gain an important advantage in electronic warfare by getting maximum benefit out of our communications assets. From the point of view of national technical capability, we are not particularly better at generating RF energy than any other nation, nor do we have any superior capability in receiver sensitivity. What we do have is a superior capability to build digital circuits. Digital control of communications equipment will permit us to convert this superior capability into a military advantage by enabling us to get more benefit out of communications transmitters and communications receivers than can our opponents. We can substitute digital circuitry for transmitter power, receiver sensitivity, additional equipment, and manpower to our substantial advantage.

(U) Because digitally controlled receivers can retune to a sequence of frequencies in rapid succession, they can monitor many channels nearly simultaneously. Sensing a signal on any of the assigned frequencies, they can lock onto it and receive the information transmitted. Because a typical military communication channel is actually in use only a small fraction of the time, this ability to scan and lock on can make a single receiver do the work of several. This, of course, is the feature which makes digital control of intercept receivers attractive.

(U) Widespread use of digitally controlled communications receivers would make it possible for military units to monitor two or more communications nets simultaneously, a capability which now requires multiple receivers. The frequencies monitored might include not only the primary communications net of the unit and its alternate but also the likely communications frequencies of the opposing forces. Naturally, priority in receiving signals would have to be given to the primary communication function, but the times when receiving equipment is currently idle could be put to use.

(U) Digitally controlled communications transmitters can be used in a jamming role. Because a battlefield transmitter is used only intermittently for its communications function, it is idle during a large fraction of the time. During these idle periods, it could be used to advantage in a jamming or deceptive role by broadcasting automatically on some assigned jamming or deception frequency. The total RF power output of the combined transmitters in a tactical communication net is a quite significant jamming asset, especially considering that it is probably located close to the enemy nets which are to be jammed.

(U) Digitally controlled transmitters and receivers can communicate in a frequency-hopping mode. If both receiver and transmitter are rapidly retuned according to a prearranged schedule, communications between them can be continuous but will be very difficult for anyone who does not know the retuning schedule to intercept the transmission. Frequency hopping is obviously incompatible with conventional, manually tuned equipment but is an important capability which widespread use of digitally controlled equipment would make available.

(U) By using digital control, it is possible to automate complex communications procedures which cannot now be used. For example, a tactical communications net might change to alternate frequencies at preselected times. Similarly, it might change from conventional communications to frequency hopping in a preselected manner. Again, the discipline of radio silence might be imposed automatically. The signatures of the tactical communication net can be made to change rapidly and easily by supplying different communication procedures to the digital communication controllers without having to provide extensive training to the fighting forces which use the communications systems.

(U) As our capability to make digital control systems improves over the next two decades, we will no doubt discover a wide variety of ways in which automatic digital control of communications can be used to confound the enemy and improve the reliability of our own communications. The key to making the impact of this advancing technology felt on the battlefield is by widespread adoption of digitally controlled RF generators (transmitters) and RF sensors (receivers). The essential feature of digital control is that it separates the potentially very complex control functions of communications equipment from the raw (and relatively expensive) RF generation and sensing functions. By making this separation, we permit each field of technology to advance in either area. Substantial gains are available because the duty cycle on communications equipment is relatively low.

(U) Finally, digital control of communications equipment could actually reduce its cost. By going to digital control, one can eliminate many of the mechanical parts now used for tuning and manual control. The potential savings in manufacturing cost and in maintenance should be carefully evaluated. Similarly, digital control makes possible a variety of automated test equipment which may be valuable in keeping equipment operable in the field. Even where manual control boxes are needed with digitally controlled communications equipment, our ability to make low-cost microcomputers makes possible great simplification in the mechanical parts of the control.

DEVELOPMENT STEPS TO BE TAKEN

(U) There are three ways to move toward widespread use of digital control in communications equipment. First, one can encourage specific programs in which digital control is used. Second, one can initiate tests of digital control in operational military communications nets using experimental equipment. Third, one can initiate interface standardization efforts.

(U) Several programs are underway in which digital control of communications equipment has been proposed, and some have even been completed, mainly for intercept purposes. Simply by encouraging these programs we can make progress toward understanding the costs and difficulties of using digital control. It would be well, however, to assess future programs against the broader goals outlined earlier, since digital control is usually proposed for narrow specific purposes, such as jam-resistance, covert communications, remote operation, etc., and not for the full range of capability which digital control could provide. For example, the jamming role of communications transmitters can be enhanced if they cover a broader frequency range than their most probable targets. SINCGARS, for example, fails to meet this goal. Similarly, it may make sense to build receivers capable of frequency hopping at rates other than those of the transmitters with which they are associated.

(U) Enough digitally controlled equipment has been built that it would be relatively easy and inexpensive to assemble a small unit communications system using digitally controlled equipment. Such a communications system might be assembled from intercept receivers, modified jamming transmitters, and commercial minicomputers. It would be instructive to use such a system in a combined communication/jamming mission against conventional communications equipment. We need to experiment with digital control of communications equipment in order to appreciate the full range of possibilities it affords us.

(U) We should begin some standardization efforts aimed at the digital control interfaces to communications equipment. These interfaces are important because they may outlive both the communications equipment and the control equipment which use them. New generations of control equipment will surely replace the initial equipment as our ability to pack complex control functions into small, low-power, low-cost devices improves over time. New communications transmitters and receivers will replace the initial set of digitally controlled units as we become more adept at producing digitally controlled devices at lower cost and in more convenient packages. A well-thought-out interface standard can permit these two developments to proceed at their separate pace through several generations of equipment.

(U) The standardization effort will have to involve personnel in communications, computers, and security. The interface standards establish in broad terms the range of communications systems which are possible. For example, the digital interface standard will have to establish the number of bits to be used in specifying frequency, a number related to the precision of the local oscillators which may be available in the distant future. Similarly, the rate at which digital data are delivered to the communications equipment will set an upper bound to the rate of frequency hopping possible in the equipment. The efforts to standardize the interface will reveal a great deal about the central design issues of digitally controlled communications equipment. Obviously, any such standardization effort would start with the digital interfaces used in existing intercept receivers.

(U) It is important to note that the effort to standardize the digital interface is not an effort to standardize on any particular communication system. The digital interface should be equally applicable to AM, FM, FSK, and digital data link communications systems. Similarly, it should apply to HF, VHF, UHF, Laser, and other communications systems. The interface standard will specify the encoding of communications control parameters; it should not specify the values used in particular communications equipments. Separate standardization efforts to choose frequency bands and modulation types of particular equipment will still be required.

APPENDIX F

FIRE SUPPORT OF OFFENSIVE OPERATIONS

GENERAL

(U) Soviet offensive combat doctrine regarding artillery support stresses decentralization of command, mobility, surprise, massing of fires, and immediate response to the needs of the supported unit commander. Artillery support during offensive combat is employed to coincide with the phases pertinent to each particular operation. In general, an artillery offensive can be categorized into the following phase:

- Preparatory fires
- Fires in support of the attack
- Fires in support of operations in the depths of the enemy's defenses

(U) The following are general characteristics of Soviet artillery in offensive operations:

- Artillery units conduct reconnaissance continuously by ground, air, and instrumental reconnaissance facilities
- Artillery support is concentrated in the direction of the main attack, and fires and units are maneuvered rapidly during the course of battle
- Conventional artillery fires are massed rapidly in conjunction with nuclear missile attacks and air strikes
- Rapid acquisition and allocation is made of targets for artillery, tactical air support, and nuclear fire means
- Strong antitank artillery reserves are maintained at regiment and higher levels
- Continuous close coordination is maintained between all combat units

FIRE SUPPORT OF ATTACK OF A DEFENDING ENEMY

(U) Preparatory fires are carried out under centralized control against the entire depth of the enemy's first defensive zone. The preparation is designed to disrupt enemy troop controls and to neutralize all forward enemy strong points, observation posts, and heavily defended areas. Prime targets are known and suspected enemy nuclear delivery systems.

(U) Fires in support of the attack are planned and conducted in order to neutralize enemy artillery and other weapons, to prevent the enemy from restoring effective troop control, to break up counterattacks, to destroy nuclear weapons systems and headquarters, and to hinder enemy maneuvers. Concentrations are planned based on the scheme of maneuver and fired accordingly, and targets of opportunity are engaged whenever discovered. Artillery during this phase is usually decentralized and is more responsive to the needs of individual ground unit commanders.

(U) Fires in the depth of the enemy's defense are conducted by the artillery which accompanies the attacking troops or by missiles and is employed in order to help sustain the momentum of the attack. It seeks to prevent enemy counterattacks and to destroy enemy forces seeking to withdraw from the main defense belt. Both air strikes and artillery are closely coordinated with the movement of the leading friendly units, all directed toward accomplishment of the division mission of the day.

(U) For the offense, fire planning is conducted in the first-echelon regiments of the MR and tank divisions based on the scheme of maneuver and fire support plan of division and higher. These plans enable the division to capture assigned objectives and accomplish the missions of the day. The division CRTA receives instructions from and advises the division commander on the employment of the artillery to include:

- Starting time, duration, and phases of fire preparation
- When and where to place defensive barrage phases during combat in the depth of the enemy defense
- Plans for decentralization of artillery control during the course of battle and scheme of reinforcement of the assault units with accompanying artillery
- Plan of support for commitment of second echelon forces and reserves. The division fire plan is normally based on the army fire plan. The CRTA incorporates the fires of the regimental and divisional artillery groups into the Army plan and simultaneously develops a division fire plan. This division plan is then forwarded to the Army for incorporation into the Army plan. Adjustments in both organization for combat and planned fires are made as the operation develops. These are also forwarded to Army.

EXECUTION OF FIRE SUPPORT PLAN FOR ATTACK OF A DEFENDING ENEMY

(U) Depending on the nature of the enemy defenses, the condition of available forces, the terrain, the nuclear/chemical situation, and the availability of artillery, Soviet planners prefer to achieve certain density norms for artillery. In the breakthrough of well-prepared enemy defenses, for example, relatively high numbers of guns per kilometer of breakthrough frontage are desirable, even under nuclear-scared conditions. However, the modernization of artillery and improved methods of fire control allow lower densities than those considered standard during World War II.

(U) Based on the fire support plan, supporting artillery groups are deployed into positions to provide preparatory fires and the initial fire support of the attack. Table F-1 provides tactical deployment norms for Soviet artillery. Of course, this example presupposes friendly forces in contact forward of the artillery positions. In a hasty attack artillery units would deploy into less elaborate positions, possibly pre-planned and reconnoitered, in order to provide fire support rapidly.

TABLE F-1

TACTICAL DEPLOYMENT NORMS (U)

Distances	Mortars	Guns and Howitzers	Multiple Rocket Launchers
Between Weapons	15-60 m	20-40 m	15-50 m
Between Batteries	–	400-2000 m	1000-2000 m
From the FEBA	500-1500 m	3-6 km (DAG) 1-4 km (RAG)	3-6 km

UNCLASSIFIED

(U) Preparatory fires would support the deployment of the assault forces up to the assault line. Then, without pause, fires in support of the attack would begin. When the assaulting forces reach a safety line some 200-400 m from the enemy positions, fires are shifted to the next line. Radio/telephone and visual signals can be used to shift these fires.

(U) Soviet doctrine calls for continuous fire support during the attack. Thus, after the initial fires, control of artillery is increasingly decentralized and artillery units supporting the first echelon battalions and regiments begin to displace. This displacement is preplanned to accommodate the advance of the assault forces. Thus, for example, the displacement of part of the direct support artillery battalion will begin upon the assault forces reaching a line selected during the planning for the battle. Continuous support is provided by displacing artillery by bounds, attempting to retain one-third or two-thirds of the artillery in position and in range to support the assault force.

(U) Included in the plan for the battle are the concept and tasking for fire support of the commitment of the second echelon. Displacement of supporting artillery must be planned to have the artillery units tasked with this mission in position to support that action.

APPENDIX G

CONCEPT FOR JOT&E OF COUNTER COMMAND, CONTROL AND COMMUNICATIONS

GENERAL

(U) In order to understand better the capabilities of U.S. forces to Counter-C^3 of Soviet ground forces, realistic operational test and evaluation are required to investigate the complex interactions among U.S. and Soviet electronic warfare forces, armored and infantry maneuver units, target acquisition and engagement systems, and combat support units. The major uncertainties focus on the military worth of present capabilities of U.S. forces to disrupt Soviet C^3 and how that capability can be improved.

(U) In some European scenarios, the Soviets utilize a massive concentration of forces to breakthrough NATO defenses. This strategy requires effective C^3 to orchestrate the movement of forces for a quick breakthrough. If the defending U.S. forces can interfere with the Soviet C^3, then decisive concentrations of forces may not be achievable or may be slowed sufficiently to permit effective attack by aerial weapons.

[redacted]

[redacted]

[redacted] [redacted]

[redacted]

CONFIDENTIAL

OBJECTIVE

(U) To address these uncertainties U.S. ground and air forces should be tested jointly against simulated Soviet forces in operational test exercises. The objective of the test program is to assess the effectiveness of current and planned U.S. forces in countering Soviet C^3. The test program should also support the development of tactics and help hardware developers identify system requirements or improvement which would enhance U.S. Counter-C^3 capabilities.

TESTING APPROACH

[redacted] For a test exercise to provide the data needed, it should meet several criteria:

- (U) U.S. forces should face simulated Soviet forces employing Soviet tactics and procedures and using communications and ECM with the essential characteristics of Soviet equipment. A major deficiency of previous attempts to measure Counter-C^3 effectiveness on a large scale has been the use of U.S. tactics and equipment on both sides
- (U) A free play approach to testing should be taken. This would involve real-time assessment and extraction of casualties essential to reflecting the effects of Counter-C^3 and motivating the participants
- (U) Large-scale forces maneuvering without narrow geographic limits should be employed to obtain results in the correct frame of reference. On the U.S. side, a divisional segment is required with some EW corps assets. Lower echelon units to include a full maneuver battalion are needed to retain the essential aspects of maneuver and C^3 targets
- [redacted]
- ([redacted]

(U) The approach to the test exercise will involve opposing "red" and "blue" forces controlled by umpire forces utilizing instrumentation to track the geographic locations of major elements such as battalion or companying CPs, artillery batteries, ASA facilities, and aircraft. Data from field umpires transmitted to a central tracking facility would permit real-time assessment of outcomes of engagements.

CONFIDENTIAL

DATA AND ANALYSIS

(U) The test exercise should be designed to provide data at two levels. At the first level, the impact of counters to C^3 should be directly observable from gross results. Measures such as time to achieve objectives, loss ratios, or magnitudes of forces reaching certain phase lines or objectives should be meaningful gross measures if engagements are assessed in near-real-time.

(U) At a second and lower level, the test exercise should provide data sufficiently detailed to permit fine grain diagnostic analysis of the effects of attacking the C^3. Measurements will range from timeliness of each type of engagement to distributions of delays in key types of messages at critical times in the battle. Debriefings of participating commanders are another important data source, particularly in guiding the numerical analysis.

(U) The test exercise will be preceded and followed by application of simulation models in order to efficiently design, understand, interpret and extend the test results. While it is not expected that a simulation model can be calibrated to the results, use of the results in such models should provide an analytical framework for the development of conclusions in the evaluation.

EXPERIMENTAL DESIGN

(U) The exercise nature of the testing and the expense of test operations preclude application of usual statistically based experimental design techniques. Testing will be limited to only variation of one controlled test condition at two or three levels. The following cases might constitute a test:

- Baseline I – no Counter Soviet C^3
- Baseline II – no Counter U.S. C^3
- Counter-C^3 I – both sides utilize Counter-C^3, U.S. forces use currently deployed equipment
- Counter-C^3 II – both sides utilize Counter-C^3, U.S. forces use some developmental EW systems

(U) An important controlled test condition will be the training of the participating troops. Initially, U.S. troop units participating in the test exercise should be selected and trained to a high level of readiness and ability.

STRUCTURE OF JOINT PROGRAM

(U) The test exercise is a joint activity. In addition to Army ground and helicopter attack units, Air Force units should exercise air-related elements of the C^3 system on both sides and should simulate attack of C^3 elements as part of an orchestrated joint Counter-C^3 effort. Additionally, elements of Air Force ECM may play an important role in locating or disrupting opposing C^3 elements.

[redacted]